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Yuhang Yang
Maode Ma
Editors

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Preface

Welcome to the *Proceedings of the 2nd International Conference on Green Communications and Networks (GCN 2012)*, which was held on December 12–14, 2012, in Chongqing, China.

GCN 2012 will be a venue for leading academic and industrial researchers to exchange their views, ideas, and research results on innovative technologies and sustainable solutions leading to green communications and networks. The conference will feature keynote speakers, a panel discussion, and paper presentations.

The objective of GCN 2012 is to facilitate an exchange of information on best practices for the latest research advances in the area of green communications and networks, which mainly includes the intelligent control, or efficient management, or optimal design of access network infrastructures, home networks, terminal equipment, etc. GCN 2012 will provide a forum for engineers and scientists in academia, industry, and government to address the most innovative research and development including technical challenges, social and economic issues, and to present and discuss their ideas, results, work in progress, and experience on all aspects of advanced green communications and networks engineering.

The GCN 2012 conference provided a forum for engineers and scientists in academia, industry, and government to address the most innovative research and development including technical challenges and social, legal, political, and economic issues, and to present and discuss their ideas, results, work in progress, and experience on all aspects of information computing and applications.

There was a very large number of paper submissions (1834). All submissions were reviewed by at least three Program or Technical Committee members or external reviewers. It was extremely difficult to select the presentations for the conference because there were so many excellent and interesting submissions. In order to allocate as many papers as possible and keep the high quality of the conference, we finally decided to accept 486 papers for presentations, reflecting a 26.5 % acceptance rate. We believe that all of these papers and topics not only provided novel ideas, new results, work in progress, and state-of-the-art techniques in this field, but also stimulated the future research activities in the area of information computing and applications.

The exciting program for this conference was the result of the hard and excellent work of many others, such as Program and Technical Committee members, External Reviewers, and Publication Chairs under a very tight schedule. We are also grateful to the members of the Local Organizing Committee for supporting us in handling so many organizational tasks, and to the Keynote Speakers for accepting to come to the conference with enthusiasm. Last but not least, we hope you enjoy the conference program, and the beautiful attractions of Chongqing, China.

December 2012

Maode Ma
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GCN 2012 was organized by Chongqing Normal University, BeiHang University, Peking University, and sponsored by the National Science Foundation of China, Shanghai Jiao Tong University, Nanyang Technological University. It was held in cooperation with *Lecture Notes in Electrical Engineering* (LNEE) of Springer.

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Contents

Part I
Green Information Technology

Chapter 1
Research on Calculation of Rover's Coverage on the Lunar Surface

Yasi Hu, Xin Meng, Zhongshi Pan, Dalin Li and Yi Yang

Abstract This paper outlines the purpose and significance of the close exploration to the moon using lunar rover, proposes a new calculation model for the coverage boundary of lunar rover on the lunar surface, and introduces the basic idea, the core algorithm of the model, the establishment and conversion of the related coordinate systems. The model considers the elevation of the lunar surface and the attitude changes of sensor. The coverage boundary can be determined by combining direct and reverse algorithms. According to rover coverage, the characteristics of lunar soil and rocks and other environmental information in the detection area can be determined, and a reference for the rover route planning can be provided.

Keywords Lunar rover · Coverage · Grid · Elevation

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1.1 Introduction

In recent years, China has made great progress in lunar exploration area. The Chang'e Project launched by China is the exploration about the moon for the purpose of deep space exploration, which has successfully obtained three-dimensional (3D) images of the lunar surface [1, 2]. In order to detect the characteristics of lunar soil and rock environment, close explorations on the lunar surface are necessary [3]. At present, the most direct and effective tool for close explorations on the lunar surface is the lunar rover, which has high-level of autonomy, and which can carry out exploration missions well in the complex environment of the lunar surface [4]. It is significant to determine the rover's exploration coverage on the lunar surface.

Researches on the coverage of the lunar surface at home and abroad mainly focus on the high-orbiting satellites. Because the satellite is far away from the lunar, and the impact of the elevation of the lunar surface may be ignored, it is difficult to detect complex lunar environment accurately. Rover in the parade on the lunar surface [5], the impact of the elevation of the lunar surface on rover's coverage boundary cannot be ignored. Therefore, a new method for the elevation of the lunar surface coverage boundary calculation aiming at lunar rover will be put forward in this article. There are several kinds of exploration devices on lunar rover, such as the panoramic camera, lunar measuring radar, X-ray spectrometer, infrared imaging spectrometer, etc. The main researches in this paper include using panoramic camera with rectangular view to carry out the close exploration on the lunar surface; considering the elevation of the lunar surface; establishing the lunar surface coverage model to determine the coverage boundary of the camera on the lunar surface.

1.2 Basic Idea of the Calculation Model

Assume the rover height is 1 meter, and compared to the lunar radius, the curvature of the lunar surface is negligible. If the elevation changes of the lunar surface not considered, the lunar surface near the rover can be approximated to be horizontal. If selecting the position of the rover on the lunar surface as the coordinate origin to establish the local coordinate system of the lunar surface, the Z value is the corresponding elevation value of each sampling point of the lunar surface.

According to the geometry of the sensor's view and attitude parameters, establish the sensor coordinate system. First, apply the direct algorithm [6] to calculate the four pixels' projection coordinates on the lunar surface of the frame camera's outer boundary. Second, obtain the four projection points' minimum outsourcing grid to determine a rough range. Last, apply the reverse algorithm to build a quadrilateral grid based on the lunar surface sampling points' resolution

and their elevations, and determine the position relationship between the grid and the camera view, and then achieve the determination of the coverage boundary. The core of the model is to calculate the projection coordinates on the lunar surface of the four pixels on the camera boundary to subdivide lunar surface to grid, and to judge the relationship between the subdivided grid and the camera view. The specific algorithm is described as follows:

Calculate the projection coordinates on the lunar surface of the four pixels on the camera boundary, and determine the projection points' minimum outsourcing rectangular region, which is composed by one or more quadrilateral grids, according to the initial resolution.

Determine the position relationship between the grid and the camera view. If the grid is completely in the view, or completely not in the view, abandon the grid without treated; if they intersect, subdivide the grid to the minimum required resolution. If they still intersect, the grid must be on outer boundary.

Determine the entire grid on the outer boundary, calculate the coordinate of the grid center point, and output the results after coordinate conversion as needed (Fig. 1.1).

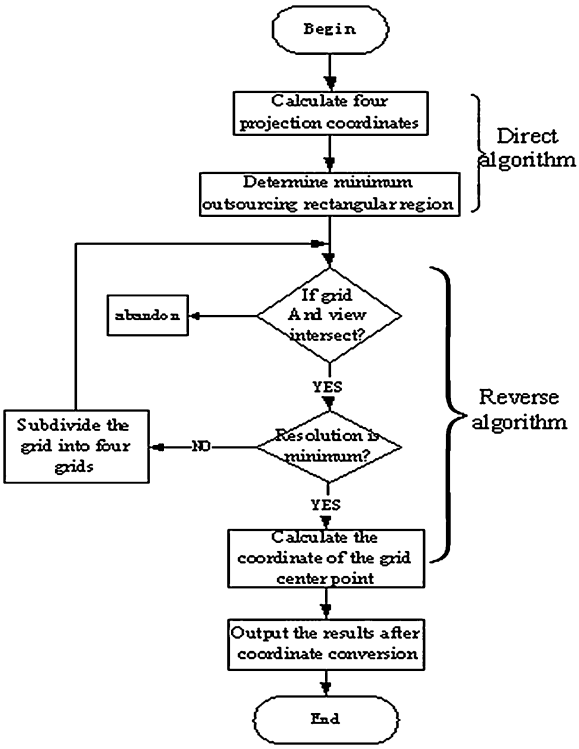

Fig. 1.1 Flow chart of the lunar surface coverage algorithm

1.3 Implementation of the Calculation Model

1.3.1 The Establishment of Coordinate System

The five coordinate systems involved in this model are: the sensor-centered coordinate system, the rover coordinate system, the local lunar surface coordinate system, the moon-centered fixed coordinate system and the lunar geographic coordinate system. The definitions are shown as follows:

The sensor-centered coordinate system. The origin point of the center of the sensor coordinate system is the center of the sensor. The X-axis points to the direction of movement, the Y-axis is parallel to the scanning direction, and the Z-axis is perpendicular to the rover surface. The three-axis X, Y, and Z are applicable to the right-hand rule. The three parameters, which describe the sensor attitude, are the roll angle *ax*, the pitch angle *ay*, and the azimuth angle *az*. The roll angle is the rotation angle around the X-axis; the pitch angle is the rotation angle around the Y-axis; the azimuth angle is the rotation angle around the Z-axis. It is shown as Fig. 1.2.

The rover coordinate system. The center of the sensor is the origin point of the rover coordinate system. When the sensor has no attitude change, it would be defined the same as the center of the sensor coordinate system.

The local lunar surface coordinate system. As what is shown in Fig. 1.3, the rover position *K* is the origin; the normal direction of point *K* is the U-axis; the N-axis points to the south of the earth meridian tangent of point *K*; the E-axis is perpendicular to the plane U-P–N; they constitute a right-handed coordinate

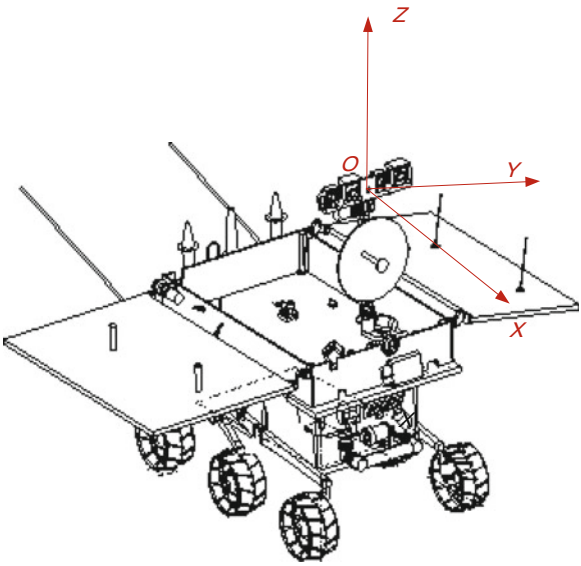

Fig. 1.2 Sensor-centered coordinate system

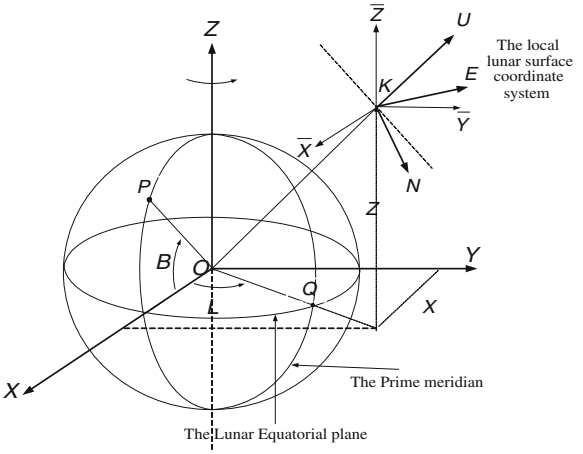

Fig. 1.3 Lunar coordinate system

system. When not considering the elevation in this coordinate system, the sampling points on the lunar surface would be regarded as in a horizontal plane [7].

As shown in Fig. 1.3: The details of the moon-centered fixed coordinate system [8] and the lunar geographic coordinate system [9] are not mentioned here.

1.3.2 Conversion of the Coordinate System

Conversion from the sensor-centered coordinate to the rover coordinate

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = T_{\text{sen}\to\text{rov}} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{sen}} \tag{1.1}$$

Among Eq. 1.1, the transformation matrix is:

$$T_{\text{sen}\to\text{rov}} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(ax) & \sin(ax) \\ 0 & -\sin(ax) & \cos(ax) \end{bmatrix} \begin{bmatrix} \cos(ay) & 0 & -\sin(ay) \\ 0 & 1 & 0 \\ \sin(ay) & 0 & \cos(ay) \end{bmatrix} \begin{bmatrix} \cos(az) & -\sin(az) & 0 \\ \sin(az) & \cos(az) & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Conversion from the rover coordinates to the local lunar surface coordinate

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{lun}} = T_{\text{rov}\to\text{lun}} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{rov}} = \begin{bmatrix} X \\ Y \\ Z - h_c \end{bmatrix} \tag{1.2}$$

Among Eq. 1.2, the transformation matrix is: $T_{\text{rov}\to\text{lun}} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -h_c \\ 0 & 0 & 0 & 1 \end{bmatrix}$ and h_c is rover height.

Conversion from local lunar surface coordinates to moon-centered fixed coordinate

According to Fig. 1.3, the conversion could be described as follows:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix} = \begin{bmatrix} -\sin B\cos L & -\sin L & \cos B\cos L \\ -\sin B\sin L & \cos L & \cos B\sin L \\ \cos B & 0 & \sin B \end{bmatrix} \begin{bmatrix} N \\ E \\ U \end{bmatrix} + \begin{bmatrix} X_K \\ Y_K \\ Z_K \end{bmatrix} \tag{1.3}$$

Among Eq. 1.3, matrix $[X_K \quad Y_K \quad Z_K]^T$ is the coordinate of any point in the lunar three-dimension space; L and B are the latitude and longitude of point K.

Conversion from moon-centered fixed coordinate to lunar geographic coordinate.

The two coordinate systems actually are two expressions for the same coordinate system. The easiest way is to regard the lunar as a sphere and the simple conversion formula is shown as follows:

$$\begin{cases} L = \arctan\frac{Y}{X} \\ B = \arctan\frac{Z}{\sqrt{X^2+Y^2}} \\ H = \sqrt{X^2+Y^2+Z^2} - R \end{cases} \tag{1.4}$$

Among Eq. 1.4, L, B, H, and R respectively mean the longitude, the latitude, the altitude, and the lunar radius.

1.3.3 The Determination and Subdivision of Grid

Take direct algorithm to determine the minimum outsourcing, and calculate the projection coordinates of the four pixels on camera boundary, C1, C2, C3, and C4 in the local coordinate system of the lunar surface. As is shown in Fig. 1.4:

Va is the angle of the X-axis of the camera view; Vb is the angle of the Y-axis; establish the initial observation vector in the sensor center coordinate system:

$$\overrightarrow{FC_1} = \begin{bmatrix} \tan\frac{va}{2} \\ \tan\frac{vb}{2} \\ -1 \end{bmatrix} \overrightarrow{FC_2} = \begin{bmatrix} -\tan\frac{va}{2} \\ \tan\frac{vb}{2} \\ -1 \end{bmatrix} \overrightarrow{FC_3} = \begin{bmatrix} -\tan\frac{va}{2} \\ -\tan\frac{vb}{2} \\ -1 \end{bmatrix} \overrightarrow{FC_4} = \begin{bmatrix} \tan\frac{va}{2} \\ -\tan\frac{vb}{2} \\ -1 \end{bmatrix}$$

Convert the observation vector to the local coordinate system of the lunar surface. Take C_1 as an example, and the new observation vector is:

$$\overrightarrow{FC_1}' = T_{\text{rov}\to\text{lun}} T_{\text{sen}\to\text{rov}} \overrightarrow{FC_1} = [l_1 \quad l_2 \quad l_3]^{\text{T}} \tag{1.5}$$

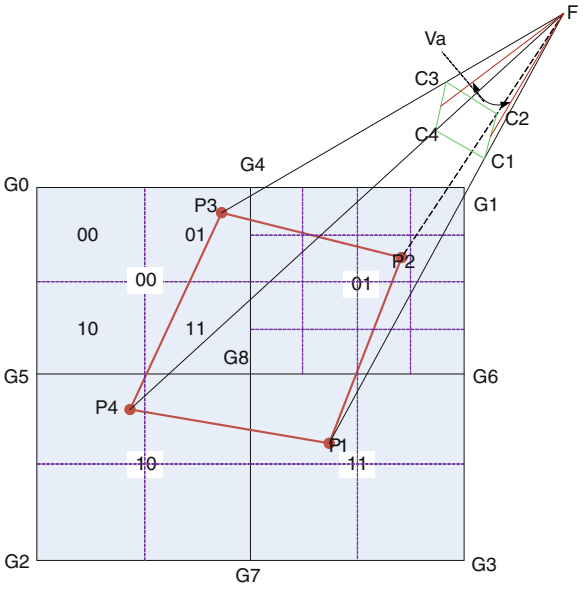

Fig. 1.4 Grid subdivision diagram

Combine the linear equation and the plane equation

$$\begin{cases} \dfrac{x}{l_1} = \dfrac{y}{l_2} = \dfrac{z}{l_3} \\ z = -d_c \end{cases} \tag{1.6}$$

Then the answer P_1 is obtained.Among the Eq. 1.6, d_c is the elevation of the rover's location.

Similarly P_2, P_3 and P_4 can be obtained, and the coordinates of G_0, G_1, G_2, and G_3 can be calculated simply. Then the minimum outsourcing rectangular grid is obtained. According to the required resolution, each grid will be subdivided into four grids [10], using quadtree [11] subdivision method, which is to take the midpoint of each side in the grid.

In Fig. 1.4, Assuming points $G_0(x_0, y_0, z_0), G_1(x_1, y_1, z_1), G_2(x_2, y_2, z_2), G_3(x_3, y_3, z_3), G_4G_5G_6G_7G_8$, can be calculated as follows:

$$\begin{aligned} G_4 &= \begin{bmatrix} \dfrac{x_0 + x_1}{2} \\ y_0 \\ \dfrac{z_0 + z_1}{2} \end{bmatrix} G_5 = \begin{bmatrix} x_0 \\ \dfrac{y_0 + y_1}{2} \\ \dfrac{z_0 + z_2}{2} \end{bmatrix} G_6 = \begin{bmatrix} x_1 \\ \dfrac{y_1 + y_2}{2} \\ \dfrac{z_1 + z_3}{2} \end{bmatrix} \\ G_7 &= \begin{bmatrix} \dfrac{x_2 + x_3}{2} \\ y_2 \\ \dfrac{z_2 + z_3}{2} \end{bmatrix} G_8 = \begin{bmatrix} \dfrac{x_0 + x_1}{2} \\ \dfrac{y_0 + y_1}{2} \\ \dfrac{z_0 + z_1 + z_2 + z_3}{2} \end{bmatrix} \end{aligned} \tag{1.7}$$

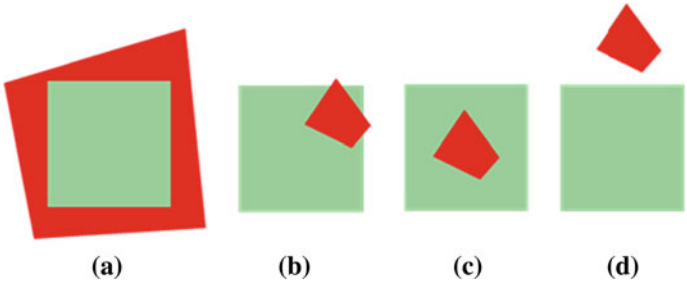

Fig. 1.5 Relationship between the grid and the view

1.3.4 The Judgment of the Relationship Between the Grid and the View

In Fig. 1.5 the red is camera's view, the green is grid, using reverse algorithm to determine the positional relationship between them. Convert the grid point coordinates into the sensor center coordinate system, compute the angles of grid point and the camera X axis and Y axis, and compare them to the camera view.

Judge four points of the grid. There are four cases between the grid and view's location relationship as follows:

(a) If there are 4 points in the view, the grid is completely in the view;
(b) If there are 1–3 points in the view, the grid intersects with the view;
(c) If no point in the view and the camera projection in the grid, the view is in the grid;
(d) If no point in the view and the camera projection out of the grid, the view is outside of the grid.

This judgment considers the elevation of each point in the grid, and the results vary with the change of elevation.

1.3.5 The Determination of Coverage Boundary

And then take reverse algorithm to determine the boundary, by judging the relationship between the subdivided grids and the view. If the grid is entirely in or out of the view, it is abandoned; if the grid and the view intersect, the grid is subdivided until the resolution meets the requirement, and the center points of grids are outputted.

Based on the data in Fig. 1.4, the grid is subdivided as the Fig 1.6:

In Fig. 1.6, grid 01 is divided into the third layer. The node is full if the grid entirely in the view; the node is empty if the grid out of the view. When the node is

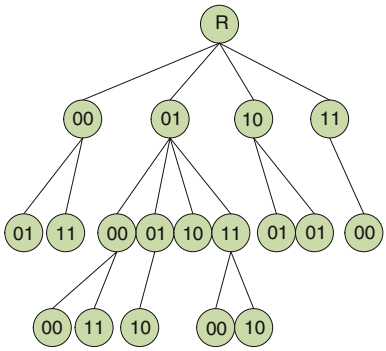

Fig. 1.6 Grid quadtree subdivision diagram

full or empty, it is no longer to be subdivided. In other cases, the grid has to be subdivided until it meets the resolution requirements, and the deepest layer of the leaf nodes are the outer boundary.

Thus the coverage boundary is determined, combining with coordinate system conversion in Sect. 1.3.2, the corresponding longitude and latitude can be calculated, and a unique geographic coverage is obtained.

1.4 Analysis of Experiment Results

According to the model, a simulation program has been written to carry out the experimental analysis. The related parameters are set as follows:

Initial position of the rover: (1100, 1000, 898.44 km), angle of camera view (Va × Vb): (40° × 20°), the camera attitude parameters (roll, pitch, azimuth), pitch angle range from −90° to 90°, azimuth range from 0° to 360°, and the counterclockwise direction is positive. Initial resolution is 4 m, minimum resolution is 0.1 m. When the camera's attitude parameters are set to be (0°, −90°, 0°) and (0°, −40°, 60°), the simulation results are shown in Fig. 1.7:

It can be seen in Fig. 1.7, the right coverage is larger, and it has a rotation on the pitch and azimuth. As the elevation is low and visual range is small, latitude and longitude varies not obviously, the coverage boundary is smooth. This model is applicable to attitude changes of the sensor, and supports the 360° circular shooting, which is flexible to meet the practical requirements.

Fig. 1.7 Coverage boundary diagram of the lunar surface

1.5 Conclusion

This paper outlines the purpose and significance of the close exploration to moon using lunar rover, proposes a new calculation model for the coverage boundary of lunar rover on the lunar surface, and introduces the basic idea, the core algorithm of the model, the establishment and conversion of the related coordinate systems. The model considers the elevation of the lunar surface and the attitude changes of the sensor. The coverage boundary can be determined by combining direct and reverse algorithms. Then the model is implemented by computer simulation. It is general and flexible. According to rover's coverage, the characteristics of lunar soil and rocks and other environmental information in the exploration region can be obtained, and a reference for the rover route planning can be provided.

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Chapter 2
Research on Information Technology Driven Creative Industries Business Model

Hongyuan Wang

Abstract In the modern society, the development of the industry is not only confined to its own resources advantage, the technical advantages are more concerned about more deep-seated strategic perspective that is the business model perspective. In the stage of the rapid development of information technology and networking, various industries for the study of the business model is more extensive. The creative industry is emerging industry, on the basis of integrating and using information technology and business model relevant literature results, and through the combination research analysis for the characteristics of the creative industries. And under these preconditions, to analyze the concept of creative industries, the development of the creative industry in China and the overview of combining business model, exploring the creative industry business model's innovation path.

Keywords Information technology · Network · Creative industry · Business model

2.1 Introduction

In the era of rapid development of modern computer information technology and network technology, all walks of life continue to increase the intensity of information technology, to achieve resource sharing and efficient allocation of resources; they are greatly conducive to information communication and contact,

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to shorten the time but also to improve the efficiency. The creative industry is also a modern society emerging industries, such as tourism and cultural industries, the animation industry, etc. It continues to meet the social spiritual needs, but also to promote social progress [1, 2]. However, in today's information technology-driven creative industry will be how to get faster, better, more sustainable development that will be thinking [3]. Due to the people's need, the tourist attractions are increasingly demanded, the way that people will enjoy their lifestyles also had a big change, if it is still in the past tourism development mode, people will not accept, coupled with the tourism industry to the environment brought huge negative effect, it is very important to appear a method based on the innovation mechanism of tourism business development strategy, which is the use of creative culture and tourism industries combined method to realize a kind of new tourism industry development strategy, this approach not only changed the traditional way, can give people new tourism environment, in order to meet the real needs of people, and the mechanism innovation fundamentally solve the environmental pollution caused by the conflict, mechanism innovation of this kind is exactly our country needed now. The cultural and tourism industries combined mode.

Academic researches more for the industry's business model, the business model is a connection corporate strategy and business's middle layer, it is not only able to integrate a number of management concepts and methods, but also able to explore innovation and new breakthrough, providing a clearer strategic planning framework for the operation and development of the industry. When the creative industries get the stage of flourishing development, industrial development will be the service transformation and promote the development of the green economy, which reflect the positive people higher level of spiritual pursuit for the rise of creative industry. The research on creative industry business model appears especially urgent, however, the research on the creativity industry this emerging industry is not much, but also is very easy, to combine with the background of information, to research creative industry business model and to promote the rapid development of creative industries [4, 5].

2.2 Research on the Creative Industries

Creative industry is also creative industry, which said enterprises from the people's talents, creativity and intelligence, ability gets the power foundation, also including research and development of intellectual property rights to carry on employment opportunities and wealth creation in a series of activities. Creative industry has arisen in 80 times, it is an emerging industry. At the same time, creative industry shows a very strong vitality and broad space for development in the social development stage. It is not only beneficial to enhance national competitiveness, but also to achieve the rapid of national innovation and span type development, at the same time to enhance China's economic strength and comprehensive ability [6, 7].

Creative industry includes three aspects, the first is the creative industry and culture related industries such as art, media, tourism, sports, animation, and other industries; the second should have a new cultural and creative, as well as the appropriate mode of operation; the final step is the tenth of similar industries in the creative career employees is greater than before. The last one has become to distinguish the effective practice standard of creative industry [8, 9].

Creative industry has been rapid development in foreign countries, but also is a country to bring huge economic benefits. Data show that the value of daily global creative economy is up to $ 22 billion, and the increment speed is 5 %. However, in contrast, United States and Britain grew more rapidly that have reached 14 and 12 % respectively. Creative industry brings not only the rapid growth of social and economic, but also promotes the national employment. In China, the creative industry have a bigger development in Taiwan and Hong Kong and other places, creative industry is also ceaselessly outspread. The interior Beijing, Shanghai, Shenzhen, and other places, creative industry has gradually developed for creative industry base to promote the development of social economy and create benefit [8].

2.3 Research on the Commercial Mode

Commercial mode has known as the focus of public attention in management of community, especially has increased competition in the current society, product falls into homogeneous competition stage, the attention of business model has increased gradually, however, the business model is based mainly on the following aspects are described [10].

(1) Financial perspective

Business model is the enterprises economic model from the financial perspective; it is also a way of making money. It stresses that is the relationship between corporate stakeholders from the cost structure, pricing, expectations, profit, revenue sources to consideration. However, some scholars also believe that the business model is the operation business model, but also a strategic business model, its main feedback is that the enterprises how to adapt to the environment to achieve sustained profitability result and purpose in the complex environment.

(2) Value creation perspective

The business model is to emphasize the key focus of creating value form the value creation perspective. As shown in Fig. 2.1, the business model manages a good business operation, to bring benefits for the enterprise, customers, partners, suppliers. The core way to create value is mainly through its own resources configuration, more than competitors to create more value.

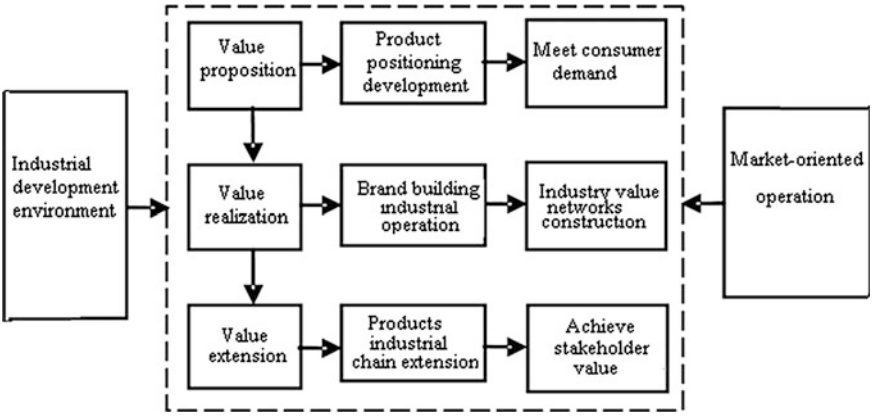

Fig. 2.1 The commercial mode analysis of value creation perspective

(3) System integration perspective

From the system integration perspective, business model is expressed as containing a variety of factors system, which not only pays attention to all the elements of the system, but also pays attention to the mutual relationship. It can be regarded as the key interactions and dependence of the system, it is based on the external conditions and internal resources, the ability to determine, to organize its resources, shareholders, employees, customers, suppliers, and stakeholders to make effective collection, to achieve excess profit from the strategic level.

Above the perspective, analyze the business model operation mechanism of creative industry, as shown in Fig. 2.2.

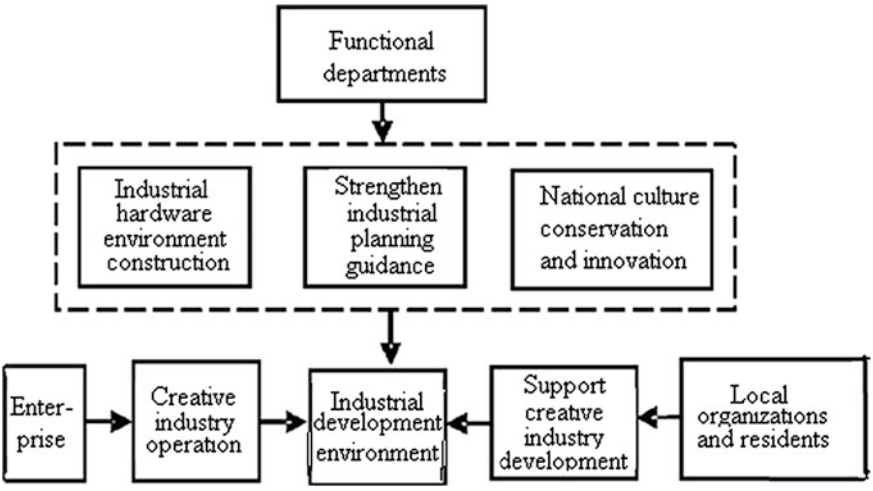

Fig. 2.2 The business model operation mechanism of creative industry

Creative industry business model includes several aspects, not only needs the enterprises to run, also needs the government and related departments through the hardware improvement and policy guidance, the cultural maintenance innovation to support the development of creative industries, and inseparable from the common maintenance and development of the local organizations and residents.

2.4 Research on Creative Industries Business Model Driven by Information Technology

Creative industries business model is driven by information technology, its matching degree of various elements is shown in Fig. 2.3, information driving business model must have three elements to meet the conditions to achieve effectiveness and performance, respectively customer value proposition, core resource and flow, and the profit pattern [11].

Along with the rapid development of education, nation height value to the educational devotion, the school did to learn environment and condition to contain very big improvement, teachers and the students' number year by year increases, instrument and equipments continuously of renewal, infrastructure in the school continuously strengthens. Meanwhile, the safe problem faced by campus increases day by day, these safe problem not only express because of personnel increment and to the high request made by the infrastructure and the hardware environment and the management work, also performance for educational insecurity in the external environment influence of the factor upon the campus increase gradually, and teachers and the students' individual faces of safe pressure, also express to pursue to study oneself in the school who want continuously a management of

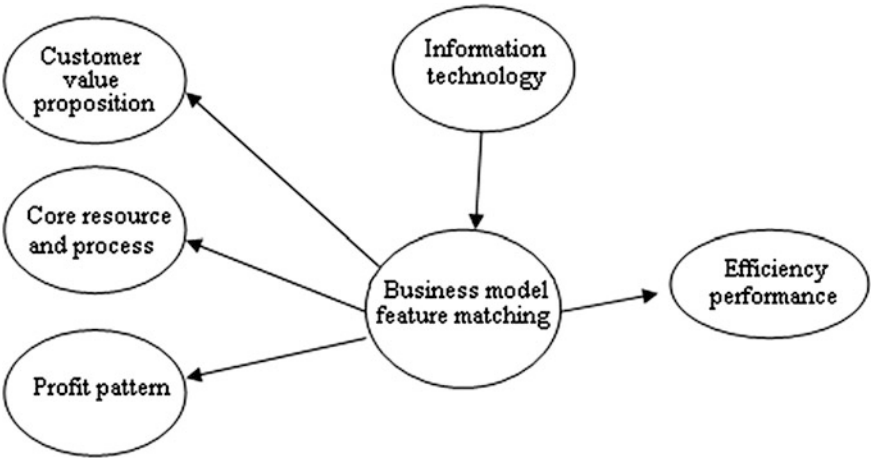

Fig. 2.3 Creative industries business model driven by information technology

Table 2.1 Reliability and validity analysis of business models factor combination analysis

High-order composite	Validity reliability	Factor loading	Error of observation value	Elements constitute	Significant test (t value)
Element combination matching degree	0.9246	0.827	0.224	Customer value proposition	
		0.763	0.293	Core resource process	19.261
		0.849	0.275	Profit pattern	15.137

strengthening the internal and dangerous source, establish good campus safe cultural environment.

Along with the speeding of social informationization development, especially in recent years in the world under the push of "information superhighway" fever in the scope, the information technique is influencing the lives of each aspect, its technique development is also in imposing array. Using the modern campus cultural management of information technique can be quickly, effective, auto but again systematically store, modify, check to seek and handle a great deal of information. Making use of information technique will get better effect to strengthen campus cultural construction.

From the Table 2.1, it can be seen that the each element combination reliability value of business models reached 0.9246, indicating that these factors reflect the creative industry business mode operation, however, the elements of the commercial mode of influence degree have difference, all elements have difference for the influence degree of commercial mode, the core resources and flow as well as profit model have significant differences, however, the profit model has the greatest influence to reach 0.849, followed by customer value proposition that is 0.827, the last is the core resource and process.

For the creative industries not only business model is concerned, it also need to analyze the efficiency and performance of business model, which can realize the industry's continued growth and development. In the Table 2.2, the feature matching degree and the profit level value's maximum is 0.835, followed by feature matching degree and competitive position is 0.829. However, it has little difference with the business growth path coefficient, while the significant level is 0.05; the

Table 2.2 Research on creative industry business model element combination for the impact of benefit performance

Feature matching degree and benefit performance	Path coefficient	Covariance	Standard error	(t value)In 0.05 significant level, > 1.87
Feature matching degree and profit level	0.835	0.965	0.055	15.349
Feature matching degree and business growth	0.827	0.921	0.058	14.134
Feature matching degree and competitive position	0.829	0.960	0.055	15.267

three elements about the matching degree and profit level, business growth and competition status have significant difference. For three elements of the creative industries, it should be concerned, however, first to focus on the elements matching degree and profit level, followed by the competitive position, finally the business growth.

2.5 Conclusion

Nowadays, to enter the competition stage of the business model, the sustainable development of creative industries is given full play to its own advantage in the need of policy support, to carry on promotion and application development. The first of all must be the overall strategic planning, creative industry area resource, external environment combination analysis, to establish and improve the creative industry business model and the path of development, and to strengthen the creative projects. At the same time, to perfect this emerging industry investment and financing environment, to drive the creative industry's growth and development.

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Chapter 3
Research on Science and Technology and Finance Scientific Positive Feedback Mechanism Based on Ceramic Industry Technology Innovation Strategic Alliance

Yong Huang, Funian Zheng and Zhijian Huang

Abstract In the ceramic industry regional industry, it needs to be centrally advantage to the formation of industry alliances, promoting the development of ceramic industry technology innovation strategic alliance. The development of ceramic industry science and technology as well as the financial market as the guide and the positive feedback system theory as a foundation, to analyze the science and technology strategy and the financial market are combined with positive feedback mechanism, and the customer as a benchmark to establish the model of positive feedback mechanisms of the ceramic industry technology and financial markets. Through the model establishment and analysis, they own positive feedback relationship of technology products and financial market. The final is shown that the change of ceramic industrial technology products status as well as the financial market structure is a quantitative change to cause the whole process of the qualitative change of which the most important is the financial system's transition. Therefore, the relationship between science technology and financial is influence, promote each other, etc.

Keywords Ceramics industry · Technological innovation · Technology finance · Positive feedback mechanism

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3.1 Introduction

Science and technology competition is becoming increasingly fierce in the ceramic industry, to adopt the ceramic industry technology innovation strategic alliance which is one of the best choices [1]. With the rapid development of science and technology, market information updating, product innovation of science and technology, transformation industry, etc., they are increasingly strengthened. In order to study science and finance direct correlation with the positive feedback mechanism among them, it is conducive to promote the development of ceramic industry technological innovation alliance [2, 3].

3.2 Technology Finance Basic Theory

In theory, technology and finance definition has not been defined, however, the science technology finance in the practice process of industry and enterprises has been applied, which still do not have a scientific connotation's independent science. Some scholars believe that the complete definition of the science technology finance are the promotion of enterprise science technology research, industry, and product high-tech development have a series of financial market instruments, procedures, rules, perfect service, etc. They have the features of innovative and systematic [4]. It is composed of industry enterprises, intermediary organizations, national institutions and financial market, and other different subjects, and is subject of different activities to constitute a structure system that represents the states financial, a major component of scientific technological innovation system. The technology finance theory definition can be analyzed from four different perspectives of in-depth analysis: (1) Having the interaction between technology and financial, which emphasizes on the mutual promotion, mutual influence between technology and finance; (2) For financial, technology has a one-way demand characteristics, namely science technology product development, patent achievements transformation and the entire product industrialization process all need financial power tools, policies and services; (3) Emphasis on the industry association between science technology and finance, namely the financial is support for high-tech industry product development; (4) Between science technology and finance has an open system, its content is very extensive, including industry, government, market financial institutions, and other involved subject, and technology finance is the combination of means, system, and mechanism to guide. In the combination's market economy of financial and technology, society and industry cultural environment that exists in a complex system [5, 6].

At the same time, the development of science technology and finance is influenced by different factors, and also need many aspects of interaction, game. The interactive effects include: (1) The development of science technology can enhance the level of financial market, its expression is that information network

Table 3.1 The union mechanism of science technology and finance

Science technology and finance	Financial resources	Direct financing
		Indirect financing
	Investment venture	Public venture
		Private venture
	Capital science and technology market	Board and board of smal-l and medium-sized enterprises
		Gem
		New three-board market
		Technology property exchange
		Bond market
	Science technology loan	Commercial bank loans
		Policy science and technology loan
		Folk financing
		Financial lease
	Insurance	Commercial science and technology insurance
		Policy science and technology insurance
	Financial environment	

development effects the financial innovation, the tools of the trade, the innovation of means, the efficiency improved; (2) Financial innovation affects the information flow speed, convenient securities transactions, to promote the rapid development of trade financing, as well as globalization, real time.

Finance is the main performance for the development security of science technology: (1) Financial market system uses the technology of continuous innovation, and combines with a variety of financial instruments, systems, etc. And through the financing channels to meet the funding requirements of science technology activities; (2) in the science technology investment, finance has liquidity, transfer, price discovery and risk dispersion, and other functions [7].

At the same time, the structure between financial and science technology comprises six parts: financial resources, venture investment risk, capital science technology market, science technology loans, insurance, and science technology‘s financial environment. In this system, the capital science technology market of the direct financing and venture investment risk belong to indirect financing science technology loan. The structure is shown in Table 3.1.

Among them, financial resources refer to the government through financial budget and tax preferential policies and supports for sci-tech industry development, so science technology resources’ research for the science technology, more attention development. International is through the financing way of indirect and directs to influence the development of science technology and the study of quantity, structure, progress, etc. As the science technology basic research investment is too large, the risk is very high, the capital into the financial market is less, so the government should make some regulation.

The venture capital risks are high risk investment professional institutions, and can control the risks of market. The high growth of new technology enterprises especially high-tech industrial enterprises can gain high profit financial capital. From the entire industry development of enterprise life cycle angle, venture investment risk can become a high-tech enterprise, development and the development of early stable external financing good way.

Loan is as the enterprise science technology development, the transformation and so on, and a series of science technology activities provide the debt characteristic financial help, which is divided into four parts, including business technology, financial technology, policy science technology loan, and financial leasing. However, capital market to the science technology enterprises provides the direct financing market, due to different risk and liquidity; capital market can be divided into five parts, namely technical property, the bond market, the new gem, the third board market, main board, and medium enterprises board.

Insurance is the financial risk based on the science technology activities, science technology enterprise capital operation risk, financial instruments and policy risk to carry on science technology insurance, they aim to reduce a variety of the financial instruments of financing system risk.

Science technology finance environment represents the operating system environment in the economic, legal, and social of science technology finance. The effect operation efficiency of finance and science technology as well as the development level, which is a major component of the science technology financial system.

3.3 Establishment of Science Technology and Financial Positive Feedback Model of Ceramic Industry Technology Innovation Strategic Alliance

Aiming at the selection of technology product, it lies in the ceramic industry competition as well as the cylinder model that is the nonlinear Polya process modeling. The first step, the science technology product market as the area is an infinite cylinder, where in the sum of products is m different colored balls that are on behalf of selling ceramic industry product types, namely ceramic industry a and ceramic industry b, the two kinds of technology products, financial accumulation quantity sold to quantity expressed as $q_m = \left(q_m^1, q_m^2\right), q_m^1, i = 1, 2$ that stands for the technology products ceramic industry i in the m point of the financial market cumulative amount sold; when $i = 1$ is the initial state of science technology product, namely $q_0 = \left(q_0^1, q_0^2\right), \quad \left(q_0^1, q_0^2\right) = t_0$. In the m point the ceramic industry financial market share is represented as a vector $X_m = \left(X_m^1, X_m^2\right)$, while $X_m^i = q_m^i / t_m, t_m = t_0 + m X_0 = \left(X_0^1, X_0^2\right)$. Expresses its initial financial market share from m to $m + 1$, the customers with a science technology product are optioned, namely every science technology products is sold, many experienced process carry

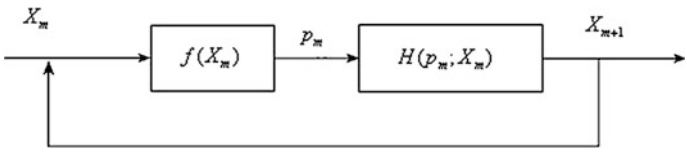

Fig. 3.1 The positive feedback relation diagram between technology products and financial behavior

on the random sample survey in cylinder, a random sample of the plurality balls; and then does not change the original financial technology products market share and the case of the structure to put them back; according to a choice of product function to the cylinder into a single ceramic industry ball that is representative for ceramic industry products. To be selected process changes the structure X_m of financial markets, to be selected initial probability is $p_0 = \left(p_0^1, p_0^2\right)$, namely $p_m = \left(p_m^1, p_m^2\right), p_m^1 + p_m^2 = 1$ therefore the selection function is $p_m^i = f(X_m), i = 1, 2.$ The final result vector is representation for $B_m = \left(B_m^1, B_m^2\right) B_m^i(X_m) = 1$ and Probability is $p_m^i(x)$.

Finally the formula can be adopted

$$X_{m+1}^i = X_m^i + \frac{1}{t}\left(B_m^i(X_m) - X_m^i\right) \tag{3.1}$$

According to the above formula can get the positive feedback and scientific mechanism cylinder model of technology and financial, the formula is

$$\begin{cases} p_m = f(X_m) \\ X_{m+1} = H(p_m; X_m) \end{cases} \tag{3.2}$$

As a result of the positive feedback relationship between financial behavior, technology products diagram are shown in Fig. 3.1.

$$X_m\, f(X_m)\; p_m\; H(p_m; X_m)\; X_{m+1}\; q_m^t \tag{3.3}$$

3.4 Analysis on Technological and Financial Positive Feedback Mechanism of Ceramic Industry Technology Innovation Strategic Alliance

Due to the ceramic industry market information is not clear, and the product alienation between ceramic industry products is smaller, the customer has no particular preference in the financial market. Therefore, through the ceramic products market sample random survey analysis, it can choose three kinds of ceramic product brands conducted model calculations. That has chosen three

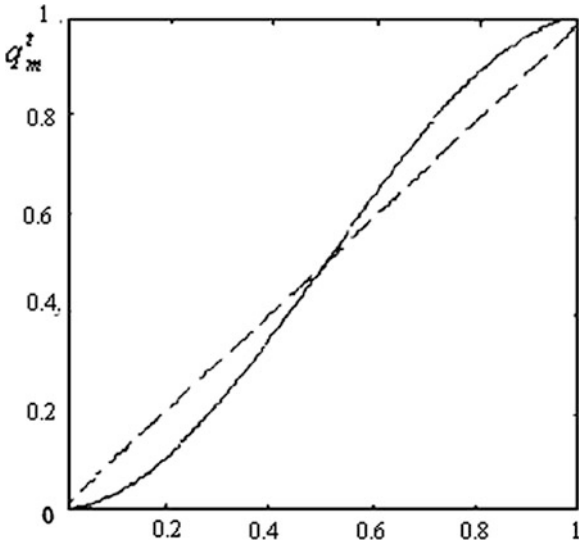

Fig. 3.2 Positive feedback mechanism cylinder model function of science technology and financial

different brands' ball, and expressed brand 1 is recommended the number of n (n > 2), then elected to the probability of a particular brand that is

$$p_m^1 = \frac{C_{p_m}^1 C_{p_m}^2 + C_{p_m}^3}{C_{t_m}^3} \tag{3.4}$$

Assumed that $p_m^1 > 2$, $t_m > 2$, it can be obtained:

$$p_m^1 \approx \left(X_m^1\right)^3 + 3\left(X_m^1\right)^2\left(1 - X_m^1\right) \tag{3.5}$$

The functional relationship is shown in Fig. 3.1.

It can be seen from the Fig. 3.2, the whole process of the ceramic industry technology products' status as well as the financial market structure's change is a quantitative change to cause the qualitative change, of which the most important are the financial system transition, this represents the interaction relationships between technological and financial.

3.5 Conclusions

In the ceramic industry technology innovation strategic alliance, the relationship between science technology and finance affects the development of ceramic industry. Through the cylinder model to study for its positive feedback scientific mechanism between them, which can get the positive feedback relation and function formula between technology products and financial behavior, advantageous to science technology and financial adjustment of really ceramic industry,

from the process of carrying on quantitative change to the qualitative change, of the ceramic industry and science technology development. Ceramic industry to finance and science and technology promote mutually, the mutual development of the correct path, to achieve the correct path of the mutual promotion and the mutual development between finance and science and technology under the ceramics industry.

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Chapter 4
Study on Role of Art in Information Age Based on Role Income Ratio

Ning Song and Jing Wang

Abstract Continuous updating of information technology enriches the artistic manifestations, making art more freedom and perfect in the new period of development. Meanwhile, with the continuous optimization of art means and improvement of artistic thought, rapid changes happened in various elements in the information age, thereby enriching the people's work and lifestyle, it can be said that art plays an irreplaceable role in the information age. For a more in-depth study on the role of art in the information age. In this paper, the significance of art in the development of the information age is concluded and expounded, the evaluation role model is also constructed, and on the basis of analysis of role evaluation model principle, a experimental research and quantitative analysis is made on the identity, satisfaction, and the role effect of artistic role, so as to explore the specific role.

Keywords Information age · Role evaluation model · Dentity · Role effect · Income rate

4.1 Introduction

With the development of Internet, technology, and computer technology, the requirements of art form and the results are getting more demanding. In order to meet the higher demand for the Arts in the information age, we need better position of the role the arts played in the information age, making information technologies in promoting the art of continuous improvement and optimization, at the same time, art can also play a more important role in innovating and reforming of information technology [1].

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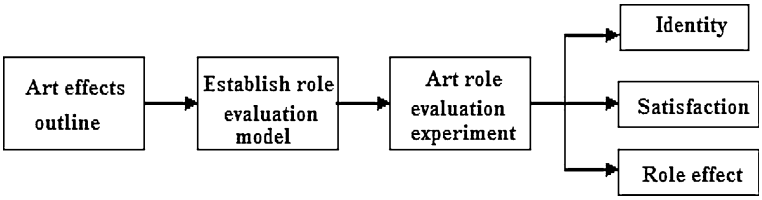

Fig. 4.1 Art role research content diagram

In many areas when using and sharing information in an era of high-tech, art's development are also seeking opportunities for fusion with information technology. The combination of art and information technology meets the diversity of esthetic demands, the role of art in the information age becomes increasingly important [2]. This article will generalize the role played by art in all areas in the information age, thus summarizing the role of art characteristics. Then, establish the role evaluation model, and use this model for quantitative analysis of role identity, satisfaction, and effect, so as to make an accurate positioning on the role of art [3]. The art role research content diagram in this article is shown in Fig. 4.1.

4.2 The Important Role of Art in the Information Age

The development of information technology makes artistic creation more freedom, fewer and fewer constraints on art, art can be on a higher spiritual expression. At the same time, art also demonstrates strong technical, connectivity, and interactivity, which will have an important guidance and inspiration role to the rapid development of information technology. Therefore, in areas such as e-commerce, distance learning training, and advertising design. We should not only have the technical skills and functions related to the strong hardware support, but also need some relevant art production and innovation ability, and from the perspective of art, explore the unique growth in all areas, in order to achieve the perfect fusion of art and technology.

Art extends the using field and results of virtual reality technology in the information age, virtual reality technology including 3D imaging technology, multiple image processing technology, and software scene simulation technology. It is by means of computer technology and art simulate visual, auditory, and tactile integration in realistic environments, so that people can dominate the external environment and able to immerse inside. Thus, input devices and output devices realize dynamic interactivity between man and the virtual world, and will allow people to generate a stronger desire to artistic expression, in a self-designed environment to stimulate creative ideas [4]. In this process, the artistic expression can be achieved through Adobe Photoshop, Freehand, 3D max, and other professional software, a variety of artistic expression mode makes virtual environments more realistic. Simulated reality triangle diagram is shown in Fig. 4.2; simulated reality system diagram is shown in Fig. 4.3.

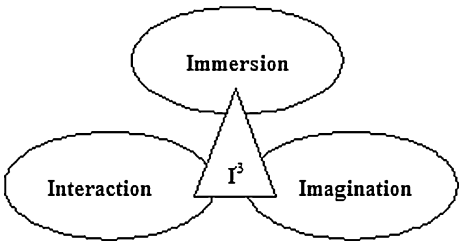

Fig. 4.2 Simulated reality triangle diagram

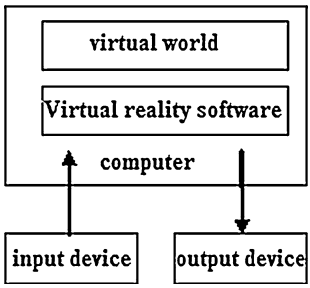

Fig. 4.3 Simulated reality systems diagram

The rapid development of e-commerce is with the up of IT, it combines the technology of the Internet, online payments, and the e-marketing. E-commerce makes it possible for net shopping, online trading, and online trade communication without going out. IT tools enable the e-commerce system operate sterilely, and the design of system can enhance the effectiveness of e-commerce activities on the visual system level, in order to attract user's attention faster than ever, so as to achieve artistic effects. Art provides a stronger appeal for e-commerce platform, enables businesses to grasp the network publicity effect better, and take advantage of the diversity of artistic expression to improve the promotion of e-commerce activities [5].

The development of arts will help promote the progress of information society in the level of interaction. Network not only broaden the horizon, but also indirectly inhibit the interactive activities. The art has a strong performance desire, infusing it to the network world, you can change the single electronic and digital interactive way to form the ideological diversity interaction between people, and stimulate creative thinking. While taking advantage of video transmission technology and the use of the art tool for designing interactive teaching platform, so it can better promote the development of the information age technology.

4.3 Design Research and Method

Aiming at freshmen and junior students of a college English major to conduct a survey, and choosing two classes' students are formation of two groups to analyze and to carry out the oral tests, it is mainly through the semi structure interview to

research. Interview time is defined as 5 min, content is the combination of students' learning process and experience to question, Such as "when did you begin learning English?", "favorite degree of the English language", "improving the mode and method of language learning", and so on. Using the recording test for students test, through the data processing and statistics analysis, that is the recording through sound processing software to convert, and to save it as text, and then to carry out the data processing and analysis [6].

4.4 The Establishment of Art Role Evaluation Model

The role played by art in the information age can be through various investigations, but the investigation index often used the indirect, and with a large subjectivity, therefore we cannot position the role of art accurately. This article will establish art role evaluation model, giving the specific factors index to the role of art, thereby a quantitative analysis of the role played by art can be achieved. The art role evaluation model is shown in Fig. 4.4.

In art role evaluation model, role satisfaction, identity and roles effect are dependent variable, diversity, linking relationships and interactions are independent variables, the dependent variables are decided by independent variables, the dependent variables reflecting the role of art in the information age. The diversity is divided into surface diversity and deep diversity, surface diversity mainly for art role of external environmental factors, the deep diversity mainly for their own forms of expression and practical significance. Linking relationship mainly refers to the unified relationship between the role of art and the characteristics of the information age, IT makes art form and results a qualitative leap forward, while art has an important role in promoting development and optimization of IT, they are two mutually enhancing relationships. Linking relations are divided into linking

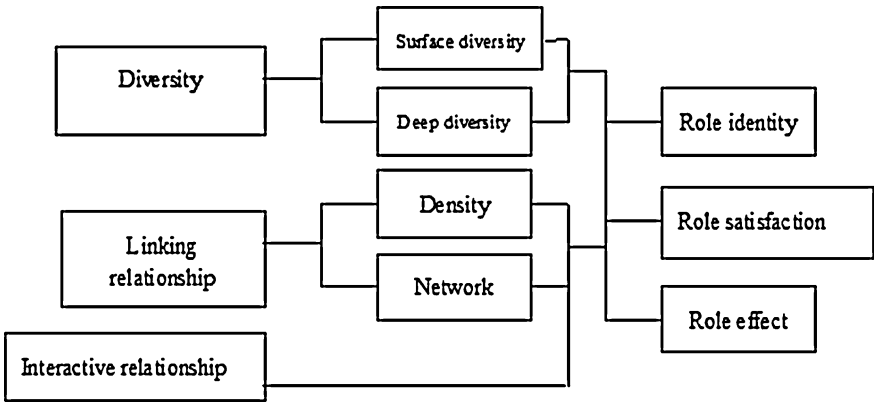

Fig. 4.4 The evaluation model of art role

density and network linking; the linking density is used for measuring the proportion of the art effect of its role, network linking system is used for the measuring art effect relationship for its role.

The main parameter of role identity, satisfaction, and effect is a role yields, that is, the relationship between the benefits of art role in the information age, used for reflecting the extent of art role, yielding R's expression is shown in the formula (4.1) [7].

$$R = \frac{G}{T_s + T_w} \tag{4.1}$$

Among them, G is the total receipts of art role, T_s is the exploring time for art roles, T_w is the art role duration. When using the average formula yields conversion, you can use the average number for calibration yield, which can be more convenient to calculate yields, the transformed expression is shown in formula (4.2), when simplifying formula (4.2), (4.3) can be gained [8, 9].

$$R = \frac{\alpha t_s g}{t_s + \alpha t_s t_w} \tag{4.2}$$

$$R = \frac{\alpha g}{1 + \alpha t_w} \tag{4.3}$$

Among them, g is the revenue of each sample, t_s is the role of each sample, the exploring time of role for each sample, t_w is the exploring time for art roles, α is the yield coefficient, it can be obtained by Table look-up.

Art's role in the information age is with the innovation and development of IT, it is not set in stone. At different times, the role of art will change, so you need to look at the role yields at the relevant time period, in this case the expression of role yields is shown in formula (4.4) [10].

$$R = \frac{\sum_{i=0}^{m} \alpha_i g_i}{1 + \sum_{i=0}^{m} \alpha_i t_w} \tag{4.4}$$

4.5 The Experimental Research of Art Role Evaluation

Use this article to establish the role evaluation model, making a quantitative assessment for art samples to determine the proportion of role played by art in the information age. In selecting art samples, selection can be carried out in stages, so that you can use formula (4.4) to calculate the average earnings for each time period to get role yields, the results are shown in Table 4.1.

Table 4.1 The experimental results of art role evaluation

	Surface diversity correlation coefficient	Deep diversity correlation coefficient	Density correlation coefficient	Network correlation coefficient	Interactive relationship correlation coefficient
Role identity	0.253	0.572	0.213	0.31	0.892
Role satisfaction	0.638	0.29	0.294	0.427	0.925
Role effect	0.452	0.495	0.593	0.496	0.825

From Table 4.1, we can get that, the deep diversity has a greater impact on role identities, which means that role identification degree depends largely on expression and significance of art itself, but the density and network have less impact on the role identity.

Surface diversity has a greater impact on role satisfaction, that is to say, the role satisfaction depends primarily on the art role of external environmental factors, to improve the artistic creation environment will help to improve the role of satisfaction, while the strength of network will also have a greater impact on the role satisfaction degree.

Role effect is the result of both surface and deep diversity, both of them are indispensable. At the same time, the greater role density, the better role effect, so the art performance method and manifestation should be more diversified, which will have an important role in upgrading the role effect.

The function of interaction is consistent with the role identity, satisfaction, and effect. Interactions more closely to role identity, satisfaction, and effect can be better expressed. Therefore art should match the demand of the information age; so that they can be better fused together, making art plays an increasing role the information age.

4.6 Conclusion

Continuous updating of information technology provides a good opportunity for the rapid development of the information age, art as one of the important elements in the information age, is in a unique way reaching the various applications in the information age, making the information age more gorgeous. Role yields as the cut-in point of this article, in accordance with the establishment of the role evaluation of artistic roles, quantitative analysis of the role characteristics played by art in the information age, the results suggest that the role identity, satisfaction, and effect are associated with multiple factors. Consequently, with the changes in the external and internal factors, the role played by art in the information age will changes accordingly. We can expect that arts will have a more important role and significance for the future development of the information age.

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Chapter 5
Study of Electronic Commerce Maturity of Nantong Home-Textile Enterprises Based on AHP and Fuzzy Theory

Hongyao Ni

Abstract This article advances the evaluation index system of e-commerce maturity of Nantong home-textile enterprises. The index system covers four dimensions: attention degree to e-commerce of home-textile enterprises, e-commerce operations, e-commerce security, e-commerce revenue. This article first adopts AHP and fuzzy evaluation theory, and calculates various levels of the index weights, then using fuzzy method to determine the evaluation mathematical models of the various index; finally evaluate e-commerce maturity of Nantong home-textile enterprises.

Keywords The analytic hierarchy process · Fuzzy evaluation · Nantong home-textile · E-commerce maturity

5.1 Introduction

Textile industry is a veteran pillar industry in Nantong [1]. There are only more than 450 home-textile enterprises to expand sale channel via e-commerce in Haimen Dieshiqiao, and more than 60 home-textile enterprises establish department of e-commerce marketing or subsidiary company. In Dieshiqiao international home-textile City, there are nearly 4,000 stores to develop their business through e-commerce network of online trading, the online consumption sum more than 20 %. The development of e-commerce is the key factor of continuing existence in Nantong home-textile enterprises [2, 3]. Therefore, evaluation of Nantong textile enterprises in e-commerce maturity is extremely urgent, on the basis of previous studies, the author has constructed evaluation index system in Nantong home-

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textile enterprises in e-commerce maturity, using the analytic hierarchy process (AHP) and 1–9 scale to determine the weights of the various index, and establishing fuzzy evaluation model, finally validating this method to evaluate Nantong textile enterprises in the implementation of e-commerce maturity of rationality and reliability through the Nantong textile enterprises instance [4, 5].

5.2 The Building of E-commerce Maturity Index System in Nantong Home-Textile Enterprises

5.2.1 Theoretical Background

Chen ZhuPu early put forward the evaluation index system of the enterprise e-commerce maturity via referencing to the CII e-commerce index system by the National Information Evaluation Center [6]. And he stressed the basis of the e-commerce operational processes and evaluated the enterprise via the five aspects: e-commerce infrastructure, the inner and external environment in the e-commerce, e-commerce operation process, e-commerce security and e-commerce revenue.

Nantong home-textile enterprises have carried out e-commerce nearly 10 years, but most enterprises are relying on third-party platform for the implementation of e-commerce, and expand the enterprise's own sales. So a lot of literature on the infrastructure of e-commerce index system lacks practical value, this paper emphasis more on the importance of enterprise e-commerce and actual operating results.

5.2.2 Index System Design

Nantong textile enterprise e-commerce applications rely more on third-party e-commerce platform to expand business sales, on the basis of summing up the literature and combined with Nantong textile enterprises e-commerce implementation, so author designs the four index system about the attention degree of the enterprises e-commerce, e-commerce operations, e-commerce security, e-commerce revenue on Nantong home-textile enterprises in e-commerce maturity index system [7, 8]. The index system of e-commerce maturity in Nantong home-textile enterprises is as shown in Table 5.1.

5.3 Based on AHP and Fuzzy Comprehensive Evaluation Algorithm

The AHP is a structured technique for organizing and analyzing complex decisions. Based on mathematics and psychology, it was developed by Thomas L. Saaty in the 1970s and has been extensively studied and refined since then. It has particular

Table 5.1 The index system of the e-commerce maturity in Nantong home-textile enterprises

Elements	Index	Index explanation
The attention degree of the enterprises e-commerce U1	Website maintenance U11	The implementation of the ongoing maintenance of e-commerce website in home-textile enterprises
	Professionals U12	The implementation of e-commerce with the appropriate professionals in home-textile enterprises
	Staff training mechanisms U13	E-commerce training to employees on a regular basis in
	E-commerce investment proportion U14	Willing to invest the cost of e-commerce in home-textile enterprises
E-commerce operations U2	Online product publicity U21	Propaganda of the implementation of e-commerce for textile products and corporate image
	Online transaction U22	Complete product transactions by electronic payment in home-textile enterprises
	Internet marketing strategies U23	Continue to implement and improve online marketing strategies in home-textile enterprises
	Profit model innovation U24	Continue to realize the innovative e-commerce profit model in home-textile enterprises
	Customization services U25	E-commerce implementation to promote the textile enterprise customization services
E-commerce security U3	Network security degree U31	Website network security in home-textile enterprises
	Online payment security U32	Online payment security in home-textile enterprises
	Viruses situation U33	Website virus defense capabilities in home-textile enterprises
E-commerce revenue U4	Network sales share U41	E-commerce sales accounted for a share of sales of the home-textile enterprises
	Customer satisfaction degree U42	E-commerce implementation to enhance the satisfaction of the end consumer groups to home-textile enterprises
	Decrease of marketing costs U43	E-commerce implementation to reduce the marketing costs of the traditional marketing model
	Improvement of Work efficiency U44	E-commerce implementation to improve the work efficiency of the textile enterprises

application in group decision making, and is used around the world in a wide variety of decision situations, in fields such as government, business, industry, healthcare, and education. It provides a comprehensive and rational framework for structuring a decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.

5.3.1 Establishing the Hierarchical Structure Model

Stratified by the factors included in the problem, first the overall goal should be considered the highest level; then we consider the various measures and criteria taken to achieve the overall goal is the middle layer; finally the various options of solving the problem should be considered the lowest level. Various factors should be considered on the appropriate level. Factor sets are collection of various criterion of the associated evaluation object elements, usually set U, U = {U1, U2,…, Un}.

The e-commerce maturity factor of Nantong home-textile enterprises divided into two levels according to Table 5.1, you can create top-level factor sets: U = {U1, U2, U3, U4}. The second level single factor set as follows: U1 = {u11, u12, u13, u14}; U2 = {u21, u22, u23, u24, u25}; U3 = {u31, u32 Bases the, u33}; U4 = {u41, u42, u43, u44}.

5.3.2 Estimating the Normalized Priority Weights of Decision Criteria

Importance of each factor is usually not the same, in order to reflect the differences of the various factors importance we give each factor (Ui) to the priority weights wi. By the weights of the collection known as the factor weight sets, W = (w1, w2,…, wn).

Before the constructor of matrix of dimension *N*, we use the 1–9 scale method listed in the relative importance of the ratio of the various index, as shown in Table 5.2.

Accordingly to compare the same level element in multi-level model and establish the following form of the orthogonal judgment matrix:

$$A - B_i = \begin{pmatrix} b_{11} & \cdots & b_{1n} \\ \vdots & \ddots & \vdots \\ b_{m1} & \cdots & b_{\mathrm{nn}} \end{pmatrix}. \tag{5.1}$$

In the formula, $b_{ij} > 0$, $b_{ij} = 1/b_{ji}$, $b_{ii} = 1$, b_{ij} means importance scale about element B_i and the elements B_j.

There are two methods of calculating judgment matrix, the geometric mean method and standardize the column average.

More commonly used specification column average method to estimate the normalized priority weights in this paper. Suppose largest characteristic root of judgment matrix $A - B_i$ is $\lambda_{\max}$, the normalized priority weights vector of decision criteria W_i and $\lambda_{\max}$ is calculated:

$$W_i = \sum_{j=1}^{n} b_{ij} \Big/ \sum_{j=1}^{n} \sum_{i=1}^{n} b_{ij} \quad (i = 1, 2, \ldots, n; j = 1, 2, \ldots, n) \tag{5.2}$$

Table 5.2 1–9 scale method

Value	Scale explanation
1	Two elements are compared, both are equally important
2	The two elements compared, the first element is slightly important than the latter
5	The two elements compared, the first element is important than the latter
7	The two elements compared, the first element is very important than the latter
9	The two elements compared, the first element is extremely important than the latter
2, 4, 6, 8	Between these two levels compromise the scale
$1/b_{ij}$	The anti-comparison of two elements

$$\lambda_{\max} = \frac{1}{n}\sum_{j=1}^{n}\frac{\sum_{i=1}^{n} b_{ij}\omega_i}{\omega_j} \quad (i = 1, 2, \ldots, n; j = 1, 2, \ldots, n). \tag{5.3}$$

5.3.3 Consistency Test

When we test consistency for each paired judgment matrix to calculate the maximum characteristic root $\lambda_{\max}$ and the corresponding weights W_i. From the theoretical analysis: If the matrix A is consistent pairwise comparison matrix, where

$$\alpha_{ij}\alpha_{jk} = \alpha_{ik}(a \le i, j, k \le n). \tag{5.4}$$

But it is almost impossible to construct pairwise comparison matrix. Therefore, there is good consistency to the pairwise comparison matrix. Exactly the same stringent requirements paired comparison matrix, the absolute value of the maximum characteristic root should be equal to the order of the matrix. In order to improve the scientific nature of the actual decision making, we usually take consistency test. The inspection process is divided into the following three steps:

Step 1. Calculating the consistency index CI.

$$S = W \cdot R \tag{5.5}$$

Step 2. Average random consistency index RI.

From the relevant literature we can find the RI of comparison matrix A, RI is called the average random consistency index, and it is only relative the order n of matrix, when n = {1, 2,…, 9}, where RI = {0, 0, 0.58, 0.9, 1.12, 1.24, 1.32, 1.41, 1.45}, as shown in Table 5.3.

Step 3. Calculating the consistency ratio CR.

$$\mathrm{CR} = \mathrm{CI}/\mathrm{RI} \tag{5.6}$$

If CR < 0.1, we consider the judgment matrix which has good consistency, otherwise we must adjust the value of the judgment matrix.

Table 5.3 Average random consistency index RI

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

5.3.4 Building and Solving the Fuzzy Evaluation Algorithm

Step 1. Building the evaluation sets.

We can give five elements of the evaluation set when evaluation index is to be quantitative analysis, such as {very high, high, generally, low, very low}, {very good, good, generally, poor, very poor} {[90–100], [80–89], [70–79], [60–69], [40–59]}, there are five results of e-commerce maturity evaluation in Nantong home-textile enterprises, it is very good, good, generally, poor, and very poor, set V = {V1, V2, V3, V4, V5,} = {very good, good, generally, poor, very poor}.

Step 2. Constructing fuzzy relation matrix and fuzzy evaluation matrix.

According to the evaluation set of objectives to be evaluated by the expert group, we can get the evaluation results of each factor evaluation and fuzzy matrix. N evaluation of the factors set composed of a total evaluation matrix R. Then via the weight vector W and the relationship matrix R, the fuzzy evaluation matrix S can be constructed:

$$S = W \cdot R. \tag{5.7}$$

5.4 Case Study of the Nantong Home-Textile Enterprises

On the basis of theoretical studies and combined with the previous analysis, we can get a fuzzy comprehensive evaluation of the hierarchical model of e-commerce maturity index system in Nantong home-textile enterprises, as shown in Table 5.4.

According to the hierarchical model theory of e-commerce maturity evaluation in Nantong home-textile enterprises, we can establish judgment matrix A − B, as shown in Table 5.5.

We can establish the judgment matrix of the B layer element and C layer element, according to the Eq. (5.1), (5.2), we can get:

$$\mathrm{WB} = (0.301,\ 0.417,\ 0.097,\ 0.185)$$

$$\lambda_{\max} = 4.099$$

Accordingly Eq. (5.3) can be calculated: CI = (4.099 − 4)/(4 − 1) = 0.033, look up Table 5.3, when n = 4, where RI = 0.9, according to Eq. (5.4), CR = 0.033/0.9 = 0.037 < 0.1, we consider the judgment matrix has satisfied consistency, the weight is acceptable. Similarly we can calculate the weight of the

Table 5.4 Fuzzy comprehensive evaluation of the hierarchical model of e-commerce maturity index system in Nantong home-textile enterprises

The target of e-commerce maturity index system in Nantong home-textile enterprises A
The attention degree of the enterprises e-commerce B1
Website maintenance C11
Professionals C12
Staff training mechanisms C13
E-commerce investment proportion C14
E-commerce operations B2
Online product publicity C21
Online transaction C22
Internet marketing strategies C23
Profit model innovation C24
Customization services C25
E-commerce security B3
Network security degree C31
Online payment security C32
Viruses situation C33
E-commerce revenue B4
Network sales share C41
Customer satisfaction degree C42
Decrease of marketing costs C43
Improvement of work efficiency C44

Table 5.5 Judgment matrix A − Bi

$A–B_i$	B_1	B_2	B_3	B_4
B_1	1	1/2	3	2
B_2	2	1	4	2
B_3	1/3	1/4	1	1/2
B_4	1/2	1/2	2	1

C layer of each element relative to the B shown in Table 5.6. According to Table 5.6 we can get the combined weight of the 16 evaluation results.

$$W = (0.028, 0.134, 0.087, 0.051, 0.121, 0.072, 0.158, 0.042, 0.025, 0.016, 0.051, 0.030, 0.079, 0.039, 0.048, 0.018)$$

The 16 evaluation factors of e-commerce maturity in Nantong home-textile enterprises can be composed of the factors set U, and the evaluation results have five kinds, such as very good, good, generally, poor, very poor. According to expert evaluation data we can obtain the following evaluation results matrix R, shown in Table 5.7.

Table 5.6 The weights of e-commerce maturity index in Nantong home-textile enterprises

B layer element	Weights	Index	Weights	Combined weights
The attention degree of the enterprises e-commerce U1	0.301	Website maintenance U11	0.093	0.028
		Professionals U12	0.446	0.134
		Staff training mechanisms U13	0.290	0.087
		E-commerce investment proportion U14	0.171	0.051
E-commerce operations U2	0.417	Online product publicity U21	0.290	0.121
		Online transaction U22	0.172	0.072
		Internet marketing strategies U23	0.379	0.158
		Profit model innovation U24	0.100	0.042
		Customization services U25	0.059	0.025
E-commerce security U3	0.097	Network security degree U31	0.162	0.016
		Online payment security U32	0.529	0.051
		Viruses situation U33	0.309	0.030
E-commerce revenue U4	0.185	Network sales share U41	0.427	0.079
		Customer satisfaction degree U42	0.213	0.039
		Decrease of marketing costs U43	0.261	0.048
		Improvement of work efficiency U44	0.099	0.018

Table 5.7 Evaluation results matrix

Index	Very good	Good	Generally	Poor	Very poor
Website maintenance U11	0.2	0.6	0.2	0.1	0
Professionals U12	0.1	0.7	0.1	0.1	0
Staff training mechanisms U13	0.1	0.4	0.3	0.2	0
E-commerce investment proportion U14	0.3	0.3	0.3	0.1	0
Online product publicity U21	0.2	0.6	0.1	0.1	0
Online transaction U22	0.5	0.5	0	0	0
Internet marketing strategies U23	0.2	0.4	0.2	0.2	0
Profit model innovation U24	0.1	0.2	0.4	0.3	0
Customization services U25	0.2	0.6	0.2	0	0
Network security degree U31	0.1	0.8	0.1	0	0
Online payment security U32	0.3	0.6	0	0.1	0
Viruses situation U33	0.5	0.3	0.2	0	0
Network sales share U41	0.2	0.7	0.1	0	0
Customer satisfaction degree U42	0.2	0.5	0.2	0.1	0
Decrease Of Marketing costs U43	0.2	0.5	0.1	0.2	0
Improvement of Work efficiency U44	0.2	0.6	0.1	0.1	0

According to Eq.(5.5) $S = W \cdot R$, where $S = (0.213, 0.518, 0.156, 0.115)$. Based on the maximum degree of membership method, the maximum degree of membership value of Nantong home-textile enterprise e-commerce maturity

evaluation max(s) = 0.518, the e-commerce maturity in Nantong textile enterprises is the second stage of the evaluation grade, that is "good".

5.5 Conclusions

For multi-program evaluation, there is the limitation of the weight in AHP, for example judgment matrix consistency test is difficult to pass. This paper is based on AHP and fuzzy comprehensive evaluation algorithm theory, effectively avoiding the AHP in man-made subjective judgments of the e-commerce maturity evaluation. Case study indicates that the evaluation based on AHP fuzzy comprehensive evaluation algorithm is good in evaluating the e-commerce maturity in Nantong home-textile enterprises.

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Chapter 6
Water Content Prediction in Geophysical Exploration Based on BP Network

Yanrong Niu

Abstract This research is adopting neural network technology for the use of a number of known geophysical testing the well Pumping test data to the geophysical parameters of aquifer discharge umts with single-hole model composed of the training sample set, establishing the err BP network forecasting model for regional geophysical methods unknown under ground water content prediction, this will be major improvement to the traditional water content prediction.

Keywords Artificial · Networks · Integrated · Geophysical methods · Water content prediction

6.1 Introduction

Water resources is a human production and life indispensable natural resources, biological survival of the environmental resources, with the water crisis intensifies water quality deterioration, water shortages have evolved into the world paid close attention to the resources and environmental problems one. Groundwater is an important part of water resources, human indispensable natural resources, its life, industrial and agricultural production, and urban construction, social and economic development plays a significant role.

In the North China Plain region, due to the large-scale development of groundwater use in the past 40 years, has been formed around Shijiazhuang, Hengshui, Changzhou, and other cities of the three regional funnel. With the

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continued exploitation of groundwater resources, the composition of the groundwater resources component has changed significantly. According to different model results, the more flow in the deep water resources and clay layer released water accounts for about 75 %, about 15 % of the released water sand laminated, lateral recharge in only 10 %. Noncompensation means that the status quo adopted most of the water from the aquifer storage resources, and has caused serious land subsidence, which also allows us to re-examine the use of groundwater resources.

Based on geophysical methods to groundwater in situ testing capabilities, with high efficiency, low cost, continuous measurement of other advantages, the use of geophysical techniques to predict the water content of the aquifer is expected to solve the above problem has become the hot topic of current research. Therefore, geological modeling technologies and integrated geophysical study the combination of aquifer water content forecasting methods that have emerged. Ground of integrated geophysical techniques, three-dimensional distribution of the fine to identify aquifer and changes; to carry out ground geophysical technology research, precise computation of aquifer effective porosity, permeability, effective saturation, shale content, and other geological parameters; Finally, geophysical parameter mathematical model, to carry out the moisture content of the aquifer, the prediction processing system.

6.2 The Basic Theory of Artificial Neural Networks

The artificial neural network is an emerging cross-disciplinary. In the practical application of artificial neural networks, artificial neural network model uses BP neural network (back-propagation neural network) [1]. The BP algorithm consists of two parts: the forward pass and error back-propagation of information. In the process of the forward pass input information calculated from the input layer hidden layer, layer by layer to the output layer, each layer of neurons status affects only the state of the next layer of neurons. If the output layer does not have the desired output, the calculation of the change of error value of the output layer, and then turned to the back-propagation, the error signal through the network along the connection path to anti-pass back to modify the weight of the layers of neurons until they reach the desired goals, Fig. 6.1. BP neural network learning rules: adjust the network weights and thresholds of the square of the network errors and the smallest; it is to adjust the network weights and thresholds in the direction of steepest descent [2].

BP model consists of multiple nodes of input layer, hidden layer, and an output of the output layer, each node of individual neurons, and one-way connection between adjacent layers. Transfer function between the nodes for the S-shaped function, i.e.,

$$f(x) = \frac{1}{1 + e^{-x/Q}} \tag{6.1}$$

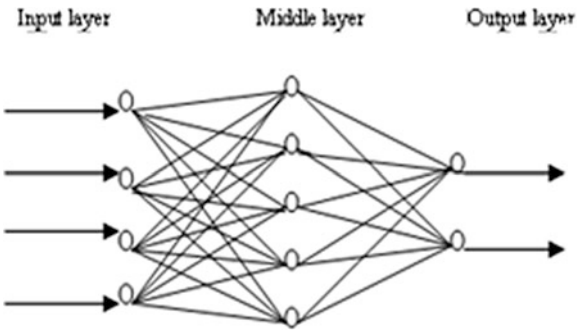

Fig. 6.1 BP ANN module

The output of the layers of nodes is calculated as follows:

$$y = f\left(\sum_{i=0}^{n} w_{ij}\, x_i - \theta\right) \tag{6.2}$$

Each node input is connected by the weights ω of the input information and the threshold θ. Where y is the node output, xi is the node to accept the information, ωij is related to the connection weights, θ is the threshold, and n is the number of nodes.

6.3 Geophysical Method

Geophysical methods are divided into the power law and elastic wave method. Which is the power law: (1) transient electromagnetic method (TEM), (2) conductivity imaging method (AMT), (3) induced polarization (IP), each method has its advantages and characteristics, such as [3, 4]: exploration of the direct current method to detect saline very invasively, and water distribution; seismic exploration method in the constructor, stratigraphic division, strata rich water, and lithology contrast with a strong ability; electromagnetic sounding method has the absolute advantage of the exploration depth. Therefore, the response to different exploration tasks, a variety of geophysical methods optimized combination of comprehensive analysis, a key aspect of this research project, several geophysical methods have been used to extract the different combinations of the following prediction model:

In areas of shallow aquifer level for example, the Quaternary aquifer structure of the North China Plain region alone IP method, which have come to the use of its measurement and inversion of resistivity, polarizability, half-life, and decay rate layer thickness parameters is sufficient to model prediction;

For Aquifer of the fine-grained structure and the stratigraphic sequence, litho logy characteristics can be taken to stimulate the pattern of the polarization and shallow high-resolution seismic method or the TEM in addition to the forecast model can also aquifer structure of a more nuanced understanding of;

For the deeper aquifer structure of the Ministry, we recommend the use of frequency domain electromagnetic sounding method, the exploration depth of the electromagnetic method, conditional case with seismic exploration, can be the physical parameters of the deeper geological, which improve the prediction accuracy to a great help.

6.4 BP Neural Network Model

6.4.1 Modeling Selection of Neurons

Predecessors have been confirmed by a large number of field and laboratory test, the subject of forecasting model selection of input neurons to the following principles: First, the existing geophysical equipment can be measured, or the conversion parameters, practical and observability; second, to be matched with the comprehensive geophysical methods to study the fine structure of the aquifer to fully tap the received observation data resources; optimal combination, taking into account the complementarities between the input neurons use to avoid or reduce redundancy; Fourth, for the protection of the prediction model has a broad generalization ability.

Based on the above principles and before the text of the discussion of integrated geophysical methods which provide the geophysical parameters the amount of the initial neural network prediction model's prediction input basic neural element selected is: ρ, h, st/2, D, ηs such as ground geophysical observation parameters (resistivity ρ, h, aquifer thickness, St./2 half-life D attenuation ηs polarization rate).

6.4.2 Normalized Input Neurons

Because each unit of data collected as the input neurons are inconsistent, the scale difference of the input neurons, there will be a large sample to eat small sample, and therefore must be the input layer data (0, 1) normalized to eliminate the impact of the scale. Commonly used normalization formula is:

$$x_s = \frac{x - x_{\min}}{x_{\max} - x_{\min}} \tag{6.3}$$

where: x is the corresponding value of an input parameter; $X_{\min}$ and $X_{\max}$ are the neurons set minimum and maximum values; X_s, a normalized value of the input parameters. The output form of an output and little change in magnitude, there is no need to take the normalized output neurons.

6.4.3 BP Training

Has been collected from the sample divided into three separate parts, namely the training set, validation set, and test set. The training set used to estimate the model, the validation set is used to determine the parameters of the network structure or to control the model complexity, while the test set to test the final choice of the optimal model performance. A typical split is 50 % of the totals sample of the training set, while the other 25 % each; three parts are randomly selected from the sample.

Shijiazhuang City Xima Zhuang and Beijing Chaobai two water source data model of the work rely on currently at our disposal, respectively the Xima Zhuang, and the Chaobai two water to take out a well data as a predictor of promotion sample set, the two 13 wells in the area as a training sample set have been previously described to normalize after a treatment sample data is shown in Table 6.1.

6.4.4 Result

The modeling has taken a global optimization algorithm Levenberg–Marquard method training function with trainlm functions, the results shown in Table 6.2.

BP neural network prediction model pointed out the applicable conditions in this way; by testing the trained model, we have come this way the model error is less than 5 %, to achieve the purpose of modeling.

Table 6.1 Sample data of ANN model

NO		Q	T	S	D	η
Training set	1	25	0.23	0.15	0.35	0.4
	3	34	0.32	0.1	0.42	0.47
	6	70	0.71	0.5	0.84	0.6
	7	27	0.11	0.1	0.6	0.33
	8	35	0.32	0.25	0.64	0.47
	11	38	0.36	0.27	0.67	0.47
	35	50	2.76	0.14	0.5	1.07
	37	51	2.39	0.11	0.44	1.2
	20	40.82	2.97	0.22	0.48	1.01
	33	64.28	1.91	0.14	0.57	1.33
Validation set	4	45	0.34	0.3	0.77	0.53
	1–2	48.93	2.67	0.14	0.39	1.08
Test set	1–34	51	2.39	0.1	0.48	1.07

Table 6.2 The experimental results

NO	1	3	6	7	11	35	37	20	33	4	1–2
Q	25	34	70	27	38	50	51	40.8	64.2	45	48.9
Forecast	25.5	33.7	71.0	26.3	37.8	49.2	50.5	40.2	63.9	44.3	48.8
Error (%)	2	0.9	1.5	1.4	0.5	1.6	1	1.4	0.5	1.6	2.2

6.5 Matlab Program for Main Framework

Described in the previous paper, the network structure, training samples, and the learning algorithm to determine, set the training parameters of the network of which the largest number of training is 1,000, the expected error Inse le 6, the momentum factor of 0.9, the initial learning rate of 0.01, incremented by a factor of 1.05, decreasing multiplication factor of 0.7, the maximum error rate of change of 1.04. Before training, you first need to set the initial value of weights and thresholds the function newff () that generate the BP network weights and thresholds of the network layers is done automatically initialized.

Initialization command: net = init (net);
Initialized weights, the initial value of the threshold 0.
Training process, one of the following conditions, the training will end:
exceed the maximum wonderful 11 practice, namely. The ehs namely ep. of ChS > 1,000;
The command statement: net. Trainparam Epochs = 1,000:
performance function value is less than the error indicator g. a1 the mse core 10 a;
Command statement: net. Train Aram. Goal = 0.000001:
training longer than a time limit time.

The subject application matlab7.0 aquifer water content of the BP neural network prediction model for training, training results are shown in Fig 6.2.

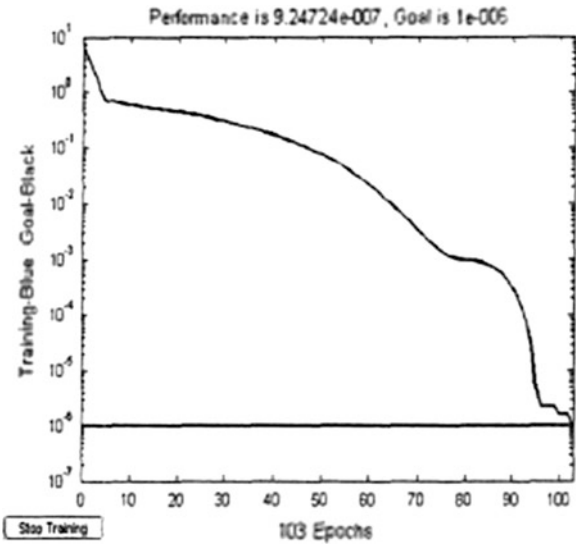

Fig. 6.2 BP neural net work forecast model training results error convergence curve

6.6 Conclusion

In this paper research results show that the BP neural network model combined with the integrated geophysical techniques during aquifer water content forecasting has certain advantages and potential. But at the same time we also have to point out, this subject is still price segment, objective reason for the data collection stage a summary of research, there is still some. By the initial results of the project is summarized, and found there are still the following issues need further study and improve the future work.

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Chapter 7
Study on Training of Computer Science and Technology

Xiaobo Xiong

Abstract Computer science and technology program is not only one of the required programs in the modern colleges and universities, but also necessary knowledge and skill that are required by the information age on talented personnel to possess. At present, seen from the teaching activities and training situation of computer science and technology in Chinese colleges and universities, some progresses have been made, but there is still a greater development space for it. In this paper, some suggestions are proposed by the author on the training of the computer science and technology personnel in colleges and universities, only for the academic exchange.

Keywords Computer · Science and technology · Personnel training

7.1 Introduction

With the continuous deepening of Chinese reform and opening-up policy, extensive attention has been paid to computer science and technology program from all walks of life.

Colleges and universities, as senior personnel training institutions in China, undertake the mission to cultivate professional talents for the country in the new century.

Therefore, how to make an enhancement and improvement to the training of the computer science and technology personnel in Chinese colleges and universities has proven to be a major problem that has a close tie with the information technology development and even the whole social and economic development.

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7.2 Current Situation and Shortcomings of Computer Science and Technology Program

The employment problem of the graduates from the computer science and technology program in colleges and universities can be mainly reflected from that the quality and ability of the graduates cannot adapt to the requirements and expectations of employing units.

The most effective way to solve such a problem is to make an enhancement to the reform of training the computer science and technical personnel in colleges and universities and attach higher importance to the combination of strength and practice in the process of learning, so as to make students meet the requirements of social development.

7.2.1 Key Problems in the Process of Computer Science and Technology Program to Train Personnel

Through the understanding of the personnel training idea in the traditional computer science and technology program [1], it is found that it is a subject based on the theory of algorithm and requires the students necessarily to possess corresponding algorithm knowledge and research ability.

This, therefore, makes the traditional colleges and universities attach higher importance to the academic attainments and research potentials of students in the training of computer science and technology personnel.

However, the imbalance of this ability exactly goes against the requirement of the current society on the computer science and technology personnel.

Generally, what the society and employing units demand are increasingly more graduates with advantages in practical operations and practice ability.

7.2.2 Analysis on the Specific Reasons for the "Difficult Employment" of Graduates from Computer Science and Technology Program

7.2.2.1 Untimely Adjustment to the Program Location

The education of the computer science and technology in China's colleges and universities does not keep pace with the development of the times, but stays in a relatively backward stage and level.

The disjoint between this program location and the market demand is one of the most important reasons for the difficult employment of the graduates from the computer science and technology program in colleges and universities.

7.2.2.2 Relatively Backward Teaching Methods and Contents

At present, the majorities of colleges and universities in China do not timely make an update and adjustment to the teaching methods and contents in accordance with the characteristics of the computer science and technology subject.

7.2.2.3 Ignoring Practice

Based on the traditional teaching idea in China's colleges and universities and the main contradiction mentioned above in the professional training of the current computer science and technology program [2], many colleges and universities in the country do not really implement the practical operations and relevant practice activities for students.

This also makes the students in colleges and universities have only theory knowledge in computer science and technology but no practice enhancement.

7.2.2.4 Imperfect Faculty Construction

From practices, it is found that the teachers of the computer science and technology program in colleges and universities are mainly oriented at specialized knowledge impartation. They are not involved in the researches related to the computer science and technology and also the other kinds of practical operations and technological application activities.

7.3 Important Significance of the Reform for the Personnel Training Model of Computer Science and Technology Program

First of all, the operational and practical abilities of these graduates are not powerful. Relevant theory knowledge has been learnt by them, but cannot be put into practice.

Second, computers cannot be operated by these graduates proficiently, and also the methods for processing some commonly seen problems are not known well.

From these two points, it can be learnt that a number of computer science and technology personnel cannot meet the needs of enterprises on recruitment.

Besides, the comments that are made by the managers of the human resource departments of the enterprises can be mainly concluded as follows: (1) the graduates from the computer science and technology program in colleges and universities are in shortage of the relevant practice experience; (2) the graduates do not possess a clear understanding of their career development and self-growth;

(3) the innovation ability as well as the analysis ability of the graduates is far away from being powerful; (4) the psychological quality of the graduates is relatively poor.

Therefore, after a great number of problems in the computer science and technology personnel trained from colleges and universities are known well, it is highly necessary for us to timely make an adjustment to the teaching model.

Only the teaching and education reform are continuously deepened, the teaching contents and objectives are adjusted, the teacher resources and structures are improved, and high importance is attached to the guidance for the practices of the students, the students studying in the computer science and technology program can really develop a comprehensive ability that makes theory and practice combined and meet the needs of enterprises on recruitment and the development of the society.

7.4 Specific Measures of the Reform for the Computer Science and Technology Program

After a conclusion is drawn up on the work experience of many years, the author thinks that a good effect can be achieved if the reform for the computer science and technology program in colleges and universities can be conducted from the several aspects in the following.

7.4.1 Changing the Traditional Teaching Idea

Teaching idea is the foundation for the development of all teaching activities. In the traditional teaching idea, high attention is paid to the impartation of the theory knowledge and the receiving study of the students, and especially to the training of the students' academic ability as well as the development of the potentials.

Obviously, this teaching idea has been unable to fulfill the social development needs of China and the current development situation of the information technology in China. Especially for some higher vocational colleges [3], it goes against the demands of society if importance is only attached to the training of theory knowledge.

In the modern times, what the enterprises need are increasingly more operational personnel and technicians, but not the specialized researching personnel. Based on this, changing the traditional teaching idea in the computer science and technology program is the first step of the reform for the personnel training model of the computer science and technology program.

It is necessary to pay more attention to the market orientation of the information age and the standards for the application-oriented talents in the new teaching idea, and then talented personnel can meet the needs of the future development.

7.4.2 Changing the Traditional Teaching System and Curriculum Setting

According to the lacked quality above mentioned by the managers of the human resource departments of the enterprises, it is necessary to train the students with a clear purpose, making them become professional technical personnel who have good psychological quality, communication ability, and analytical ability in the process of learning.

In the setting of curriculum, schools can divide the courses of the computer science and technology program into all sorts of required courses and elective courses in accordance with the gradual segmentation of the social division of labor in the modern times, so as to make it easy for students to select courses based on their own research orientation.

In addition, the flexible setting of curriculum is also helpful for students to give full play to their own initiative, exercise and train their planning ability in the process of learning, and also make a right choice when facing up with the social competition and enterprise recruitment.

7.4.3 Carrying Out School-Enterprise Cooperation and Constructing Project-Oriented Practice Base

It is necessary for colleges and universities to seek many kinds of methods for making an enhancement to the practices.

After many explorations, it is found by us that carrying out the school-enterprise cooperation is one of the very effective ways.

That is, the real field practice opportunities can be provided by the enterprises for students in the cooperation, and simultaneously the colleges and universities can provide a top priority for the enterprises to select technical supports and talented personnel.

Under this situation, the students can perceive and experience the working process by going deep into the real operational links of the enterprises, and also can get an in depth understanding of the significance of the application of the computer science and technology.

In the mean time, the students can know well the latest development conditions and achievements of the information technology in combination with the market

trends in the process of practices, and also can get a broadened outlook, and hence can make a good preparation in advance for changing from the learning in school to the working in enterprises.

7.4.4 Constructing a Double-Quality Teacher Team

The role of the teachers played in the whole teaching activity is very crucial, and also the teaching model, which is targeted at training the application-oriented talented personnel, puts forward a higher requirement on the teacher team. This needs the double-quality teachers who not only have the ability in the theoretical teaching, but also possess the ability in the designing, development, and application of enterprise project.

In general, the double-quality teachers possess the relevant practical application and development experience, and have the ability to get a good understanding of the main points of course in-depth in the processing of teaching theory courses and also provide students with detailed explanation in combination with the specific application cases.

In the process of teaching practice-oriented courses, the double-quality teachers have the ability to make a thorough analysis on the problems in the application projects and also present it to students with a clearly imperative way, so that the students studying in the computer science and technology program can easily get a real understanding of the theory and practice knowledge.

In the mean time, the double-quality teachers can provide the students with a great number of positive supports and helps in the professional technology and employment, and also build up a very good example for the application-oriented talented personnel.

In the process of constructing a double-quality teacher team, schools can take full advantage of a variety of forms, and encourage and support theory-oriented professional teachers to actively participate in the application and development of enterprise projects, so as to promote the teachers to attain a chance for practicing and improving their application ability.

Also, schools can employ the front-line development and application personnel to take part in the teaching work of practice-oriented courses. It has been repeatedly emphasized and mentioned that computer program is a program that is highly oriented at practices.

With the purpose of making the trained students melted into a job quickly, it is necessary to make an enhancement to the practical ability of the students studying in computer program.

Also, it is necessary for colleges and universities to make a change to the original teaching model of the computer program, target at training the application-oriented talented personnel, reform the teaching system and course design, actively strengthen the cooperation with enterprises, establish practice bases for students, and construct a double-quality teacher team.

7.5 Conclusion

From the above analysis, along with the application of computers and especially the popularity of network application, the computer science and technology as well as its application have attained a very great development in China in recent years. In the mean time, the education of the computer program has developed very rapidly.

However, the present situation is that the majorities of the graduates from the computer science and technology are in shortage of the ability in the practical application, development, and design, and cannot apply the knowledge in the computer science and technology program in production and life.

At the employment market of the computer science and technology program, a great number of talented personnel are urgently required by enterprises.

However, it is difficult for the enterprises to choose job seekers that they feel satisfactory with; the graduates trained from colleges and universities are hard to meet the needs of the enterprises, and the employment rate continues to decline.

Today, computer has been popularized in the life and work of people. What computer talented personnel that are needed by the information-based society and how colleges and universities timely make an adjustment to the training orientation and teaching methods of the computer program according to the development of the information-based society and train the computer talented personnel meeting the social demands are worthy of our attention.

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Chapter 8
On the Features of Computer Collaborative Workflow

Songchun Gong, Songyin Fu and Zheng Chen

Abstract At the present time, the computer technology has been widely applied to the modern business operation management, and also multiple management system models on the basis of the computer technology have received extensive applications in many areas. Among them, the workflow is a new computer automation management method, which can change the deficiencies of the traditional management models, promote the enhancement of the production and management efficiencies for enterprises, and ultimately accomplish a growth trend for the internal economic benefit. It is known that the workflow has exerted efficient management roles in many aspects. In connection with this situation, the features of the computer collaborative workflow are analyzed with an emphasis in this paper, and its applications in the actual business management are particularized as well.

Keywords Computer · Workflow · Features · Application

8.1 Advantages of Computer Collaborative Workflow

Actually, the workflow belongs to an automation management model, mainly realizes the computer operations necessary for the modern enterprises project implementation, and processes all kinds of business activities (e.g., file transfer, information transmission, and task assignment) by relying on the computer technology. It decomposes a complex problem into small parts and resolves them

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one by one. The introduction of the workflow concept into the modern business management has improved the automation level of the production and management efficiencies for enterprises. This not only helps the internal long-term development for the enterprises, but also ensures the best-quality and highest-efficient services.

At present, to seize advantages in the market competition, all enterprises have adopted the scale-expansion and business development models. However, subsequently, a series of management issues occur. Thus, how to make use of the existing resources to develop businesses and achieve the continuous growth of economic benefits is necessary for business operators to considerate actively. Driven by the development of the computer technology, the application of the "workflow" in the enterprise daily management has been valued greatly, because this new automation management model mirrors the advantages in many aspects.

Business Expansion The business development can be optimized based on the current business situation within enterprises, aiming to raise the business project to a higher position. The computer collaborative workflow is able to make the business operators transfer the most appropriate services to the users with needs at the most reasonable time [1]. At the mean time, in the course of the business operation, the workflow can let all staffs concentrate their energies on the business development, and hence the whole operation flow tends to be reliable without a hitch.

Assisted Management As a vivid metaphor, the "workflow" is a production line, in which each operation link has a close tie with the enterprise internal dynamics (see Fig. 8.1). The operators can clearly control their current business situation in time after knowing the specifics of workflow, and hence can monitor other managements within the enterprises. For example, when the customers are unsatisfied with the services provided by the enterprises, the operators can make relevant adjustments to their managements in accordance with the workflow.

Resource Allocation The optimization on the human, material, and financial resources within enterprises is another large advantage of the computer collaborative workflow. After the application of the workflow model, the utilization

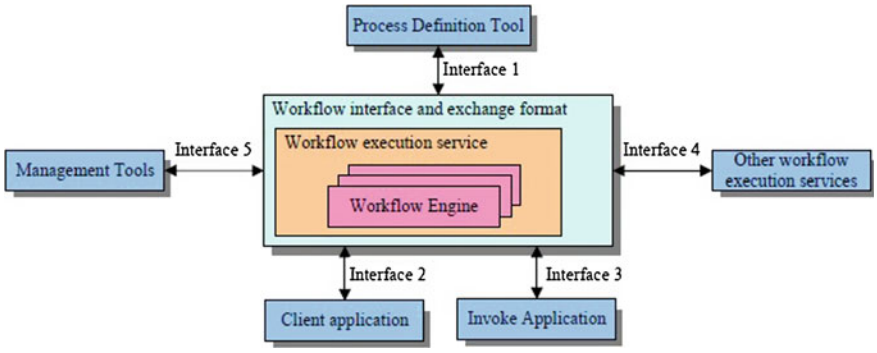

Fig. 8.1 Constitution of the workflow

efficiencies of all resources within enterprises are enhanced, and the trust relationship between enterprises and customers tends to be better as well. In addition, through the computer network, the business operators can negotiate the businesses with customers, and customize various services to meet the different needs of customers, which help enterprises in lower cost consumption.

Data Collection From the perspective of the financial management, the introduction of the workflow model has an obvious effect on the data collection. The application of computer can make full use of the utilization value of the backend database. For example, the multiple functions such as the report, search, statistics, retrieval, and analysis allow enterprises to obtain sufficient information as supports in the formulation of the financial plan, and hence the financial management tasks can proceed without difficulties [2].

Procedure Standardization In order to improve the service quality of enterprises, the reform and adjustment can be started from the existing service procedures, and drive the management ability to be strengthened. For example, the core business procedure within enterprises can be updated and converted so as to gradually adjust, reorganize and optimize them, and promote the competitiveness of the enterprises to be stronger. Also, the application of the workflow system can regulate the enterprise business procedures, and hence provides a guarantee for the scale expansion and competition participation of enterprises.

8.2 Implementation of the Workflow Database

As for different enterprises, the construction of the workflow can achieve an integrated management model in enterprises at most times, and lets the computer technology better serve the business management. In terms of the workflow operation principle, the core component of the workflow is the formation of the database, and it includes three major links (i.e., mapping, modeling, and management) in the implementation process. Each link has its own functions. The mapping mainly conducts the organizational and coordination on the current business procedures of enterprises; the modeling is creating the procedure models to reflect the services; the management means that the enterprises adopt a management model for the situation of the workflow. The specific implementation flow is described below.

Establishing a Project Team As the first implementation link, it is necessary for enterprises to create a reasonable project management team for the workflow, which specially serves the workflow. In the selection of the project management members, the enterprise leaders are necessary to be evaluated in the aspects of the theory, practice, and skills, with the purpose to ensure all members exert the relevant role in the project management, such as the financial personnel, computer technicians, and product experts.

Analyzing the Business Flow After the establishment of the management team, it is necessary to specifically analyze and process the links which can be

optimized or modified in the business flow in accordance with the current business situation that the enterprises have known. For example, in the customer service stage, the enterprises can provide the humanized service indexes, and hence provide more considerate products and services for customers. In addition, the economic influence of the business on the enterprises is necessary to be analyzed in detail, such as the sale volume and economic profit.

Formulating Work Targets The computer collaborative workflow, as a new management model in enterprises, must reflect sufficient utilization values. Therefore, in a certain period, the enterprise must formulate the work targets that comply with the actual conditions. For example, in order to shorten the time of the enterprises to issue the invoices, the relevant personnel necessarily know the time, track, accounting, invoice issuing procedures, and hence the workflow in enterprises can proceed without difficulties after the target is clear.

Creating the Business Model When both users and software suppliers show the workflow solutions, it is necessary to modify the workflow based on the specific requirements of users, and comprehensively consider the priority and then confirm the online time of all modules (see Fig. 8.2). The establishment of the business model can provide good analysis results for the workflow operation in enterprises. The users can contact the experts in the same type of software products to cooperate and exchange with each other, so as to maintain a balance between the usability and functional requirements.

Implementation of the Operational Steps Before the workflow is operated, the users need to carry out a test by combining the state of the mode, and hence ensure the whole workflow to accord with the actual needs [3]. If an error is discovered in the model after the test, it is necessary to make revision and

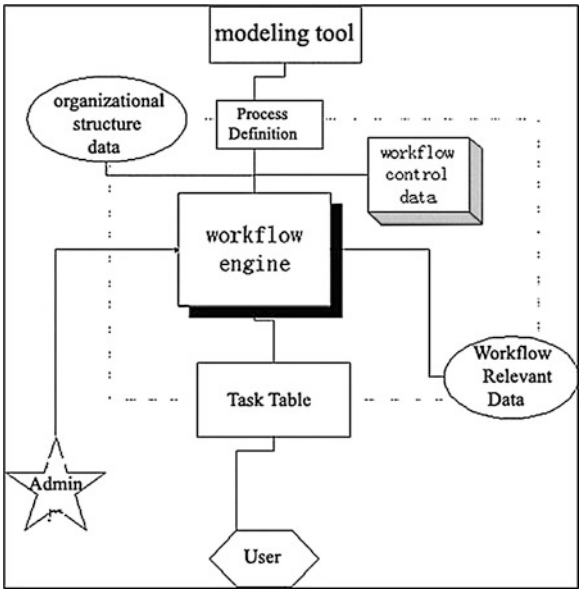

Fig. 8.2 The model of the workflow

adjustment timely, so as to improve the operation of the workflow without difficulties. The elimination or minimization of the redundant data among multiple systems is the key content integrated by the workflow, and also it requires the users that can copy the data necessary to be used among multiple systems.

8.3 Application of the Computer Collaborative Workflow

Nowadays, the computer collaborative workflow has exerted a very important role in the daily business management of enterprises, and also has attained a full promotion in all industries. Seeing from its application at the current market, the workflow has been used almost by all industries; its core tasks include the orders, quotation processing, procurement processing, contract examination and verification, customer-call processing, and supply chain management. Now, according to the classification of different industries, the application of the workflow is particularized below.

Administrative Management The administrative management is mainly required in the government bodies and departments. In this aspect, the application of the workflow is mainly reflected on the processing of the administrative forms, such as the business-trip application, overtime-work application, leaving application, office supplies application, purchase application, and so on. Thus, the workflow is able to supply government bodies with reference for their examinations and approvals.

Personnel Management The human resources departments within enterprises can take advantage of the computer collaborative workflow to operate the human resources optimal management with a gradual step at work, including the personnel training arrangement, performance evaluation, position alteration processing, staff archive information management, etc. [4].

Financial Management Financial tasks often require involving all kinds of financial information. Thus, the accounting personnel complete the statistics processing related to the funds skillfully. The application of the workflow also touches upon the payment request, account receivable processing, daily reimbursement processing, business-trip processing, capital budget, etc.

Customer Service Management As for the service industry, the workflow model can also be utilized to keep a long-term relationship with customers. For example, the customer information management, customer complains, request processing, and post-service management can be subject to a workflow model, so as to objectively evaluate the comments of the users on the services provided by the enterprises, and hence the service quality can be enhanced.

Special Service Management Each service industry has its own operation system. The commonly-used systems include the ISO series flow, quality management flow, product data management, trade company clearance, logistics company packages management. All these can be completed through a workflow model [5].

8.4 Conclusion

From the above analysis, the application of the computer collaborative workflow operation model within enterprises can continuously improve their business management, and also can drive the enhancement of the business efficiency. At the mean time, it can reduce the consumption of the cost necessary for the business operation, so as to fulfill the requirement of the modern managerial decision making. However, after the workflow management is introduced, the enterprises shall also lay a stress on the updates of the computer technology, for the purpose of keeping the smooth development of the workflow operations.

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Chapter 9
Research on Position-Oriented Guidance Teaching Mode of Computer Assembly and Maintenance

Li Qian

Abstract This paper mainly explicates the application of the teaching mode of "Position-oriented Guidance" in the course of Computer Assembly and Maintenance, in the hope of achieving the following purposes: in respect of teaching method, it can not only meet the requirement of enterprises and society for technical personnel on professional positions but also meet the need of improving students' abilities of assembling and maintaining computers; in respect of teaching mode, it can realize actual integration of students and enterprises as well as course and working tasks. Besides, it is more accordant with the feature and discipline of vocational education, and higher efficiency and timeliness will be obtained.

Keywords Computer assembly and maintenance · Position-oriented guidance · Teaching mode · Working tasks

9.1 Introduction

With the rapid development of information technology, technical ability of assembling and maintaining of hardware and software of computer has been an essential requirement for employment of graduates majoring computer or relevant subjects [1]. Meanwhile, course of Computer Assembly and Maintenance, as a specialized basic course of computer-related majors, has been offered in higher vocational colleges, but many problems in practical teaching remain to be solved.

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Researches on teaching mode of the course Computer Assembly and Maintenance only regard it as a course alone but ignore the special link between the course and working tasks on professional positions, misleading many people to attend the class for the sole purpose of acquiring knowledge on hardware [2].

Though many teachers have applied advanced multi-media technology to teaching, most of them are still teaching students with the lecturing method. Due to this fact, some students learn the course simply as a theoretical one instead of as a kind of technical ability. Therefore they fail to act on the theories in terms of technical ability and practical operation, and they do not know what to do when encountering with specific problems related to computer assembly, system installation, and trouble shooting, and so on. Thus the lecturing method cannot be claimed as a student-centered teaching, and it cannot fully mobilize students' initiative of learning. Hence the course offered fails to work in improving students' learning literacy.

Through the tracking survey of the employment of graduates (graduated from our college) of computer-related majors in recent years, I have founded that it takes most of the graduates engaged in related work of maintaining hardware and software several months to adapt themselves to the positions on the initial working stage instead of being competent at the jobs quickly. Such problems can be attributed to the following reasons: first, college students do not know about the corresponding working tasks with the course; second, the course knowledge is out of line with the corresponding positions or working tasks. It follows that the previous teaching modes are no longer suitable for teaching students nowadays. In addition, the employers are increasingly hoping that the new employees can directly participate in the routine work of the enterprises without being trained upon employment.

Hereby we must substitute the teaching mode of "position-oriented guidance" and "ability as standard" for the traditional one of "knowledge as standard", enabling students to pursue knowledge with interest and acquire knowledge at simulated positions. While improving students' technical abilities in the integrated teaching of "learning in practice" and "practicing while learning", we should also enhance their theoretical knowledge to a higher level, enabling themselves to meet the needs of enterprises and social development.

9.2 Thought of Research on the Course

9.2.1 Advantages and Disadvantages of Traditional Teaching Mode and German's Mode of Vocational Education

Traditional teaching mode can lay solid theoretical foundation and it has a relatively strong ability of sustainable development, but there is little chance for professional learning and practicing, far from meeting the requirement of employment for working ability. On the contrast, German's mode of vocational

education can analyze professional working tasks, and process of working and learning integrates with each other so that students can directly take up the occupation without long-term adaptation after graduation. However, the pertinence to positions is too strong and positions transfer ability is relatively weak.

In the process of teaching this course, we should reform the traditional teaching mode, draw lessons from German's mode of vocational education, and draw upon the essence of the two modes. First, relevant technical experts could be retained in enterprises as part-time teachers. Process of working and process of learning should be connected with students' abilities, and the target of cultivating students' occupational ability and quality should penetrate the whole process of teaching. Second, teaching shall be conducted in accordance with the practice-oriented principle. Actual position and typical working tasks should be set as the goal of study to form a teaching model of "positions and tasks oriented guidance".

9.2.2 Formulate Course System in Accordance with Idea of "Position-Oriented Guidance"

In accordance with teaching mode of "position-oriented guidance", basic laws of cultivating students' vocational abilities and actual working tasks and process, typical significance of occupation and positions should be analyzed, and working tasks with the property of learning should be scientifically designed to define the typical working process with complete structure in employment and to further specify typical working tasks.

Related teaching content should be integrated into the four teaching situations corresponding with positions. They are respectively computer disassembly and assembly, computer selection and configuration, computer system installation backups and optimization allocation and computer maintenance. We should also organize our content of course in line with the general cognitive rules of students: know about computer, select and purchase computer, assemble computer, configure computer, install software, optimize computer, utilize computer, and finally maintain computer. In this way, it not only dovetails the knowledge learned in class and positions but also enables students to achieve a better understanding and experience of positions corresponding with the course.

9.2.3 Provide More Opportunities of Visiting and Probation for Students in Class

The theoretical knowledge of computer assembly and maintenance is relatively abstract for students. If all the content of the course is organized to be lectured in class or laboratory, capital in the college will be insufficient due to rapid development of computer's components, and in my opinion, equipment in most of the labs in college

cannot ensure students to know and learn the latest products. What's more, lecture of the internal structure of computers and computer assembly easily turns components of computer into dull and tedious computer theories, and students can hardly grasp the knowledge. Therefore teachers can select one or two electronic technology squares based on local circumstances as students' "second class" and then guide the students to visit the latest electronic technology products. Students can observe technicians' work on computer configuration and maintenance on the spot, know about the workflow of technicians and feel the real atmosphere in the work-place. Hereby it can not only realize the actualization both of the place of teaching and place of working but also ensure the conformity of the content of course and content of work. What's more, it may also contribute to laying foundation for the follow-up knowledge of the course and students can get a deeper understanding of position.

9.2.4 Lay Emphasis on Students' Social Practice

Higher vocational colleges have been paying great attention to students' employment. The key issue of employment difficulties lies in students' comprehensive abilities or qualities, especially the practical ability, rather than the number of the employed graduates. Many employers hold the view that theoretical knowledge of students has basically reached the goal of professional cultivation but most of them have poor practical ability which cannot meet employers' requirement of taking up positions immediately without training. It follows that more and more attention are being paid to the practical ability of talents by employers and both society and colleges should place emphasize on and reinforce the cultivation of students' practical ability. Meanwhile, the goal of cultivating practical ability of computer assembly can be hardly attained by teaching in class alone and the only way is to participate in more practice. Thus teachers should, in the process of learning for students, encourage students to practice in computer-related enterprise or companies in holidays. In this way graduates can immediately take up positions, realizing the actual integration with positions. Besides, base of probation or starting business can be set up for college students taking the opportunity of the cooperation between college and computer-related work.

9.2.5 Teachers Should Conduct More Investigation and Survey of Enterprises

Professional teachers should be organized to conduct investigation and survey in typical computer-related enterprises as more as possible. It has two effects: first, teachers can understand the operation, management, and development of technology of enterprise so as to effectively check the integration of the refined related projects of the course and the production activities of the corresponding position.

If there are any errors of the design of the content, arrangement of content can be adjusted at any time, ensuring no gap between content of the course and positions. Meanwhile, it can lay foundation for the establishment of the close relationship between professional teachers and enterprises; second, we should select excellent experts in the industry to instruct the web-delivery of curriculum.

9.2.6 Development of Teaching Resource

As the course has been orientated as a "position-oriented" teaching mode of taking "ability as standard", obviously traditional teaching materials are no longer suitable for our content of teaching. Original order mechanism of teaching materials can be broken if permitted. Through visit and investigation of enterprises and survey of core vocational skills required by industry of computer assembly and maintenance, directors or teachers of the course shall make analysis and summary, formulate the curse standard of higher vocational teaching and syllabus of ability test and finally divide the course into units. A position and ability-oriented textbook, keeping pace with latest development of technology of computer assembly, and highlighting cultivation of practical ability should be compiled.

9.2.7 Reform of Course Assessment

Traditional course assessment adopts the way of written test which only focuses on results instead of process. Actually it cannot effectively assess the project teaching and can hardly reflect how much knowledge students have grasped. Hereby a new course assessment and appraisal system should be specially established and the assessment should be divided into two stages. The first stage adopts the way of combining assessment of process and assessment of results, theoretical tests and practice. The second stage focuses on enhancing vocational ability of installing and maintaining hardware and software of computers. Vocational qualification certification, namely Computer Maintenance Technician (Intermediate) Certificate, is adopted in this stage, which fully reflects the advantage of teaching mode of "position-oriented guidance" when applied to class, realizes the combination of lessons and certificate and highlights the feature of specialized occupation, practicality, and openness of the course.

9.3 Conclusions

This paper has mainly conducted deeper research on application of the teaching mode of "position-oriented guidance" to the course Computer Assembly and Maintenance. Reform of teaching mode enables students to directly integrate into

enterprises and contents of the course directly integrate into working tasks, which is more accordant with feature and rules of vocational teaching and brings higher efficiency timeliness of teaching. At the same time, we can obtain a project teaching method that not only meets the need of enterprises and society for professional technicians but also can improve students' key ability of assembling and maintaining computers.

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Chapter 10
Analysis of Application of Modern Network Technology in Teaching

Wei Ma

Abstract The twenty-first century is the century of information explosion, especially the development and popularization of the computer network, has impacted people's learning and living profoundly and widespread. Modern network technology, with its rich amount of information, rapid means of communication, huge volume of information, and the diversity of information, has occupied the favorable development situation in the current education and teaching. It has positive role in promoting the reform of teaching methods, enriching the content and form of teaching. It can make teaching more interesting and vivid; stimulate students' interest in learning. In this paper, we will analyze and discuss the application of modern technology in teaching.

Keywords Modern · Network technology · Teaching · Application

10.1 Introduction

In the era of information explosion, the Internet has become the main way of information dissemination, and provides great convenience for people to access information [1, 2]. As time goes by, network technology is widely used in various fields and has a great impact on people's daily lives [3]. Through the network without leaving home people can be aware of world affairs, shop online, pay bills online, and work online, these are all the result of the development of network technology. Network technology has extended to education and teaching, and

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promoted reform of teaching methods. How the modern network technology impacts on education and teaching, how to play the positive role of the network technology in teaching, this is the problem we are going to explore and study.

10.2 Characteristics of Modern Network Technology in Teaching Applications

10.2.1 Large Amount of Information

One of the most notable features of modern network technology is the large information content. The Internet brings almost all the world's information together. As long as there is a networked computer, you can sit at home and know what happened in every corner of the earth [4]. And the content of network information is very rich, covering almost every field of science and non-scientific areas. As a slogan said "there is nothing the network do not know, only you cannot think", we can see how rich the network information is.

It makes full use of the feature of network's large amount of information when the modern network technology is used in teaching [5, 6]. No matter the network courseware or network information has enriched the content and form of teaching, changed the traditional rigid teaching methods and replaces them with flexible teaching methods and greatly enhanced the students' enthusiasm. At the same time rich information of network provided the students unlimited knowledge and help. When they encounter the problems they do not understand, they can get answers directly through the network, improve their learning efficiency.

10.2.2 Real-Time Interaction

Real-time interaction is another major feature of modern network technology in teaching. The interaction between teachers and students are essential in both traditional teaching and modern teaching based on network technology. Teaching is not merely to "teach", but also "learning". It is a two-way and interactive links, any one is indispensable [7]. Without interaction, the atmosphere will be very dull in the classroom, so that the students cannot focus their attention and learning would not be efficient. The effectiveness of teaching is also not good enough. The modern network technology in teaching has greatly enhanced the interaction of teaching and learning, and this interaction is real-time in the first time. In this way, students' learning efficiency has been greatly improved.

For example, in the teaching process, teachers show the learning content to students in courseware. As we all know that we can add pictures, music, video, and other elements in courseware, they play a positive role to attract students. And the

interaction of students and courseware, interaction of teachers and students, and interaction of student and students are formed unconsciously, the teaching effect is significant. In addition, network technology applied to teaching, you can also realize the real-time interaction relying on network terminals, such as a network message board or online chatting software, etc. to exchange and interact in time.

10.2.3 Resource Sharing

Resource sharing is the most distinctive feature of the network, modern network technology makes teaching have the characteristics of resource sharing too. In traditional teaching, learning resources can not be shared between students and teachers, students and students [8]. But the network technology made up for this shortcoming of the traditional teaching. The resources sharing between the students and teachers or students and students can be realized through the network. They can upload their own learning resources to the Internet so that other students can download and use them. This strengthens the communication and cooperation among students, as well as students and teachers. The students can download resources for free, to some extents; it avoids the waste of resources.

In addition, there are a lot of resources on the network with illustrations, words, sounds, and videos. The famous Nobel Prize winner George Bernard Shaw once said: "You have an idea, I have an idea and we exchange, each can have two ideas", this sentence is a very good interpretation of resource sharing's advantages. Resource sharing can not only train the students to share and understand the spirit of sharing, but also can enrich students' knowledge and ideas, will impact on the growth and education of students profoundly.

10.3 Main Forms of Application of Modern Network Technology in Teaching

10.3.1 Form of Resource Sharing

In traditional education, resource sharing is merely referring to students sharing resource form the teachers, which greatly limits the efficient use of resources. When modern network technology is introduced into teaching, school can establish an internal website that allows both teachers and students to upload the learning resources, in order to achieve the sharing of learning resources. Or the school can establish a post bar with one class as a unit, teachers and students can upload the learning resources they have to it. And teachers can also give homework on post bar, after the students completes they can upload it to post bar. So that it realizes resource contribution, and improves the learning efficiency.

10.3.2 Forms of Online Tutoring

After the teaching activities, students cannot be able to master all the knowledge at one time. There is a process of digestion and absorption. In this process, teachers' counseling to students is inconsiderable. At school, if students have questions, they can find teachers, teachers can counsel face to face. But when the students came home from school or on holiday, the questions of the students could not get a timely answer, for a long time, students will get bored inevitably. Therefore, strengthening the teachers' guidance to students is imminent, and modern network technology enables the timely guidance of teachers to students, which we call "online counseling". That means teachers and students can communicate through the network. For example, when students encounter difficult problems in learning at home, they can seek the help of teachers by sending a e-mail to teachers, teachers receive the e-mail and reply at the first time, so that it achieves online tutoring for students. Some students' character is introverted, they are afraid to ask teachers on face. Online tutoring is a good solution to this problem, students do not need to be face to teachers when seeking guidance from teachers. There is no sense of psychological fear, and they can learn knowledge in relaxation.

10.3.3 Evaluation and Feedback Forms

Evaluation and feedback is the primary means to test the outcome of the teaching activities. By evaluation and feedback, teachers can control students' learning status, find the shortcomings in the teaching activities, and make adjustments and corrections timely. In traditional teaching, exam is the evaluation and feedback form of teaching quality and effectiveness. Although the examination has a certain extent to reflect the quality and effectiveness of the teaching, but one-sided test scores as a standard cannot grasp the quality of teaching and effectiveness fully. After the modern network technology used in teaching, the evaluation and feedback on teaching and learning activities do not take simple test scores as the main reference standard, but it can develop a teaching evaluation system on the network. It can include the students' evaluation to teachers, degree of students' understanding and digesting on the course, students' demands on teachers, the problems students encountering in learning, students' self-evaluation, students' evaluation on other students, etc. And then make the students to do evaluation and feedback online, by these evaluations and feedbacks, teachers can have comprehensive understanding of students and their learning state. They can also make appropriate changes referring to student's evaluation and requirements, and improve their teaching constantly.

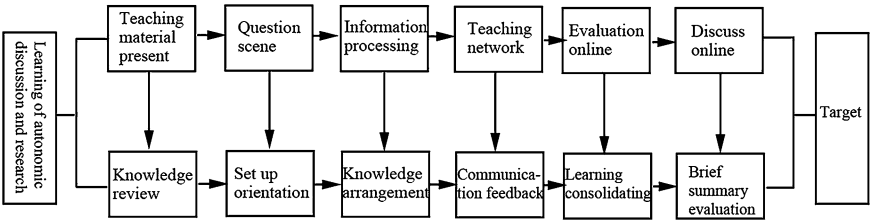

Fig. 10.1 Integration model figure of classroom teaching and modern information technology

10.3.4 Non-Real-Time Learning Forms

In traditional teaching, teachers can teach only once in the classroom, for the content has been taught they would not teach again. One reason is restriction of class time; the students need to learn new content and new knowledge. The other reason is many students can master most of the knowledge by listening once in the classroom, there is no need for a second time listening, it is time-consuming and laborious. However, some students' accept ability is poor, it requires them a lot of time in learning in order to grasp the new knowledge fully. Application of modern technology in teaching solved this problem. Teachers can record the teaching process into a video, upload to the Internet for students to download and learn. So the students can review the contents of a class at any time, without the constraints of time and location. This approach to learning is called non-real-time learning. Non-real-time learning makes full use of the advantage of network technology, provides students with multiple learning opportunities. They can also choose free, and focus on some of the teaching videos. Reviewing the old and learn new things, in this way, students have the learning initiative, will be more and more interest in learning and the learning efficiency has gradually improved (Fig. 10.1).

10.4 Active Role of Modern Network Technology in Teaching

10.4.1 Promoting the Modernization of Teaching

Science and technology develops rapidly, the application of modern network technologies speed up the pace of development of modern teaching. Network technology can not only optimize the teaching resources, integrate and share resources, and provide students a resource-rich learning environment to improve their efficiency in accessing information and learning knowledge. And the application of modern network technology in teaching broke the space and time constraints of teaching, enriched the forms of teaching. Traditional teaching began to

transit to digital, intelligent, multimedia, and networking, while these are the basic features of modern teaching. In summary, the application of modern technology in teaching has greatly promoted the modernization of the teaching.

10.4.2 Helping to Train New Personnel Meeting the Requirements of Times

Present era is called the information age, science and technology has become the most important driving force of development and progress of an era. The social need for talent has gradually inclined to the innovative talents, talents training in traditional education still remains in the mastery of book knowledge, did not inspire the innovative thinking of students. It was not able to cultivate the students' practical ability. Application of modern network technology in teaching can greatly improve the students' initiative ability of obtaining information and knowledge. The various forms of teaching will improve students' innovative thinking and ability, and ultimately cultivate new talent meeting the requirements of time.

10.5 Summary

With the rapid development of science and technology, modern network technology has been in all aspects of social life. The application of modern network technology in teaching is the needs of education development adapting the times. Modern network technology plays an important role in promoting the modernization of teaching, and compensates many inadequacies of the traditional teaching. It not only helps to improve the learning efficiency of students, but also helps to improve the quality and level of teachers' teaching. So we should pay adequate attention to the role of the modern network technology in teaching, accelerate the integration of the modern network technology and education, realize the modernization and informatization of teaching as soon as possible.

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Part II
Control Engineering and Applications

Chapter 11
Financial Market Model Based on Heterogeneous Agent Interacting

Yang Yu

Abstract In this paper, a financial market model based on heterogeneous agent interacting is constructed. In this model, two types of agents (fundamentalist and trend follower) are assumed to exist in financial market, and contrarian investment strategy and inertia investment strategy are respectively applied by them and realized investment return is used as fitness index, so as to form a heterogeneous expectation for the future price of risky assets. When investors convert different faiths or investment strategies, their proportions are presented to be time-varying.

Keywords Heterogeneous agent interacting · Stock pricing · Strategy fitness · Proportions of traders · Faith evolution

11.1 Meaning of Heterogeneity

There are two hypotheses for heterogeneity in general: differential information and differential interpretation. In the first hypothesis, information asymmetry problem is in existence. A group of individuals can acquire private information, but another group of individuals can only receive public information such as history price. Thus, information asymmetry makes heterogeneous expectation produced. The models of this aspect include the models proposed by Grundy and Kim [1]. In the second hypothesis, the same information is explained by investors in a different way. This hypothesis is supported by the empirical studies made by Kandel and Pearson [2]. Besides, this hypothesis was applied by some scholars to explain the

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reasons why stock prices steadily deviated from intrinsic values. Miller [3] proposed that profits could not be made by the investors having pessimistic faiths in stocks at the market without a short-mechanism, but optimistic investors would buy these stocks and make stock prices continuously higher because of reflecting optimistic faiths [3]. In addition, this hypothesis was proved empirically by Chen et al. [4], Diether et al. [5].

There are two types of heterogeneous agent interacting model usually: (1) rational trader or fundamentalist; (2) noise trader, chartist, or trend follower. The first thinks that stock price is decided by intrinsic value and is a discounting of the future cash flow of listed company, and thus certainly replies to value. The second believes that stock price is not completely decided by intrinsic value, and its changing trend can be continued in a short term. Therefore, investment return can be obtained with historical stock information and technology analytical means. The study of Frankel and Froot [6] on foreign exchange market shows that fundamentalists and chartists are symbiotic at the real financial market [6].

In this paper, a financial market model under the interaction of heterogeneous agents is proposed after the above analysis. In this model, realized investment return is used by investors as fitness index, thus forming a heterogeneous expectation for the future price of risky assets.

11.2 Fundamental Assumption of the Model

Financial market models of assets A and B are assumed to exist. Asset A is risk-free, can be supplied infinitely flexibly, and also its fixed annual return rate is r; asset B is risky and its net supply is 0, and its non-fixed cash flow paid at the end of t is y_t (an independent identically distributed random process). Risk-free asset A and risky asset B can be chosen by traders. If p_t is the ex price of asset A and also H types of traders exist in market, the total fortune of h type of investors in trading period $(t+1)$ can be expressed as follows.

$$W_{h,t+1} = (1+r)W_{h,t} + R_{t+1}Z_{h,t} \tag{11.1}$$

In Eq. (11.1), R_{t+1} is excess return and can be defined as follows.

$$R_{t+1} = P_{t+1} + y_{t+1} - (1+r)P_t \tag{11.2}$$

$Z_{h,t}$ is the demand of investor h on risky asset in trading period t. $E_{h,t}$ and $V_{h,t}$ are the conditional expectation and variance of investor h respectively when public information is known. Public information is expressed with I_t including the public information, such as historical stock prices, dividends, trading volume, and interest rate information acquired by traders in t and several periods before t.

$$I_t = \{p_t, p_{t-1}, \ldots, y_t, y_{t-1}, \ldots\} \tag{11.3}$$

The conditional expectation and variance of investor h on fortune in t are as follows respectively.

$$E_{h,t}[W_{t+1}] = (1+r)W_{h,t} + E_{h,t}[R_{t+1}]Z_{h,t} \tag{11.4}$$

$$V_{h,t}[W_{t+1}] = Z_{h,t}^2 V_{h,t}[R_{t+1}] \tag{11.5}$$

In addition, the traders are assumed as myopic mean–variance maximizers, and thus the problem traders are faced with can be changed as follows.

$$\max_{Z_{h,t}} \left\{ E_{h,t}[W_{t+1}] - (a_h/2)V_{h,t}[W_{t+1}] \right\} \tag{11.6}$$

The demand of h type of traders on risky asset in t can be expressed as follows.

$$Z_{h,t} = \frac{E_{h,t}[R_{t+1}]}{a_h V_{h,t}[R_{t+1}]} \tag{11.7}$$

All types of investors are assumed to be with an unchanged risk aversion coefficient $(a_h = a > 0)$. Also, the conditional variances of all types of investors related to R_{t+1} are identical $\left(V_{h,t}[R_{t+1}] \equiv \sigma^2\right)$. Thus, the Eq. (11.7) can be simplified as follows.

$$Z_{h,t} = \frac{E_{h,t}[R_{t+1}]}{a\sigma^2} \tag{11.8}$$

The proportion of h type of traders in all traders in t is assumed to be expressed with $n_{h,t}$, and thus the total residual demand of all traders on risky asset in t is as follows.

$$ED_t = D_t - S_t = \sum_{h=1}^{H} n_{h,t} Z_{h,t} - S_t \tag{11.9}$$

In Eq. (11.9), S_t is the total supply of risky asset at market in t. Also, attention should be paid to $\sum_{h=1}^{H} n_{h,t} = 1$.

11.3 The Trading System Applied in the Model

Heterogeneous agent models in current financial market of foreign countries are almost based on market maker rule. In typical market maker rule, the buying and selling prices of traded bonds are given by market makers, and there are no direct transactions between clients and bonds that are bought and sold from market makers. However, the bidding system is applied in China's stock market. That is, business entrustments submitted by buyer and seller respectively, and then transaction is complete after entrustment prices are summarized together through a

trading center. Therefore, a bidding system is applied in this model as price discovery mechanism, namely $ED_t = 0$. The total supply S_t and the total demand D_t can be seen as the function of price p_t, and thus the equilibrium price can be solved by ordering total supply which is equal to total demand. The total supply $S_t = 0$ of risky asset is assumed to be solved as follows in the known information set.

$$\sum_{h=1}^{H} n_{h,t} \frac{E_{h,t}[p_{t+1} + y_{t+1} - (1+r)p_t]}{a\sigma^2} = 0 \tag{11.10}$$

From Eq. (11.10), the equilibrium price can be solved as follows.

$$(1+r)p_t = \sum_{h=1}^{H} n_{h,t} E_{h,t}(p_{t+1} + y_{t+1}) \tag{11.11}$$

Now, considering only one type of rational traders exists in market, the equation below can be established according to the equilibrium price formula.

$$(1+r)p_t^* = E_{h,t}\left[p_{t+1}^* + y_{t+1}^*\right] \tag{11.12}$$

If all traders at market are expected rational traders, asset price is completely decided by the fundamental value of asset. The fundamental value can be expressed with the discounting of expected future dividend.

$$p_t^* = \sum_{k=1}^{\infty} \frac{E_t(y_{t+k})}{(1+r)^k} \tag{11.13}$$

Obviously, fundamental value p_t^* relies on dividend process $\{y_t\}$.$\{y_t\}$ is assumed to be an independent identically distributed random process, and also $E_t[y_{t+k}] = \bar{y}$ is a constant. Thus, the equation below can be established.

$$p_t^* = \sum_{k=1}^{\infty} \frac{E_t(y_{t+k})}{(1+r)^k} = \sum_{k=1}^{\infty} \frac{\bar{y}}{(1+r)^k} = \frac{\bar{y}}{r} \tag{11.14}$$

11.4 Formation of Heterogeneous Agent Expectation

In the following, heterogeneous expectations of different types of traders on future price and dividend are discussed. The price expectations of all traders are assumed to be as follows.

$$E_{h,t}[p_{t+1} + y_{t+1}] = E_t\left[p_{t+1}^* + y_{t+1}\right] + f_h(x_{t-1}, \ldots x_{t-L}) \tag{11.15}$$

In Eq. (11.15), L is the decision time window of traders. The equation below can be obtained after Eq. (11.15) is substituted into equilibrium price formula.

$$\begin{aligned}(1+r)p_t &= \sum_{h=1}^{H} n_{h,t}E_{h,t}[p_{t+1}+y_{t+1}] = \sum_{h=1}^{H} n_{h,t}\left(p_t^* + \bar{y} + f_h(x_{t-1},\ldots x_{t-L})\right) \\ &= (1+r)p_t^* + \sum_{h=1}^{H} n_{h,t}f_{h,t}\end{aligned} \tag{11.16}$$

To make Eq. (11.16) simpler, x_t is used for expressing the deviation value of price p_t relative to fundamental price p_t^*, namely.

$$x_t = p_t - p_t^* \tag{11.17}$$

The equation below is gained after Eq. (11.17) is substituted into Eq. (11.16).

$$(1+r)x_t = \sum_{h=1}^{H} n_{h,t}f_{h,t} \tag{11.18}$$

The expectation $f_{h,t}$ of all traders on future stock price deviation features the following linear form.

$$f_{h,t} = g_h x_{t-1} \tag{11.19}$$

This type of traders is called as positive traders if $g_h > 0$ and strongly positive traders if $g_h > 1 + r$. However, it is called as reverse traders if $g_h < 0$ and strongly reverse traders if $g_h < -(1+r)$.

In this paper, the analysis framework of fundamentalist $(h = 1)$ and chartist $(h = 2)$ is applied. Fundamentalist thinks that asset possesses a fundamental value, and asset price will return to the fundamental value if deviating from it; asset can be sold with a price higher than its fundamental value if bought with a price lower than the fundamental value. The expectation of fundamentalist on asset price in $t + 1$ is assumed to be as follows.

$$E_{1,t}[p_{t+1}] = p_t^* + v(p_t - p^*) \tag{11.20}$$

In Eq. (11.20), v is the estimate of traders on the returning speed of price to fundamental value, and used for measuring the faith of traders in the returning of price to fundamental value. The expected price is equal to current price in $t + 1$ if $v = 1$. This suggests that fundamentalist believes market is effective, and thus current price is the best prediction on future price. However, the expected price is equal to the fundamental value of asset in $t + 1$ if $v = 0$. Therefore, it can be seen that the faith of traders in the returning of price will be more intense and price will more quickly return to fundamental value if v is closer to 0. For easy discussion, the extreme conditions $(v = 0)$ is applied.

$$E_{1,t}[p_{t+1}] = p_t^* \tag{11.21}$$

Combining the Eq. (11.15), the equation below can be solved.

$$f_{1,t}[x_{t+1}] \equiv 0 \tag{11.22}$$

According to historical price information, technical traders make expected price formed through extrapolating current price. According to Eq. (11.19), the equation below can be solved.

$$f_{2,t}[x_{t+1}] = gx_{t-1} \tag{11.23}$$

Equation (11.8) can be re-written according to Eqs. (11.22) and (11.23), as follows.

$$Z_{1,t} = \frac{1}{a\sigma^2}\left(f_{1,t} - (1+r)x_t\right) = -\frac{1}{a\sigma^2}(1+r)x_t \tag{11.24}$$

$$Z_{2,t} = \frac{1}{a\sigma^2}(f_{2,t} - (1+r)x_t) = \frac{1}{a\sigma^2}(gx_{t-1} - (1+r)x_t) \tag{11.25}$$

11.5 Fitness of Trading Strategy

Investment return realized by traders from t to $t+1$ is calculated below.

$$\begin{aligned} R_{t+1} &= p_{t+1} + y_{t+1} - (1+r)p_t \\ &= x_{t+1} + p_{t+1}^* + y_{t+1} - (1+r)(x_t + p_t^*) \\ &= x_{t+1} - (1+r)x_t + p_{t+1}^* + y_{t+1} - E_t\left[p_{t+1}^* + y_{t+1}\right] + E_t\left[p_{t+1}^* + y_{t+1}\right] - (1+r)p_t^* \\ &= x_{t+1} - (1+r)x_t + \delta_{t+1} \end{aligned} \tag{11.26}$$

Because of $E_t\left[p_{t+1}^* + y_{t+1}\right] - (1+r)p_t^* = 0$, there is $\delta_{t+1} = p_{t+1}^* + y_{t+1} - E_t\left[p_{t+1}^* + y_{t+1}\right]$. It can be seen δ_{t+1} is a difference sequence relative to information set I_t, namely $E(\delta_{t+1}|I_t) = 0$.

The fitness of strategy is defined below. The total investment return realized by trader h in t is expressed with $\pi_{h,t}$, namely

$$\pi_{h,t} = R_{t+1}Z_{h,t} = (x_{t+1} - (1+r)x_t + \delta_{t+1})Z_{h,t-1} \tag{11.27}$$

The total fitness $U_{h,t}$ is equal to the weighted average of total earnings of trader h from beginning to t, namely

$$U_{h,t} = \pi_{h,t} + \eta U_{h,t-1}, \quad \eta \geq 0 \tag{11.28}$$

The profit-making ability of traders to use certain investment strategy can be measured with $U_{h,t}$. $\eta \geq 0$ suggests that fitness has a certain form of "memory". For easy analysis, the case $(\eta = 0)$ is only discussed. That is, fitness only has a tie with the profit realized in the previous trading period.

11.6 Update of the Proportions of Traders

In each trading period, investors will adjust the strategy taken in next period according to the asset profit-making of last period. In this way, the proportions of all kinds of investors will change along with the change of the profit-making abilities of various trading strategies. Because traders possess a limited rationality, they tend to apply the most powerful profit-making strategy used in previous trading activities. Here, through the application of discrete choice probability, the rule of updating the proportions of traders can be obtained.

$$n_{h,t} = \frac{\exp\left[\beta\left(U_{h,t-1} - C_h\right)\right]}{Z_t} \tag{11.29}$$

$$Z_t = \sum_{h=1}^{H} \exp\left[\beta\left(U_{h,t-1} - C_h\right)\right] \tag{11.30}$$

In above, C_h is the trading cost paid by trader h in the trading process. To the fundamentalist and technical trader in the model, $C_1 = C > 0$ and $C_2 = 0$ are ruled. In Eq. (11.29), β is called as intensity of choice. If $\beta = 0$, trading strategies are randomly selected by traders, namely the selection of trading strategies has nothing to do with the profit-making ability of strategies; if $\beta = \infty$, all traders are perfectly rational and select the trading strategies with the largest profit-making ability in history; if $0 < \beta < \infty$, investors are with limited rationality. Because profit-making ability is history information, traders may not select the strategy with the largest profit-making ability in previous period.

11.7 Faith Evolution System

From Eqs. (11.18), (11.29) and (11.30), the relational expression of faith evolution system can be obtained as follows.

$$
\begin{aligned}
&(1+r)x_t = n_{2,t-1} g x_{t-1} \\
&n_{1,t} = \exp\left[\beta\left(\frac{1}{a\sigma^2}(1+r)x_{t-1}((1+r)x_{t-1} - x_t) - C\right)\right] \Big/ Z_t \\
&n_{2,t} = \exp\left[\beta\left(\frac{1}{a\sigma^2}(x_t - (1+r)x_{t-1})(g x_{t-2} - (1+r)x_{t-1})\right)\right] \Big/ Z_t
\end{aligned}
\tag{11.31}
$$

$$
m_t = n_{1,t} - n_{2,t} = \mathrm{Tanh}\left[\frac{\beta}{2}\left(-\frac{1}{a\sigma^2} g x_{t-2}(x_t - (1+r)x_{t-1}) - C\right)\right] \tag{11.32}
$$

In above,

$$
\begin{aligned}
Z_t = &\exp\left[\beta\left(\frac{1}{a\sigma^2}(1+r)y_t((1+r)y_t - x_t) - C\right)\right] \\
&+ \exp\left[\beta\left(\frac{1}{a\sigma^2}(x_t - (1+r)y_t)(g z_t - (1+r)y_t)\right)\right]
\end{aligned}
\tag{11.33}
$$

11.8 Conclusion

In this paper, financial market is assumed to comprise of two types of traders different expectations on future price: (1) fundamentalist; (2) chartist. These two types of traders are mutually converted, and their proportions are presented to be time-varying. This will trigger the fluctuation of asset prices, and subsequently premium rate effect can be produced.

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Chapter 12
Intellective Applied Thermometer Design Based on DS1420

Jianlin Zhang

Abstract The AT89S52 SCM is the core of the entire system. The system includes temperature sensor module, data collection module, data processing module, keyboard number tube module, voice module, and LCD display module. In order to ensure the accuracy of sampling, it uses the temperature sensor's good performance to achieve the temperature and voltage transformation, and high-precision OP amplifier and then 12 bits samples. Later through a sequence of software operation, system realizes the alarm temperature pre-sets, LCD/LED display, voice playback, and other functions to achieve human–computer interaction.

Keywords DS1420 application · Scheme design · Flow chart design · Circuit · Intellective thermometer

12.1 The Overall Design Diagram

Accurate intelligent thermometer of this system first use high-precision temperature sensor, high-precision amplification get 0–5 V changes, then process the data into the microcontroller after A/D conversion. Finally, in the processing of the SCM algorithm to achieve human–computer interaction interface. Figure 12.1 is its overall design diagram.

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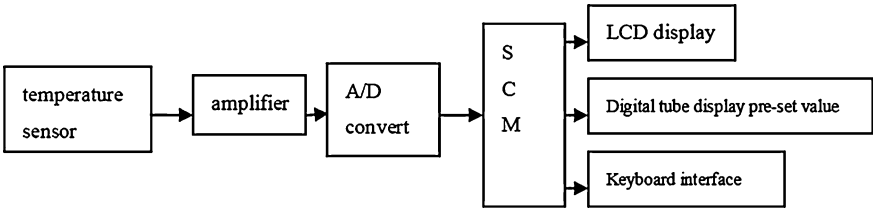

Fig. 12.1 Hardware system diagram

12.2 Comparison of the Sensor Selection and Design

The following is the analysis of the advantages and disadvantages of the two sensor.

12.2.1 Integrated Dedicated Temperature Sensor Design

The integrated temperature sensor, such as the use of AD590, the LM35 which has three pins, power, land-side and voltage output, under such connection 0 °C is undetectable, so the voltage elevation program is being used, which it can detect 0 °C and its output is high-impedance differential output, so an external amplifier needs a double-ended change the single-ended and high-input impedance amplifier (amplifier program will be given a detailed discussion in amplifier part). This program is convenient to debug and easy to control. Output can be adjusted from 0 to 500 mV [1]. Which is shown as in Fig. 12.2.

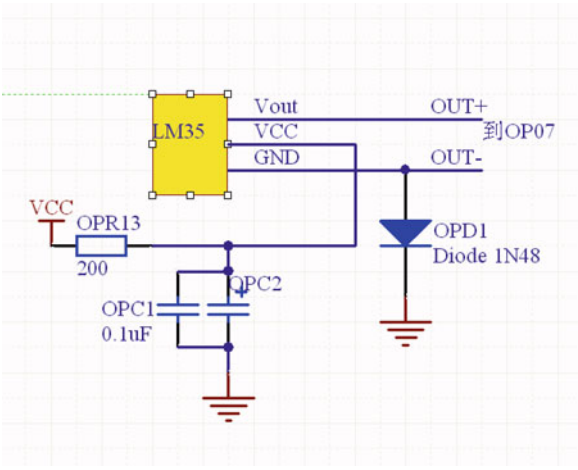

Fig. 12.2 Schematic diagram of temperature collection chip LM35

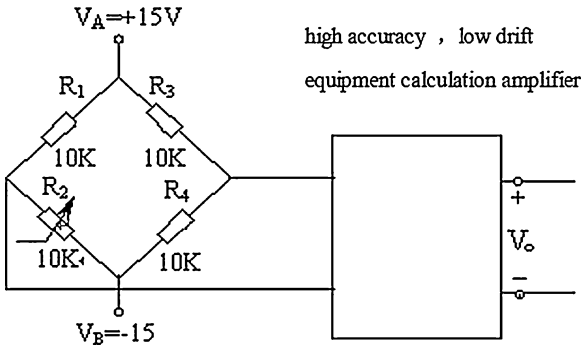

Fig. 12.3 Schematic diagram of thermistor

12.2.2 Thermal Resistance of the Program Design

The accuracy of general thermistor is relatively low which cannot reach the system accuracy requirement. Copper thermal resistance Cu100 is used as the temperature sensor, whose characteristic parameters the linearity is very good and its accuracy is high. It is connected into the bridge measurement circuit which constitutes the $T \rightarrow V$ transformation.

Adjusting this parameter can allow V_0 in the 0–5 V scope, which exactly corresponds to $T = 0$–50 °C. The disadvantage of this method is the accuracy of the request-level signal amplification circuit is very high (Fig. 12.3 is its schematic diagram). So design program one was being choosen which means integrated temperature sensor was selected. Program one is convenient to debug and is not prone to make mistake, besides its linearity is good.

12.3 The Amplifier Circuit Design

As the dynamic range of the integrated temperature sensor is narrow, hence the small-signal amplifier was required. About the accuracy requirements, we choose the precision 0P07 op amp, the differential mode output of LM35 is converted to single-ended output, and 10 times magnified, which allows that 0–5 V changes corresponding to 0–50 °C. As the magnification times are not high, dual single-ended transformation network was choosed.

The amplifier circuit consists of dual end change to single-ended circuit, and 10 times magnified. Adjusting the tone 0 resistance can inhibit 0 drift. To ensure accuracy, the resistance use metal film resistors whose stability is better. Adjustable resistors were used as precision adjustment, which ensures the accuracy of amplification. For example: if the enlarged feedback resistor change more than 1 % per °C, the actual temperature is 10 °C. Under such condition, analysis of two situations:

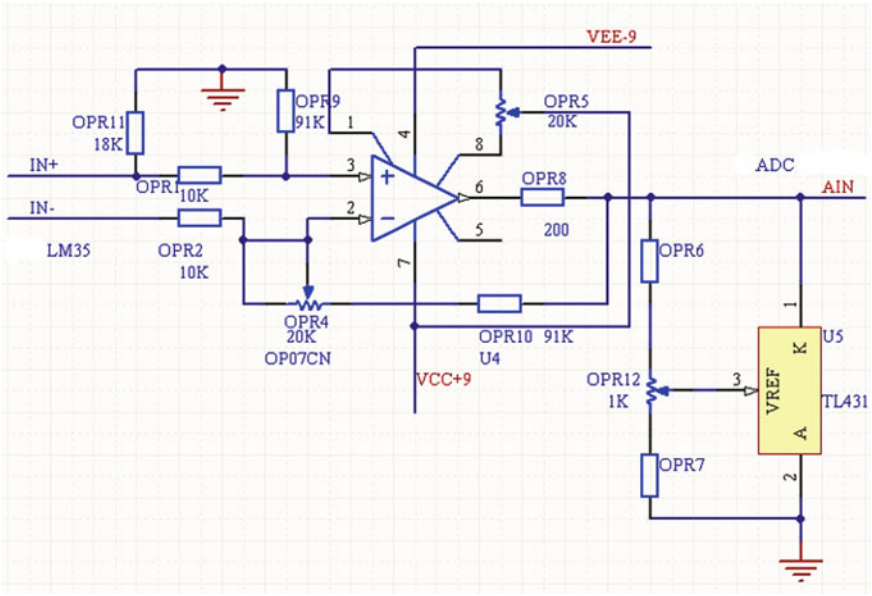

Fig. 12.4 Clipper circuit consist of OP07

Accurate amplification case: 10 °C correspond 100 mV *Magnified* 10 *times* 1 V 10 bits *AD convert* ⇒ 205
Resistance deviation case: 10 °C correspond 100 mV *Magnified* 9.9 *times* 0.99 V 10 bits *AD convert* ⇒ 191

From the above analysis, the value is quite different after the sampling quantify, if through the single-chip computing, plus the calculation error, it is difficult to achieve the requirements of the accuracy which is 0.1 °C. Protection circuit can consist of limiter circuit, using a TL431 precision reference source as a limiter circuit design; by adjusting OPR12 its output threshold can be adjusted. Figure 12.4 is its schematic diagram.

12.4 A/D Sampler Selection

As V_0 in the 0–5 V exactly correspond to $T = 0$–50 °C, and accuracy of 0.10 C required conversion bits $m = \log_2(500\ \text{C} \div 0.1\ ^\circ\text{C}) = 8.96578$, 9 bits A/D converter has been selected. However, due to the conversion problem it produces quantization error, so we choose 12 bits high-precision A/D converter TLC2543. TLC2543 is equipped with a serial control and 11-channel 12-bit ADC. And as this chip use a serial port, it occupied little source of the microcontroller (Fig. 12.5 is

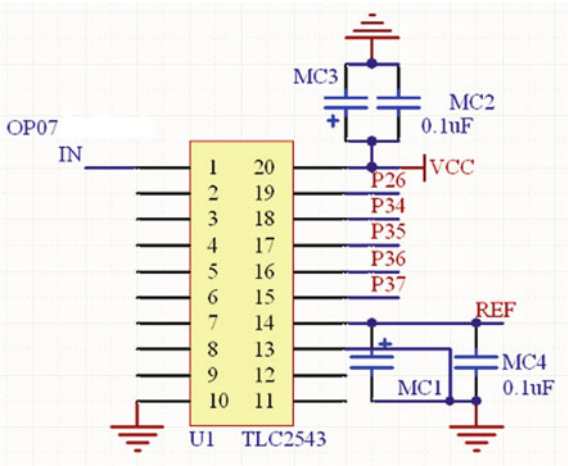

Fig. 12.5 Schematic diagram of 12 bits A/D sample chip TLC2543

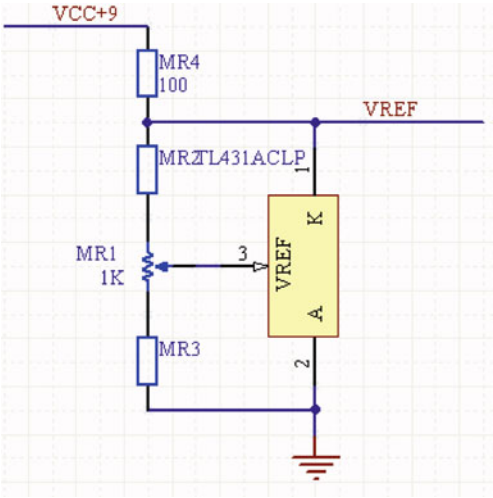

Fig. 12.6 Reference voltage source based on TL431

its connection map of hardware). In order to improve accuracy, we also choose the highly stable reference voltage provided by TL431 as the comparison voltage VREF (Fig. 12.6 is its schematic diagram).

12.5 Human–Computer Interaction Design

In order to increase the human–computer interaction, we added LCD display and voice reporting temperature, in addition to the keyboard and digital tube. You can see the dynamic characteristics of the temperature by watching LCD, and voice broadcast services can serve for the blind which make system more humane.

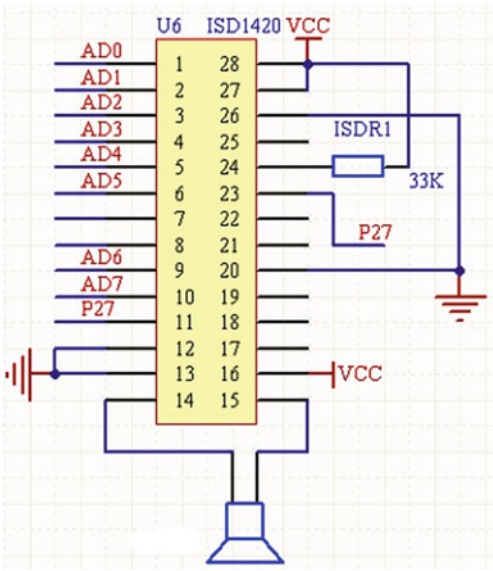

Fig. 12.7 DS1420 schematic diagram

Meanwhile, we also provide a pre-set temperature alarm function to realize automated control. The LCD monitor is 126 × 64 dot matrix and by the LCD module it displays temperature curve during a period of time.

The management of the keyboard LED lights were controlled by 8279 or ZLG7290. In order to spare the microcontroller interface, chip ZLG7290 with I^2C bus interface was used as the digital display which can manage the 64 buttons and 8 digital tubes [2].

12.6 Voice Broadcast System Based on DS1420

Voice broadcast system consist of a lot of chips, here we choose the ISD1420 chip which integrates audio amplification, audio sampling, storage, playback zoom, and automatic level control (AGC). The control is very simple, and the recorded sound (can be stored for 100 years) can be selected to play according to the address. Figure 12.7 is its schematic diagram.

The address assignment for the digit "0–9", ".", "centi degree" which is needed to be broadcasted in the voice broadcast system:

Syllable	Address
"0"	00H
"1"	04H
"2"	08H
"3"	0CH
"4"	10H
"5"	14H
"6"	18H
"7"	1BH
"8"	20H
"9"	24H
"."(dot)	28H
"centi degree"	2CH

12.7 Block Diagram of the Design of Software Programming

The core of this system is the microcontroller. D/A sample was sent to microcontroller, data conversion by microcontroller produces a lot of outputs which includes alarm, temperature digital display, temperature voice broadcast, LCD waveform display, and so on.

12.8 Conclusion

By analysis and multiple testing, the product system front-end part normalized output (0 to +500 C Linear mapping 0–5 V),and output has protection circuit which make sure output voltage does not exceed 5 V; system collects temperature sample per second and after being filtered and calculating the accuracy is 0.10 C. Each measured once per minute system reports once by voice; system can be set arbitrarily within the range 0–500 C temperature as warning temperature to make sure just as the measured temperature exceeds the warning temperature value system immediately alarm.

Intelligent thermometer can be used to accurately measure human body temperature, which has great significance for real life. Such as "SARS" time, has played a huge role in the area of large flow of people (the railway station, bus station) and accurate measurement of their own technology is also an important way of promoting scientific development.

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Chapter 13
Simulation of Computer Monitoring and Controlling System for Automated Multilayer Garage

Defang Zhao, Xin Zhang, Lili Wang, Tao Wang and Li Ding

Abstract In order to design practice of automated multilayer garage based on S3C2440, ARM industrial control panel for large-scale automated multilayer garage was designed, it's structure and function were analyzed, and the development environment of the system as well as the control layer-built and administration flow chart were introduced. The system structure was realized with formation, dividing into three stories as of administration, monitoring, and execution in accordance with the function. The system was composed of such subsystems as upper-level real time monitoring, garage management, management information, field spot industrial bus communication, and identification of in/out personality. It was shown by the applying practice that this system possessed expansibility, publicity, and operational convenience.

Keywords S3C2440 · Multilayer garage · Computer monitoring · Simulation

13.1 Introduction

With the popularity of the car, parking is difficult to have a static traffic problems faced by large- and medium-sized cities to become a social problem, and even to some extent, restrict the development of China's automobile industry, government and the community has paid great attention to the car parking problem. The three-dimensional (3D) garage automated 3D garage and to maximize use of space, large-scale 3D garage have developed rapidly [1].

Abroad in the research and manufacture of parking earlier, mainly Japan, South Korea and Germany, Japan in 1960 completed a four-car parking spaces, two-stage

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mechanical parking garage in 1971, began to develop assembly self-propelled 3D garage, Japan technology research and development aspects of the parking garage in a leading position, the number of completed parking and vehicle capacity is also highest in the world, Japan has put into use mechanical parking spaces over more than 300 million; South Korea in the 1970s of the twentieth century follow the example of Japan, with nearly 100 manufacturing enterprises, the annual growth rate of 30 % due to the attention of the government; the parking industry is very developed in Germany, production of parking equipment manufacturers, about 24, in owhich KLAUS and the OTT OWOHR two production accounts for about 80 % of the total output of Germany, have an advantage in the laneway type of product technology [2].

In the early 1990s, China started to develop and use mechanical parking equipment through the introduction of technology to fully digest and analysis, and the actual usage of domestic transformation and innovation, the path of independent development, has been the formation of new parking Equipment industry [3–5].

13.2 System Structure and Function

Automated 3D garage system is not directly for manual processing, transportation equipment can automatically multi-storey garage storage systems, warehousing operations system including multi-storey car parking spaces in the parking within the roadway to transport equipment out of storage and computer control and communications systems. Automated 3D planning and layout of the garage is related to the field of logistics and monitoring technology, computer application technology, communications technology, equipment and parking optimal management of technology, integrated project, it is characterized by a high-level 3D parking signs, complete sets of advanced handling equipment, advanced computer control technology as the main means highly efficient use of parking spaces and storage space, save time and effort out of storage operations. Among them, the computer monitoring system is an automated parking system core, is an important part of the stereo garage, and directly determines the level of automation of the 3D garage, to ensure the safety premise out of the library operating speed.

13.2.1 Computer Monitoring System Structure and Composition

According to the characteristics of the automated 3D garage and on-site needs, system architecture uses a layered approach to achieve the designed computer control system divided into functional management, monitoring layer, control layer 3, according to user requirements and the actual situation in management and monitoring layer merge management control layer, multimedia guide system equipment (card reader, display brand and identity, and charges for terminal

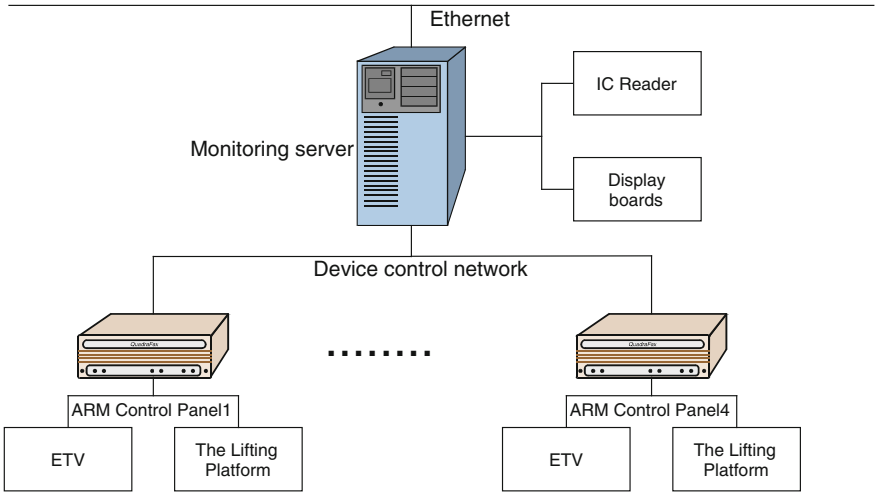

Fig. 13.1 Block diagram of system configuration

system equipment) reader layer monitoring server connection directly with the management and monitoring system constitutes Fig. 13.1.

Automated parking computer monitoring system consists of host specific real-time monitoring system, garage management system, management information systems, field bus communication system, the ARM device control system, the storage authentication system, and other subsystems. Among them, the PC monitoring system responsible for automatically assigned parking spaces, enter the operating instructions, monitoring equipment operation, determine the state of equipment and fault; garage management system responsible for the processing of parking management, ID card management, charge management, permissions management, etc.; field bus communication system is responsible for the upper control and lower equipment real-time communications, transmission operating instructions and garage parking spaces and equipment state; ARM control panel device control system according to the operating instructions to control the operations of the equipment order; responsible for the user card system out of storage a personal identification system, access to information, the storage card and operating 3D garage under the control and management of the monitoring system to complete the entire garage automatically ordered high-efficiency operation.

13.2.2 Main Functions of the System Implementation

(1) Automatic allocation of parking spaces, a variety of operating instructions sent to the ARM control panel, control equipment operation, real-time monitoring, display, record the state of equipment, and parking spaces in use for 24 h

unattended automatic deposit/pick up the car, identity verification and management fees, the overall compact automated parking Kuguan control the integration.

(2) Four sets of equipment can operate in parallel automatic deposit/pick up the car, authentication, and charging management.
(3) Four sets of stackers, lift adjacent stacker, lift mutual backup software can be set to switch stackers, to achieve near-zero system downtime, maintenance time, to achieve high system reliability and high availability.
(4) Authentication charges the credit card equipment using non-contact RF card technology, security, identification, storage/pick up the car, and charges to use the voice prompts and digital display of the two interfaces at the same time convey information from/to to take the car user-friendly and convenient .
(5) And the concerted action of the library fire protection system, fire alarm occurs can command stacker abort the current task return to a safe area with the fastest speed.
(6) The levels of operating rights management and database encryption, automatic backup, have a good data security.
(7) To achieve real-time record of equipment failures and alarms, equipment, health records, to provide data for equipment maintenance.
(8) Automatically optimizes the shortest path for bicycles, and pipeline operations in accordance with the instruction serial number of each car provides continuous access to an average speed of 86 s.
(9) The three-tier design, management information systems using C/S structure, the overall system has good scalability and good versatility.
(10) The completion of the implementation of the records, management of the garage to run a variety of information, such as the unusual circumstances of the equipment, instructions, fees, etc. improve the current data and historical data query capabilities, the flexibility to generate and print a variety of statistical reports.
(11) And friendly man–machine interface, real-time dynamic display of the garage operation of equipment, work location, the state of equipment, parking spaces occupied.

13.3 System Design and Development

The actual project development for the system's functional requirements, design the operating environment of system development and system management control process is as follows.

13.3.1 System Development Operating Environment

(1) ARM9, 200 MHz; SDRAM, 64 M; NandFlash, 128 M;
(2) Windows 2000 Advanced Server; Microsoft SQL Server7.0
(3) Visual C++, wince.

13.3.2 System Management and Control Processes

In this system, the computer monitoring system to assume the role of management and central control, assume a storage management, a database management, stocktaking management, query, print, and display the garage economic and technical instructions to calculate and analyze management functions, which include online management and away from the through line management, master anti-tone rotating lifts, stackers, contact smart car out of storage; control and monitor the running of entire automated 3D garage, and run under the management or operation of the command-organizational processes, as well as monitor the field devices and field device status, monitor vehicle flows, and also has the right equipment for fault detection and inquiry forms printing. In short, the garage monitoring system, the management and control software system is an organic whole, mainly to complete the following work:

(1) Real-time monitoring of the operation of the system throughout the 3D garage;
(2) ETV, and storage transmission equipment and vehicles operating position;
(3) Shows the current operating status of all tasks;
(4) Error alarm can be able to control the operation of all equipment in case of emergency, the management control process shown in Fig. 13.2 in accordance

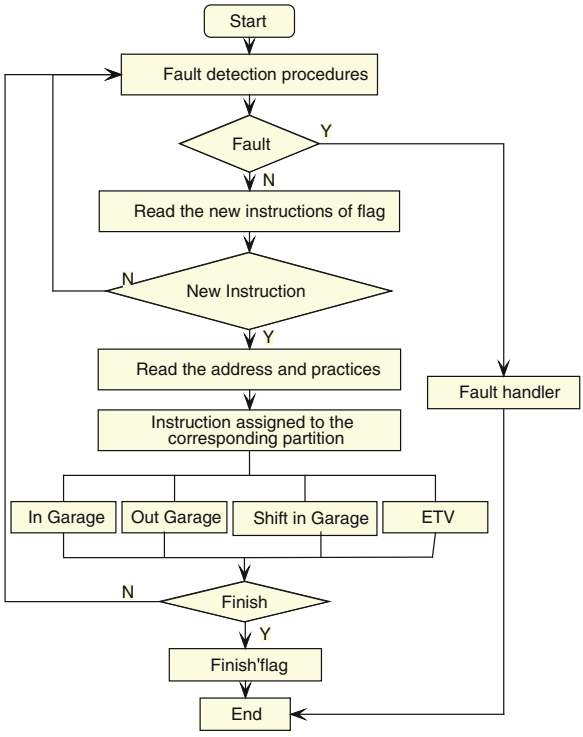

Fig. 13.2 Control flow chart

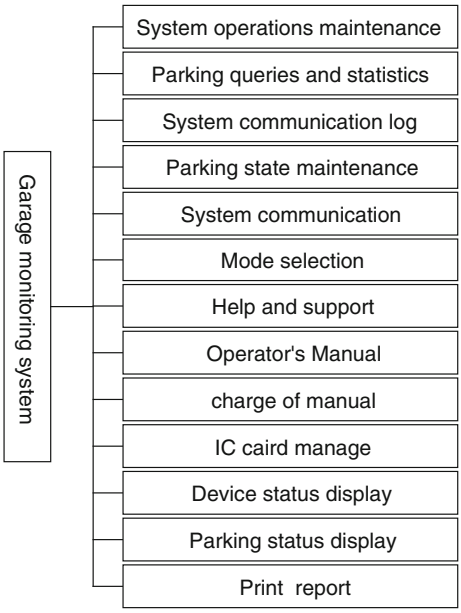

Fig. 13.3 Structure of software system

with the flow of information and the process can be divided into the automated garage monitoring software system shown in Fig. 13.3 of 13 modules.

13.4 Conclusion

Analog scale of the system up to 160 3D garages, uninterrupted operation many times that the design is feasible. Non-contact IC technology, the RF data communications technology, 3D garage tends to fully automated; modular monitoring software design makes the software design process more clear, and set aside the interface has been expanded, the system has the scalability and openness.

Computer monitoring, equipment and information management, systems integration, field bus control technology, radio frequency card technology, voice and display to guide the optimization of technology, equipment operation, the automated parking control and information management, including automatic real-time monitoring of work orders generated and sent, 3D storage and transfer equipment, real-time control, information recording, automatic a/warehousing operations, as well as automatic management of user accounts, fees and other information.

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Chapter 14
A Distributed System for Independent Acoustic Source Positioning Using Magnitude Ratios

Wensheng Zou

Abstract We have described a distributed system independent source separation of form and position of each shy; based on the ratio of energy value f-component sensors get clustering and optimization method. The simulation conditions realistic with Doppler effect is by Rayleigh fading to illustrate how to realize the system problem is to exercise more source orientation. The results show that the system will be low to high precision, need to communication cost for large data sets.

Keywords Distributed system · Acoustic source positioning · Magnitude ratios

14.1 Introduction

The previous works have found relative angles between the sound sources and the receiving sensor array which is called the direction of arrival (AOAs). Use of AOA technical scheme, so far, most acoustic methods can only to solve a tracking object, only a few people are many target tracking [1, 2]. To solve the multi-objective tracking and come array sensor, the use of independent component analysis (ICA) is natural from ICA is a powerful method to separate and restore the original data, these sources to provide statistical independence. In fact, an acoustic signal has a different propagation of the delay in time for sensors, generating convolved mixed data. Some of the methods have been developed to deal with the problem in the time domain and frequency domain. However, they are not too much of the computational load or too complicated, especially when finite impulse

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response (FIR) linear algebra is used for ICA in complex field. In addition, so far all related technology usually needs concentration of algorithm, make communication load too big, applicable to wireless sensor network (network).

14.2 Proposed Method for Multi-Object Tracking

Consider M objects emitting continuous zero-mean acoustic signals and N location-known sensors. The signals are denoted by $s_j(t), j = 1.M$ while at each sensor i, the received data are denoted by $x_i(t)$ and modeled as in [2]

$$x_i(t) = \sum_{j=1}^{M} a_{ij} s_j\big(t - \tau_{ij}(t)\big), \quad i = 1, \ldots, N \tag{14.1}$$

where $a_{ij} > 0$, is the amplitude gain of the signal from source j measured at sensor i and $\tau_{ij}(t)$ is the propagation time of this signal. When the sources move, these parameters change over time and cause different shifts to different f-components at the receivers. That phenomenon is called Doppler effect [3]:

$$f_{ij} = \left(\frac{v_c}{v_c + v_j \cos\big(\theta_{ij}(t)\big)}\right) f_j \tag{14.2}$$

where f_j is some f-component of source j, f_{ij} is the shifted version of f_j at sensor i, and $\theta_{ij}(t)$ is the intermediate angle between $\overrightarrow{ij}$ and $\overrightarrow{v_j}$.

The issue is: with the received data and the only knowledge that the delayed versions of the sources are statistically independent of one another, the source positions must be indicated.

Applying short time Fourier transformation (STFT) to the sampled data at the sensor i, the time-delay τ_{ij} only affects the phase spectral image, not the magnitude spectral image (so-called frequency image). Since the continuous form of STFT is not suitable for computing and storing, the discrete Fourier transformation (DFT) is replaced for calculation at sensors. Also note that when the speeds of the source are not zero, a source's magnitude frequency images calculated at different sensors do not have the same form, thus the results of DFT for recorded data are

$$|X_i(\omega_k)| = \sum_{j=1}^{M} |a_{ij}||S_{ij}(\omega_k)|, \quad i = 1, \ldots, N \tag{14.3}$$

$X_i(\omega_k)$ in the above equation is the DFT results of $x_i(t)$ and k represents the discrete index. Meanwhile, $|S_{ij}(\omega_k)|$ is the discrete frequency image of the signal emitted by source j and recorded by sensor i. Now consider a particular interval on the frequency domain (ω_a, ω_b) containing all shifted versions of some f-component of

source z without any interference from other sources' shifted f-components, the frequency images in this interval are

$$\left|X_i\left(\omega_k^{(m)}\right)\right| = \sum_{j=1}^{M} |a_{ij}| \left|S_{ij}\left(\omega_k^{(m)}\right)\right| = |a_{iz}| \left|S_{iz}\left(\omega_k^{(m)}\right)\right|, \quad i = 1, \ldots, N \tag{14.4}$$

where $\omega_k^{(m)} \in (\omega_a, \omega_b)$ and m is the index of the f-component. Although this f-component has different shifted versions, its energy is unchanged since the magnitude of the signal on the time domain is the same, or

$$\left|S_{iz}\left(\omega_k^{(m)}\right)\right|^{\mathrm{T}} \left|S_{iz}\left(\omega_k^{(m)}\right)\right| = \left|S_{lz}\left(\omega_k^{(m)}\right)\right|^{\mathrm{T}} \left|S_{lz}\left(\omega_k^{(m)}\right)\right|, \quad i \neq l \tag{14.5}$$

Based on the fact from (14.4) and (14.5), if an t'. Component belongs to source z, then all relative distance relationships are

$$r_{ilz}^{(m)} = \left|\frac{a_{iz}}{a_{lz}}\right| = \frac{d_{lz}}{d_{iz}} = \sqrt{\frac{\left|\tilde{X}_i\left(\omega_k^{(m)}\right)\right|^{\mathrm{T}} \left|\tilde{X}_i\left(\omega_k^{(m)}\right)\right|}{\left|\tilde{X}_l\left(\omega_k^{(m)}\right)\right|^{\mathrm{T}} \left|\tilde{X}_l\left(\omega_k^{(m)}\right)\right|}}, \quad i \neq l \tag{14.6}$$

where d_{lz} and d_{iz} are the distances from source z to sensor l and to sensor i respectively; $\tilde{X}_i\left(\omega_k\right)$ is the result after the step of noise filtering $X_i\left(\omega_k\right)$, and $\tilde{X}_i\left(\omega_k^{(m)}\right)$ is the frequency image of $\tilde{X}_i\left(\omega_k\right)$ on the segment (ω_a, ω_b) (see Fig. 14.1). That means, for each f-component m within the frequency interval, a set of constraints is calculated and the location of the source having these components can be estimated. Thus, two clustering steps are needed, one for grouping the shifted frequency components to determine the segment (ω_a, ω_b), and the other for grouping f-component positions to calculate source locations after f-component positions are computed. The advantages of this system are: (a) it is more robust than our previous system even when the sources are fixed, (b) it works well with moving sources and tolerates the co-existence of Doppler effect and Rayleigh multi-path fading, (c) it is considered to be a distributed method since the computation load is shared among the sensors and the communication cost is low, and (d) it is not constrained by the condition that the sensor number is greater than the source number.

14.3 Proposed System Architecture

The architecture design of the acoustic tracking system is displayed in Fig. 14.1 due to the extraction of distance information method as mentioned in Subsection II-B.

On frequency domain, the Gaussian noise level can be detected and all low f-components can be forced to zero (see Fig. 14.2). Filtering step keeps only several

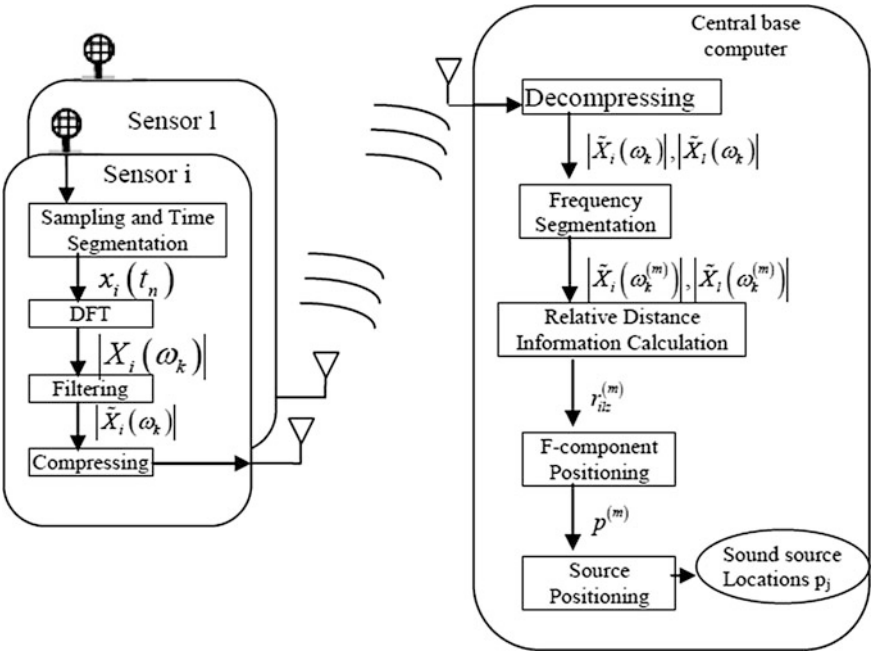

Fig. 14.1 Sensor architecture and base architecture of the proposed system

dominant *f*-components, so the data to be transmitted from a sensor to the base computer is reduced significantly. This is one of the key ideas for compressing the communication load so that the method can be applied into WSNs.

The calculation of high load sensor with DFT transforms the lengthy frame. However, you can see in Fig. 14.2, a sensor can skip the calculation of the frequency of probability of the existence of the garbage is in main f-components according to the feedback of low base. Therefore, the computational load sensor is reduced considerably [4].

The received data compression and input is "Frequency-Segmentation" stage. This process dominated *f*-components signs and the corresponding section contains component index *m*. Then the block "Relative Distance Information Calculate" calculates a set of $r_{il}^{(m)}$ for each component. These sets are then input into the "*F*-component Positioning" process to estimate the output position of each dominant *f*-component $p^{(m)}$. Frequency leakages, setting noise, Doppler effect, and Rayleigh fading influence the detection result and make *f*-components belonging to the same source *j* not having the same position. Therefore, the final stage "Source Positioning" is necessary to cluster those $p^{(m)}$ and estimate p_j under the averaging mechanism [5].

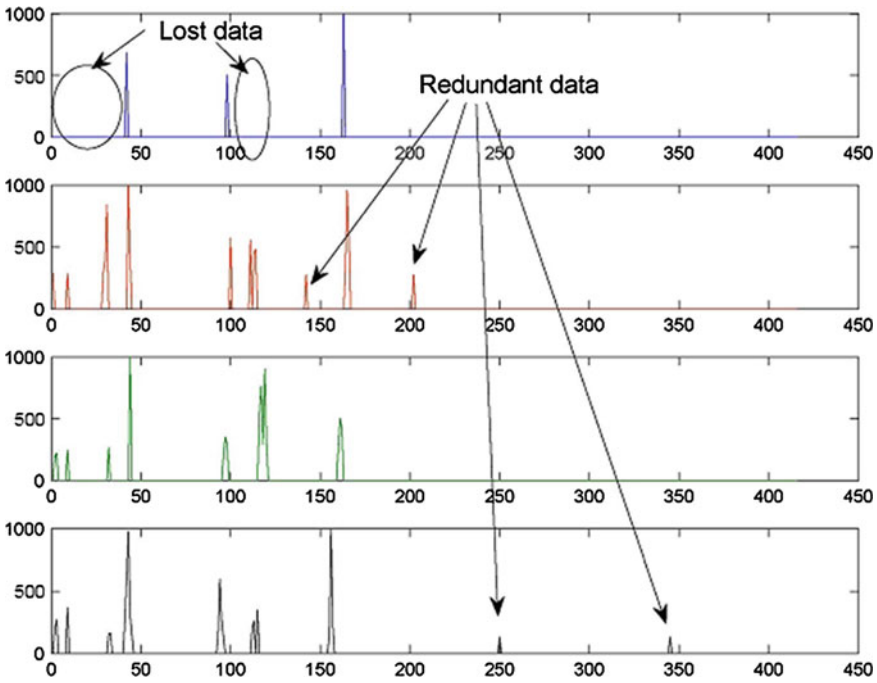

Fig. 14.2 An example of data after filtering on Fourier domain

(1) Frequency Segmentation: This stage is used to show that every frequency interval, including all versions of the leading *f*-component transfer. On a mission, group clustering *f*-component version of the change, decided frequency section. *F*-components Doppler effect is the effect of different, higher frequency, big changes. From (14.2), an t'' component of source j at f_0 has shifted versions within $\left(\frac{v_c}{v_c+v_j}f_0, \frac{v_c}{v_c-v_j}f_0\right)$. This frequency interval varies depending on f_o on the frequency scale, however, it is fixed on the logarithmic scale as can be seen below:

$$\triangle f(dB) = \log_{10}\left(\frac{v_c}{v_c - v_j}f_0\right) - \log_{10}\left(\frac{v_c}{v_c + v_j}f_0\right) = \log_{10}\left(\frac{v_c + v_j}{v_c - v_j}\right) \tag{14.7}$$

As the result, clustering task should be performed on the $\log_{10}(\cdot)$ scale of the frequency image under following criteria: (a) the width of each segment is not larger than $\triangle f\,(\mathrm{dB})$ (see 14.7); (b) the number of nonzero *f*-components within the grouped interval is greater than 2 so that the number of constraints is at least 3; and (c) the average energy of an *f*-component received at the sensors must be larger than the detected noise level. A sliding window with the width $\triangle f\,(\mathrm{dB})$ is then

used to detect the frequency segments that hold (b) and (c). As the result, the number of sources can be larger than that of sensors. Moreover, the total loss of some *f*-components due to filtering is acceptable and the redundant *f*-component will hardly be taken into account.

(2) *F*-component Positioning: All constraint ratios rilz are computed in "Relative Distance Information Calculating" process before being fed into the "*F*-component Positioning" process. The error in the constraints is unavoidable due to frequency leakage and the setting noise, so the solution for the position of *f*-component *m* should be a vector $p^{(m)}$, $p^{(m)} \in R^2$ that compromises the constraints. We propose an objective function for this compromise and the solution for source *j* will be

$$F_j = \sum_{i}^{N} \sum_{l,l \neq i}^{N-1} \left(d_{ij} - r_{ilj} d_{lj}\right)^2, \quad 0 < r_{ilj} < \infty \tag{14.8}$$

$$p^{(m)} = \arg\min_{p^{(m)}} F_j \tag{14.9}$$

The simple negative gradient method is chosen for this optimization problem.

14.4 Conclusions

The system can be regarded as a kind of design, this paper introduces the network of future generations, because it requires a powerful sensor in the long passages of the DFT data. However, the powerful computation ability is not necessary, because the feedback of the foundation, on the sensor for a full DFT and focus only calculated DFT in the trash section contains several of the frequency of leading *f*-components. The system is actually more useful not only in the positioning multiple sources. It also can output characteristic for a further specified source position estimation, because of most acoustic characteristics and recognition in the frequency domain.

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Chapter 15
Improved Electric Power Training Scheme Based on Memory Curve and Application

Ying Wang, Bin Huang, Yi Yang, Yuping Luo and Quanchao Zheng

Abstract With the rapid development of power industry in recent years, the ability of electricity employees are increasingly high requirements. Hence, how to select qualified electric power personnel and to let them obtain the knowledge to meet the job requirements has become a significant issue in power industry. In order to overcome the weaknesses of traditional training, this paper proposed a training method for new electric power staffs based on the analysis of the memory curve and improved calculation application. Through the development of training programs, organizing a strong memory of learning methods and steps, and creating high-quality questions, the training promotes students to learn the knowledge and skills in a short period. At the same time, through the design of scientific assessment mechanisms and formulas for students, analyzing the overall capacity of the students, the training also improves the quality of personnel selection.

Keywords Electric power industry · Memory curve · Assessment system

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15.1 Analysis of Electric Power Training for New Employees

The power industry as a technology-intensive industry, the requirement of personnel's capacity and quality is higher than many other industries [1]. Consequently, it is important to select the capable personnel to meet the job requirement. In many industries, the new recruits generally have pre-service training and a three-month trial and the trial situation and it is used to decide whether the new employees will be recruited as full-time employees or not [2]. However, in practice, because of the inadequate management of human resources and the irresponsible managers which makes the new employees' experience and ability cannot be distinguished, so that all the new employees can become full-time employees after the probationary period [3, 4].

The characteristics of the new employee training in the electric power industry:

1. Unreasonable training time: After recruitment, the training department does not make a reasonable training plan and often arrange the new staffs to participate in the ongoing training with little consideration of whether the training is suitable for new staffs. Some of the training projects were developed but not implemented or delayed, and sometimes due to various problems, the training knowledge is not obtained by trainees.
2. Weak pertinence: The electric power industry covers a wide range of disciplines and many professions. On the other hand, there are a variety of job positions in the power industry that require professional knowledge and specific job skills. The power companies tend to adopt a centralized training, standardized training content and assessment for new employees, the learning content is not designed in line with the job position needs, resulting in miscellaneous training and bringing difficulty to in-depth explanation of the knowledge. And these false eventually cause the companies cannot find the suitable working personnel.
3. Low assessment effectiveness: The assessment of traditional training is often conducted in a large knowledge modules or test the trainees after all trainings are completed, which is suitable for those who have good short-term memory and stay up all night for exam. With these methods, these trainees get a high score in assessment, but since they learn the knowledge by their temporary memory so that they will quickly forget what they have learned. Therefore, the assessment of traditional training is misleading and failed to assess any real ability of the trainees.

15.2 Memory Curve and Improved Application

15.2.1 Memory Curve

Human learning is a process from message maintaining to forgotten, which is determined by a person's physical and psychological characteristics. German

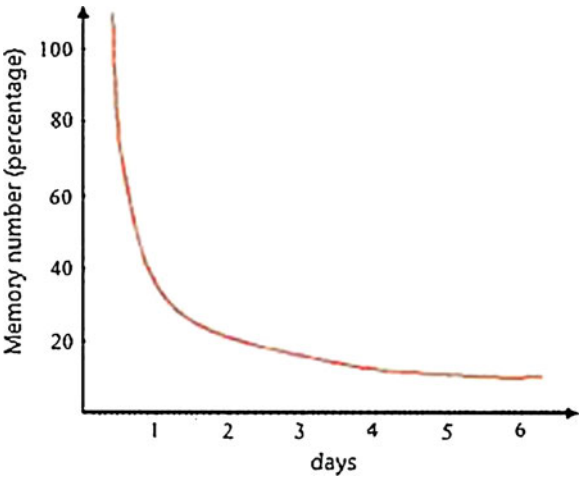

Fig. 15.1 Ebbinghaus curve

psychologist Ebbinghaus (Ebbinghaus 1850–1909) researched on this memory process and conducted a systematic study, found that there is a rule in the human brain and memory which can be described using a curve (see Fig. 15.1), known as the Ebbinghaus forgetting curve or the Ebbinghaus memory retention curve or memory curve [5]. The memory curve does not consider individual's personality or characteristics, but looking for the law of the memory in the equilibrium point [6]. The vertical axis in the memory curve represents the information maintaining and the horizontal axis is time, as shown in Fig. 15.1. The curve shows the law of the forgetting development: the forgetting effect begins when the information input in the brain. From the curve, we can see the forgetting rate slow down over time, the forgetting rate is highest at the beginning of memorizing then slow down, then goes to a considerable time with no longer forgotten [7].

Observe from the forgetting curve, you will find that if you do not review the learning content then the content will be forgotten, and the forgotten speed and amount will slow down over time.

15.2.2 Improved Application of the Memory Curve

After Ebbinghaus found this stunning law, people have been trying to use his law to improve people's memorizing effect, this area is still a high-end hot topic and there are ongoing improved applications. Currently, there is another memory algorithm called Super Memo which was created by Dr. Edward Jacek Gorzelańczyk and Dr. Piotr Wozniak. They researched from 1985 based on the analysis of Ebbinghaus curve applications and a vast amount of data then brought up the Super Memo algorithm. The algorithm so far is still under study and is the World's most scientific and effective memory algorithm in 20 years' study.

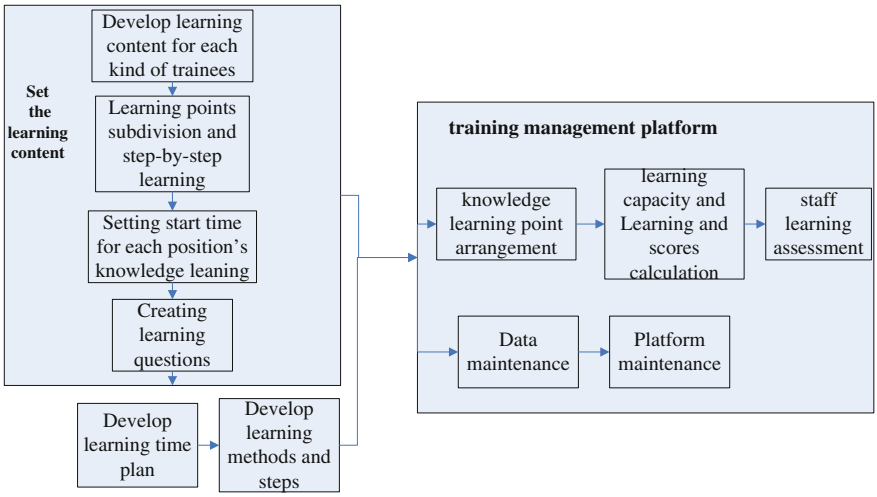

Fig. 15.2 New staffs training structure

15.3 The Improved Method and its Application in Electric Power Training

This paper proposes an improved application based on the analysis of memory curve and its improved algorithm and the shortcomings of the existing evaluation mechanism, as well as the drawbacks of traditional training. Through the development of training programs, organizing a strong memory of learning methods and steps and creating high-quality questions, the training promotes students to learn the knowledge and skills in a short period. At the same time, through the design of scientific assessment mechanisms and formulas for students, analyzing the overall capacity of the students, the training also improves the quality of personnel selection. Figure 15.2 is the overall structure of the improved application:

15.3.1 Time Plan and Training Method Based on the Memory Curve

15.3.1.1 The Development of Training Time Plan Based on Memory Curve

The table above shows the memory curve algorithm Super Memo of learning content review interval. Serial number from 1 to 5 represents a total of 73 days, new employees have a little more than three months as probation time in the table. Therefore, we can see the first column in Table 15.1 as a plan of new employee to learn and review knowledge.

Table 15.1 Time interval of knowledge content review

No.	Time interval	No.	Time interval	No.	Time interval
1	4 days	6	2 months	11	2 years
2	7 days	7	3 months	12	4 years
3	12 days	8	5 months	13	6 years
4	20 days	9	9 months	14	11 years
5	1 month	10	16 months	15	18 years

15.3.1.2 Development of Learning Method and Procedures Based on the Memory Curve

On the basis of the analysis of Super Memo memory algorithm, we propose new staff training, the flow chart is shown in Fig. 15.3:

1. Study or review of new knowledge;
2. Answer all the learning and review questions created from the knowledge points, if there is a wrong answer, the system identifies the question for the first time, indicates that this question needs to be reviewed. If all questions are answered correctly, then this learning or review is completed, otherwise skip to Sect. 15.3;
3. If all questions of the knowledge point are correctly answered, then this learning or review is completed; if there are one or more than one wrong answers, then they need to repeat learning the questions, but the repeated questions are only the issues identified. If a question is wrong answered again that the system identifies the question for the second time, means that question need to be learned for the third time. And so on to repeat the learning of knowledge points until all the questions are answered correctly and withdraw from this knowledge.

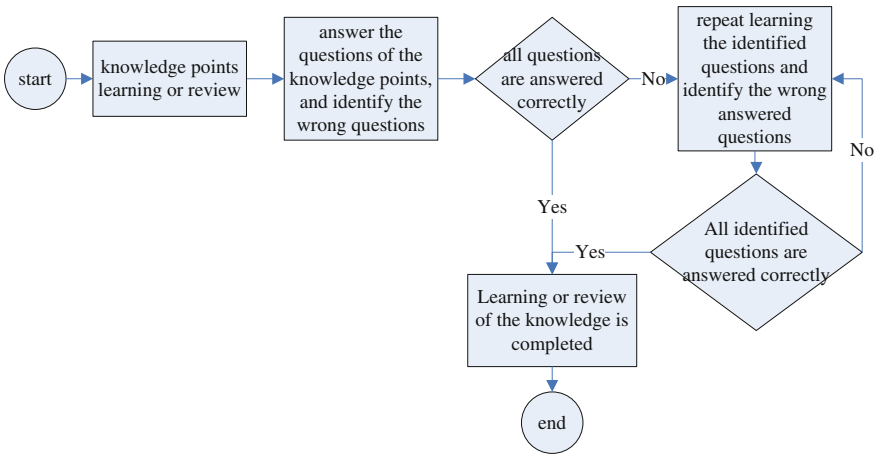

Fig. 15.3 Knowledge points repeated learning methods and steps

15.3.2 Training Content Design

15.3.2.1 Setting Leaning Content for Different Trainees

The electric power knowledge is complex and it is difficult for anyone to learn in a short time. Therefore, there are two kinds of knowledge need to learn for new staffs, the first one is basic concepts such as basic knowledge and power production safety knowledge for all employees, the second one is the knowledge and skills specific positions.

15.3.2.2 Learning Points Subdivision and Step-By-Step Learning

The principle of knowledge categorization: split the knowledge into modules, and then subdivide the module knowledge.

15.3.2.3 Setting Start Time for Each Position's Knowledge Leaning

According to the Table 15.1 of knowledge review interval, each job should be developed training for each knowledge point to avoid irrational distribution training time which will result in students' exhaustion. Additionally, a good training plan should not leave the learning content to the next day, because this is a bad habit which will cause accumulation a lot of work. At the same time, it is necessary to strictly abide the review time interval, because it is calculated in accordance with the memory cycle.

15.3.2.4 Creating Learning Questions

Learning outcomes are largely decided by the quality of creating problems which is a key factor in learning and training effects. We take the following approach in problem creating: (1) Divided the complex knowledge into multiple sub-points, which is based on the factor that it is easier to memorize the knowledge divided into 10 sub-knowledge points; (2) Visualize the questions demonstration forms. The questions include basic concepts, theoretical knowledge, and on-site work, such as the construction operations. Such topics will be demonstrated as video animation to show the working site to let the trainee's better understand of the field environment and work, which helps trainees to quickly adapt the actual work.

15.3.3 Establish a Scientific Assessment System

Currently, the Super Memo algorithm application does not analyze the study or review situation of each stage but mainly targeted on the analysis of the final examination which is the lack of the scientific assessment for students' ability. In this paper, based on the analysis of the Super Memo algorithm application assessment mechanism, a more scientific assessment is proposed to achieve sectional assessment for new staffs' ability and analysis of their overall capacity. The following statistical method is based on the assessment scores of the memory curve:

From Table 15.1, it is known that all trainees are required to repeat the learning for six times. The statistical factors are set as follows: There are six stages of learning; each stage has 100 points and totally 600 points in six stages. Assume that a student's knowledge volume is n in stage z and the total scores of each knowledge point in each stage is $\frac{100}{n}$; assume that the amount of questions of the mth knowledge point is m_k, and the mth knowledge point has to be repeated for r times to pass, the correctly answered questions of r times of answering is $z_{m_{ki}}$ $(i = 0, 1 \ldots r)$, of which 0 has not yet began to answer, hence $z_{m_{k0}}=m_k$. Thus in the z stage, the total scores of the mth knowledge of the trainee is:

$$\frac{100}{n}\sum_{j=1}^{r}\left(\frac{n_m - \sum_{i=1}^{j} z_{n_{m_{i-1}}}}{(n_m)^2} \times z_{n_{m_j}}\right) \tag{15.1}$$

Formula 15.1 gives full consideration of the answer situation of the mth knowledge point in z stage, it takes both the number of answering question and the number of correctly answered questions as calculation factors. Thus in the z stage, the total scores all knowledge points of the trainee is

$$\sum_{m=1}^{n}\left(\frac{100}{n}\sum_{j=1}^{r}\left(\frac{n_m - \sum_{i=1}^{j} z_{n_{m_{i-1}}}}{(n_m)^2}\right) \times z_{n_{m_j}}\right) \tag{15.2}$$

After six stages of study and review, the total scores all knowledge points of the trainee is

$$\sum_{z=1}^{6}\left(\sum_{m=1}^{n}\left(\frac{100}{n}\sum_{j=1}^{r}\left(\frac{n_m - \sum_{i=1}^{j} z_{n_{m_{i-1}}}}{(n_m)^2} \times z_{n_{m_j}}\right)\right)\right) \tag{15.3}$$

The above formula considers the knowledge points answering situation of various stages, take account the number of answering and correct answers as the calculation factors. In addition, the student's final examination score is composited of each stage's score, and the proportion of each stage is the same, thus, it is more reasonable for statistical learning of each participant.

15.3.4 System Management

By building a management platform to achieve intelligent control of learning content and intelligent arrangement of the review. To improve learning effectiveness through computer technology and multimedia animation technology.

15.4 The Comparison of Memory Curve-Based Training Method and Traditional Training Method

15.4.1 Improve Training Effectiveness

The trainees will be motivated through developing a reasonable plan of learning time, setting the demand of knowledge for the job, and developing a visualized and easy operated learning platform for intelligent arrangement of learning programs and content. Moreover, it also shortens the training time to learning more knowledge which enhances trainees' learning outcomes.

15.4.2 Improve the Quality of Personnel Selection

Traditional training often takes account of the final test scores as the only factor to evaluate students' ability, ignoring the various stages of student learning and it is not conducive to the selection of talents. New training method build up the analysis of learning scores of staffs' knowledge in the various stages of learning scores, which consider the answering number and correctly answered questions as important factors of score calculation. This training is more reasonable to count the learning condition and overall ability of each trainee which contribute to an important personnel selection factors.

15.4.3 Reduce Training Costs

The new training method achieves network training and electronic learning content, compared to traditional training; it greatly reduces the training costs. The new training method was implemented in a pilot power bureau, where the traditional training costs including accommodation and traveling expenses, lecturers, and venue fees. The number of trainees is an important factor with an average cost of $ 10,000 for each new employee and the power bureau has 100 employees in 2007 and an annual staff increase rate of 10 %. Based on the memory curve, training costs, including post-upgrade and maintenance costs of the new training methods management system, the former costs a maximum one time input of 500,000, only the upgrading and maintenance costs (100,000 in 2009) need to be invested every year, and growth rate is 10 %. The curve of the traditional training expenses in the pilot bureau is as follows:

$$y = 100 \times (1.1^{x-2007} - 1) \tag{15.4}$$

where x is the year, and $x \geq 2008$, y is the new employees' training costs of traditional training expenses in the pilot bureau. The cost of new training method in the pilot bureau is as follows:

$$y = 10 \times 1.1^{x-2009} \tag{15.5}$$

where x is the year, $x \geq 2008$, and when $x = 2008$ $y = 50$, when $x \geq 2009$, y is the new employees' training costs of traditional training expenses in the pilot bureau.

The curve of new staffs' training costs and expenses using new training method is as follows:

In Fig. 15.4, we can see the training fees of traditional training in pilot bureau is rising year by year, but the fees of new training methods is high only in the first year which need to invest in the training management system to achieve memory curve, and

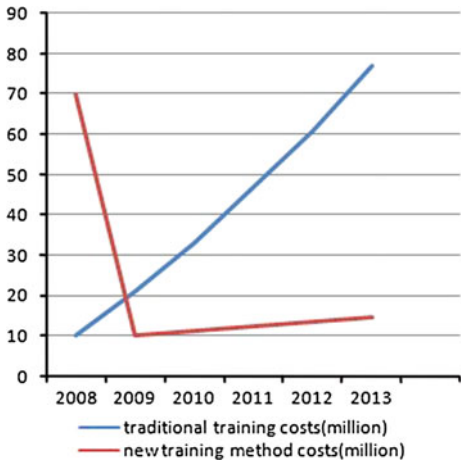

Fig. 15.4 The training expenses of the pilot bureau

increase rate is less than traditional training costs. Statistically, the expenses of the new employees training using new training method in the pilot power bureau is 1.03 million Yuan between year 2008 and 2011, while the traditional training expenses is totaled 15.11 million. The power bureau's costs of traditional training method is twice as much as the new training between 2008 and 2013, which shows that the new training method's advantage will become more significant as the year of growth. Thus, we can see that memory curve-based approach of training can greatly reduce costs.

15.5 Conclusions

In this paper, the author developed a new training method for power staffs based on the analysis of the weaknesses of traditional training methods, which combined with the memory curve and its improved algorithm in the review of knowledge learning. The practical operation shows that the training method helps reasonable arrangement of trainees 'learning plans and learning contents, helps to count the learning conditions of new employees more scientifically, enhance students' learning effectiveness, and greatly improve the quality of personnel selection.

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Chapter 16
Modal Analysis of a Two Mass Feeder

Qingrui Meng, Chuwen Guo, Jie Quan and Zhipeng Hu

Abstract Conveying velocity of a two mass feeder is adjusted by using a frequency converter according to practical requirements. But the trough mass and the exciter are often damaged because of resonance. To resolve this problem, modal characteristics of a two mass feeder are analyzed in this paper. At first, the FEM model of the trough mass is built and analyzed by using ANSYS; correctness of the simulation results is proved by modal tests. Then modal characteristics of the two mass feeders are analyzed, the natural frequencies and the mode shapes are obtained. The results show that the fifth and seventh frequencies are closer to the working frequency and may cause large deformation of the trough mass and the exciter, which are the main reasons for the damage of the two mass feeder. Analysis results of this paper provide theoretical basis for correct use and further improvement of the two mass feeders.

Keywords Two mass feeder · Modal characteristics · ANSYS · Modal tests

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16.1 Introduction

Inertial vibratory feeders are widely used in many industry fields for bulk solids handling. However, because of complexity of its mechanical structure and limited capability, there exist various impending problems such as severe noise, low efficiency, fracture of the steel plate, and so forth. Many research works have been carried out to solve these problems [1, 2]. But the problems still exist and are disadvantage factors in many cases.

A better choice is to use a novel inertial vibratory feeder—two mass feeder (refer to Fig. 16.1), which comprises trough mass, exciter, reactor springs, and isolator springs. The unbalance rotating masses are installed in exciter. A two mass feeder adopts the principle of near-resonant inertial vibration, its exciting force and power is highly reduced compared with non-resonant vibrating machines. With the advantages of high conveying velocity, low noise, small power consumption, and long service life, it has a wide application prospect. Many research works on its characteristics have been carried out. Koizumi et al. presented vibration characteristics with full consideration of transmissive force and the optimum design procedure of a vibration feeder [3]. Gerstel and Scheublin developed a computer simulation to facilitate direct and fast calculation of the forward speed of the particles on the vibrating deck in relation to the design parameters [4]. On the basis of calculating the system response, the required unbalance and the transmitted force of a two mass vibratory feeder, Pramanik discussed a method for selection of the feeder's spring stiffness [5].

Conveying velocity of a two mass feeder is often adjusted by using a frequency converter according to practical requirements. But weld cracking or fracture of the steel plate are often caused by resonance. To resolve these problems, in this work, a system model is established using a finite element method (FEM). By adopting commercial software package ANSYS, modal characteristics of the trough mass of the two mass feeders are analyzed and verified by experiments.

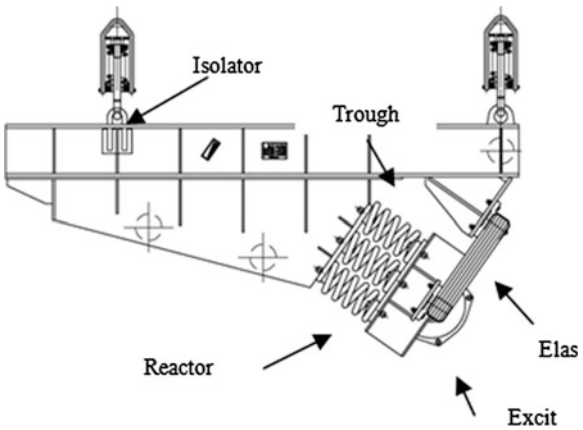


Fig. 16.1 Two mass feeder

16.2 Modal Analysis of the Trough Mass

For the sake of avoiding producing too much finite elements, which will increase computing time, reduce grid quality, and analyze precision, certain simplifications of analysis model of the trough mass have been made, including bolt holes, chamfers, fillets, and so forth. The analysis model built in ANSYS as shown in Fig. 16.2.

Material and related parameters of the trough mass are shown in Table 16.1 Mesh generation of the trough mass is shown in Fig. 16.3.

The rigid mode should be removed from solutions of the free mode, thus the first 10 free modes can be calculated. Since the working frequency is 16.25 Hz, we just study the first 5 mode shapes obtained from the FEM analysis as shown in Fig. 16.4.

From Fig. 16.4 it can be seen that the first mode presents a twist motion of the trough mass with respect to the z-axis, and the deformation is quite large. It indicates that the trough mass will become asymmetric and the track motion will be seriously affected when resonance occurs. The second mode presents rotational motion of both the junction panels in opposite direction with respect to x-axis, while the third mode presents rotational motion of the junction panels in the same direction with respect to x-axis. The fourth mode indicates bending motion of both the side panels along x-axis; it has the same effect as the first mode on the trough mass when resonance occurs. The fifth mode indicates bending motion along z-axis.

Fig. 16.2 Trough mass

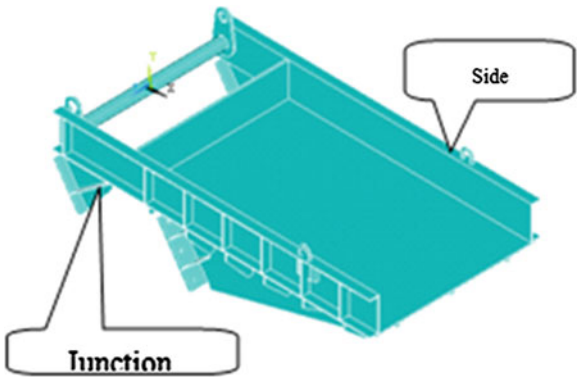


Table 16.1 Related parameters

Item	Value
Material	Q235
Elastic modulus(GPa)	206
Poisson ratio	0.3
Density(Kg/m^3)	7,850
Element type	Solid95

Fig. 16.3 Mesh generation of trough mass

From Table 16.2 it can be seen that, among the first 5 orders of natural frequency, each has a large difference with the adjacent ones. It indicates that frequency of external interference can only be close to one of them and the superposition of vibration of the trough mass can be avoided.

The first modal frequency (23.205 Hz) is greater than the working frequency (16.25 Hz) about 43 %, which is higher than 20 %. It proves the rationality of the structural design of the trough mass.

16.3 Modal tests

In order to verify correctness of the simulation results, a trough mass is experimentally measured. The testing instruments used in this test include a PCB excitation hammer, an accelerometer of type KD1005, a charge amplifier of type uT41C3, a signal analyzer of type uT3208F, and a PC. The diagram of the testing system is shown in Fig. 16.5.

The state of the trough mass is of utmost importance to experimental results. Both a free state and a fixed state are used at present. By comparison, the intrinsic attributes of the trough mass can be experimentally obtained by using a free state. So a free state is adopted in this work.

The following requirements are considered in selection of the location and the quantity of the measuring points and the measuring direction.

(1) The exciting point should be away from the node of any of the mode shapes, so as to ensure that the acquired signals have a higher signal-to-noise ratio. (2) The arrangement of the measuring points should represent the geometry characteristic of the structure. (3) Deformation features of each mode can be distinguished clearly. (4) The measuring points should include all of the key structural points.

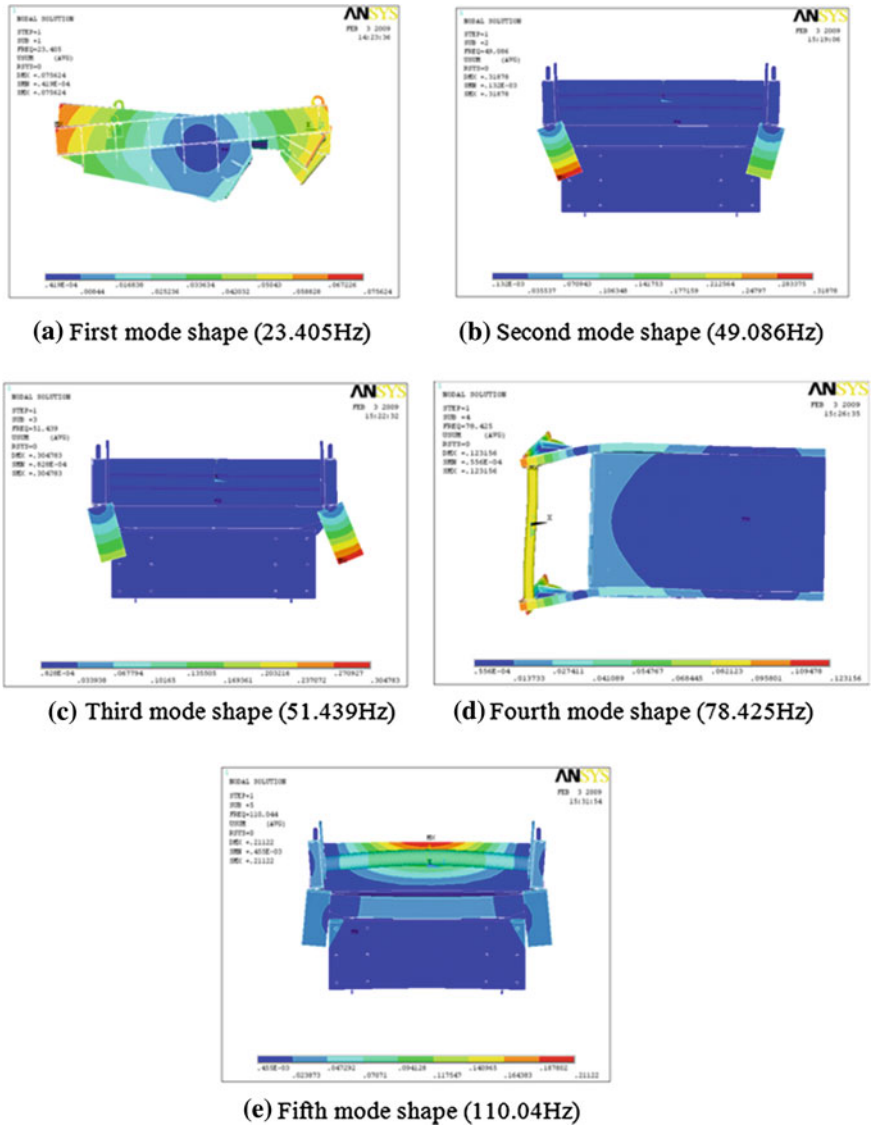


Fig. 16.4 Simulated mode shapes of the trough mass

The arrangement of the measuring points is shown in Fig. 16.6. In order to compare with the FEM analysis results, only the first 10 orders of natural frequency of experimental results are listed, as shown in Table 16.2.

From Table 16.2 it can be seen that relative errors of 8 orders of natural frequency are less than 10 %, and the maximal relative error is 20.9 %. The first 5 orders of measured mode shapes agree with the FEM analysis results quite well.

Table 16.2 Comparison of natural frequency

Order	1	2	3	4	5
Theoretical value/Hz	23.405	49.086	51.439	78.425	110.04
Measured value/Hz	27.5	50.0	65.0	83.0	103.0
Relative error	14.8 %	1.8 %	20.9 %	5.5 %	−6.8 %
Order	6	7	8	9	10
Theoretical value/Hz	117.72	124.82	144.95	151.78	155.63
Measured value/Hz	113.3	129.0	144.3	147.5	151.3
Relative error	−3.9 %	3.2 %	0.4 %	2.7 %	−2.9 %

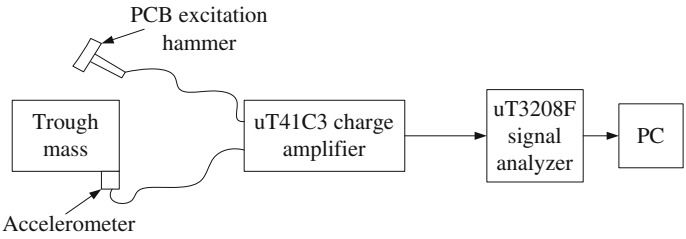
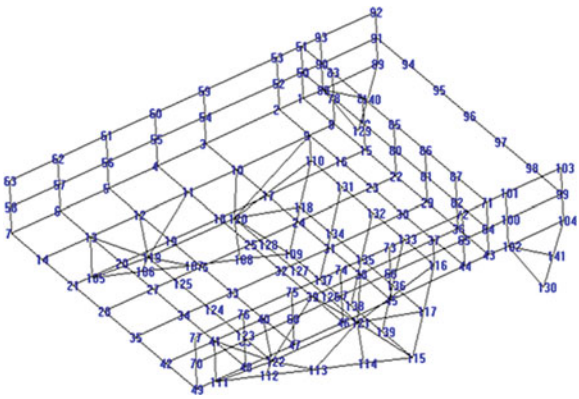


Fig. 16.5 Diagram of the testing system

Fig. 16.6 Arrangement of measuring points



In a word, the agreement between the FEM analysis and measured results is excellent and the experimental results prove the rationality of the FEM model.

16.4 Constrained Modal Analysis of a Two Mass Feeder

Besides the previous simplification of the trough mass, the following simplifications of analysis model of the two mass feeders are made.

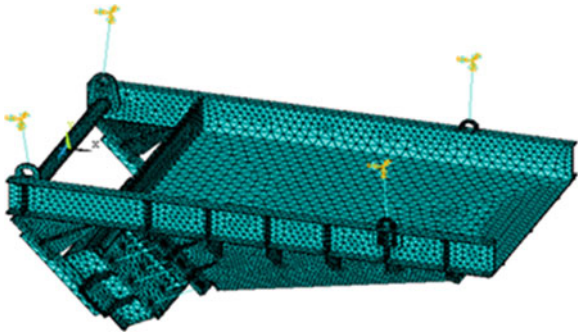


Fig. 16.7 Mesh generation of the two mass feeders

Table 16.3 Natural frequencies of the two mass feeders

Orders	1	2	3	4	5
Natural frequency	1.316	4.938	5.054	6.879	10.062
Orders	6	7	8	9	
Natural frequency	19.153	22.467	28.270	32.331	

1. The vibration motor is replaced by three mass units. The left and the right mass units represent the eccentric blocks located at both sides of the vibration motor respectively and the middle one represents the vibration motor. The middle mass unit works as major node and the other two as secondary ones, all of them are located on the exciter rigidly.
2. The reactor springs and the isolator springs are replaced by unit COMBIN14, which can effectively simulate stiffness and damping of the springs.
3. Unit SOLID95 is used in mesh generation (refer to Fig. 16.7), where upper ends of the isolator springs are all fixed.

The rigid mode should be removed from solutions of the constrained mode, thus the first 9 constrained modes can be calculated. The first 9 orders of natural frequency are shown in Table 16.3. The first 9 mode shapes are also obtained and shown in Fig. 16.8.

The first mode shows a counterclockwise rotational motion with respect to an axis parallel to the y-axis, the isolator springs have a significant deformation, while the deformations of the trough mass and the exciter are rather small.

The second mode shows a rotational motion with respect to an axis parallel to the x-axis, both the reactor springs and the isolator springs have significant deformation, but the deformations of the trough mass and the exciter are rather small.

The third mode presents a moving motion along the y-axis; the exciter has a parallel movement relative to the trough mass along the direction of the reactor springs. The reactor springs have significant deformation. The deformations of the trough mass and the exciter are rather small.

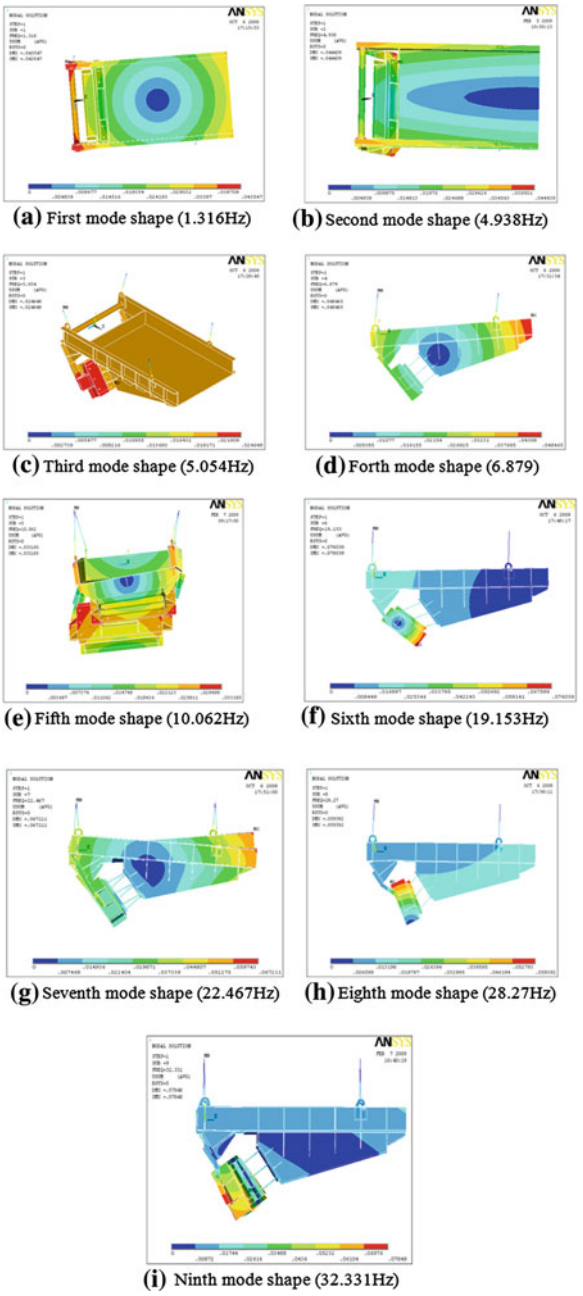


Fig. 16.8 Simulated mode shapes of the two mass feeders

The fourth mode presents a rotational motion with respect to an axis parallel to the z-axis, the isolator springs have a significant deformation, and the deformation of the trough mass and the exciter is very small.

The fifth mode presents a twist motion of the trough mass. The elastic panels have a rotational and a bending motion with respect to the x-axis. The deformation of the exciter is very small.

The sixth mode presents a bending motion of the elastic panels.

The seventh mode presents a bending motion of the elastic panels and a twist motion of the trough mass with respect to the x-axis.

The eighth mode presents a bending motion of the elastic panels and a clockwise rotational motion of the exciter with respect to an axis parallel to the z-axis.

The ninth mode presents a bending motion of the elastic panels and a twist motion of the exciter. The deformation of the trough mass is very small.

As to the first 4 orders of natural frequency, the difference between the two adjacent ones is rather small, it indicates that the exciting frequency may be close to several of them simultaneously and the vibration superposition can easily be induced.

16.5 Conclusions

FEM model is built and modal characteristics of the trough mass are analyzed by using ANSYS. Correctness of the simulation results are proved by modal tests. On this basis, FEM model of the two mass feeders is built and its modal characteristics are analyzed. Natural frequencies and mode shapes of the two mass feeders are obtained and the reasons for the damage are found.

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Chapter 17
Multiple Attribute Evaluation and Control Method of Social Scientific Research Achievements

Xiaomin Huang

Abstract Evaluation of social scientific research achievements is an important theoretical and practical problem by current research managers. This paper studies the evaluation problem of books and papers of social scientific research. First, the index system of evaluation is established. Then, a quantitative evaluation and control model based on fuzzy mathematics is presented to evaluate the social scientific research achievements. It is aiming at making the quantifiable and scientific assessment for social scientific research achievements, and providing decision references and control methods for the department of the scientific research management.

Keywords Social scientific research achievements · Multiple attribute evaluation and control · Fuzzy decision making

17.1 Introduction

With the advent of knowledge economy, the strategy of revitalizing China through science and education has become the consensus of the whole country, all levels of government and universities are increasing the investment in scientific research. How to strengthen the scientific management, and make objective and fair assessment for scientific research achievements become important parts of

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scientific research management. Only a comprehensive and correct evaluation of scientific research can help to mobilize the enthusiasm and creativity of the science and technology workers, and to encourage them to output more results and make more contributions to the socialist modernization.

The evaluation of social science research achievements is complex system engineering. With the continuous development of social science research evaluation practice, the current evaluation criteria are constantly to be modified and to be more perfect. There are three common forms of social science research achievements, basic research achievements, applied research achievements, and development research achievements. The results of these three forms are the forms of academic monographs, papers, research (inspection) reports, policies and regulations, and statistics data, and so on [1].

This paper focuses to explore the evaluation of the books and papers of social scientific research achievements. First of all, the evaluation index system is established in order to measure the level of social science research through a series of relevant indicators. Then, a comprehensive quantitative evaluation model of social scientific research achievements is presented based on fuzzy mathematics. This paper aims at measuring, monitoring, and evaluating the development of social science research and its influencing factors on the basis of a comprehensive, accurate, and objective understanding of the development of social science research, so as to gradually improve the social science research policies and measures, and to improve the whole level of social scientific research.

17.2 Evaluation Index System of Social Scientific Research Achievement

Comprehensive, objective, and accurate assessment of the scientific and technological achievements is not a simple work for scientific management department, but its assessment constitutes a complex system. This is because the assessment of scientific research achievements involves a number of assessment indexes, each index which can be divided into multiple levels and classes. These levels and classes are difficult to express by precise numbers. They often have the properties of fuzziness and complexity. So we can express these indexes by fuzzy numbers.

For the evaluation of the books and papers of social scientific research achievements, all levels of evaluation index are presented as follows [1].

u_1 Degree of innovation

It is used to measure the study depth for the papers in the field of research. It includes two level-two indexes, i.e.,

u_{11} Theoretical innovation. It refers to propose the most important theoretical views. By using the new argument to enrich and perfect a certain doctrine or theoretical perspectives.

u_{12} Method innovation. It means to present new research method, and make new analysis and generalization on important areas or important issues.

u_2 Complete degree. It means to measure the credible degree of paper data, research methods, theoretical premise, concept and logic, and the standardization degree of references. It includes three level-two indexes, i.e.,

u_{21} Reliability: It means that the theoretical premise is scientific, the data is accurate and full, and the research methods are science and appropriate.

u_{22} Logicality: It means that the concepts are clear and logical.

u_{23} References standardization. It means that all references are normative, all information sources of cited data and views are clear.

u_3 Difficulty level: It is used to measure the difficulty of the papers in the research breakthroughs and data collection and processing.

u_{31} Difficulty of research. It means that the issues are very complicated, or theoretical difficulty is more, or disciplinary foundation is weak.

u_{32} Difficulty of data collection and processing. It means that the data collection and processing is very difficult.

u_4 Achievement value. It is used to measure the role of paper on academic development and social development.

u_{41} Social value: It refers to the contributions of development rules and internal contradictions by personal and social organizations' own self-practice and creation.

u_{42} Academic values. It refers to the creation, deepening, and development of the professional scientific theory which is affected by a particular achievement. It is reflected by some constructive suggestions on discipline construction by researchers' logical reasoning and demonstration.

u_5 The indexed and cited situation: It means that the indexed and cited frequency by SSCI, A and HCI, Xinhua Digest, and People University's printed materials.

17.3 Multiple Attribute Evaluation Model of Social Scientific Research Achievements

The evaluation problem of social scientific research achievements can be regarded as a problem of multiple attribute comprehensive evaluation. Here, we establish a multiple attribute comprehensive evaluation model based on fuzzy mathematics theory.

Fuzzy multiple attribute evaluation is a method to the evaluation of the comprehensive judgment of grade status with multiple attributes by using the fuzzy relationship synthesis principle, the specific steps are as follows.

1. Determine the set of social scientific research achievements which will be evaluated X, $X = \{x_1, x_2, \ldots, x_m\}$.
2. Determine the set of evaluation index system $U = (u_1, u_2, \ldots, u_n)$, where u_1: Degree of innovation; u_2: Complete degree; u_3: Difficulty level; u_4: Achievement value; u_5: The indexed and cited situation.
3. Determine the comments level set V, $V = (v_1, v_2, \ldots, v_t)$.

The common comment is $V =$ (highest, higher, high,…, low, lower, lowest) [2], or $V =$ (best, better, good,…, bad, worse, worst) [3]. When we evaluate one achievement, the estimation scale can be divided into a certain grades. For example, from the perspective of "expert decision", the estimation scale can be divided into four grades, i.e., "5 points", "4 points", "3 points", "2 points". So the comments level set can denote as $V =$ {5 points, 4 points, 3 points, 2 points}.

4. Establish the fuzzy relation matrix $R, R = \begin{pmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ r_{n1} & r_{n2} & \cdots & r_{\mathrm{nm}} \end{pmatrix}$, where r_{ij} is the relationship of administrative subordination from u_i to v_j, and $0 \le r_{ij} \le 1$. Generally, using the jury evaluation method to determine r_{ij}.

If there are h experts in juries, then for a certain social scientific research achievement, the relationship of administrative subordination from u_i to v_j can be expressed by

$r_{ij} =$(The number of members who classify u_{ij} as one grade in V)/h

5. Determine the evaluation attribute weight vector $A = (a_1, a_2, \ldots, a_5)$, A refers administrative relationship between the attributes and the social scientific research achievement.

We can use the method of fuzzy AHP to determine weight vector [4–6]. First, construct judgment matrix $D = \{r_{ij}\}_{n \times n}$, then solve the maximal characteristic root $\lambda_{\max}$ of D, and solve the characteristic equation $DX = \lambda_{\max} X$ and obtain the eigenvector $X = \{X_1, X_2, \ldots, X_n\}$ of characteristic root $\lambda_{\max}$. By normalizing $X = \{X_1, X_2, \ldots, X_n\}$, we get $A = \left(\frac{X_1}{\sum_{i=1}^{5} X_i}, \frac{X_2}{\sum_{i=1}^{5} X_i}, \ldots, \frac{X_5}{\sum_{i=1}^{5} X_i}\right)$

Before determining the final weight vector A, we must do the consistency test for D [7].

6. Select the composite operator of evaluation to synthesize A and R, we get

$$B = (b_1, b_2, \ldots, b_m),\ B = \mathrm{AOR} = (a_1, a_2, \cdots, a_5)\ \mathrm{O} \begin{pmatrix} r_{11} & r_{12} & \cdots & r_{14} \\ r_{21} & r_{22} & \cdots & r_{24} \\ \cdots & \cdots & \cdots & \cdots \\ r_{51} & r_{52} & \cdots & r_{54} \end{pmatrix},$$

$$b_j = (a_1 \underset{*}{\bullet} r_{1j}) \underset{*}{+} (a_2 \underset{*}{\bullet} r_{2j}) \underset{*}{+} \cdots \underset{*}{+} (a_n \underset{*}{\bullet} r_{nj}), \quad j = 1, 2, \ldots, 5$$

The common fuzzy operators are as follows.

a. $M(\wedge, \vee)$, where $\wedge$ is minimizing operation, and $\vee$ is maximizing operation.
b. $M(\bullet, \vee)$, where $\bullet$ is real multiplication, $\wedge$ is minimizing operation.
c. $M(\wedge, \oplus)$, where $\wedge$ is minimizing operation, and $\oplus$ satisfy $a \oplus b = \min(1, a + b)$.
d. $M(\bullet, \oplus)$, where $\bullet$ is real multiplication, and $\oplus$ satisfy $a \oplus b = \min(1, a + b)$.

Through comparative study, $M(\bullet, \oplus)$ is the best operator among these four operators

7. Analyze the results of fuzzy comprehensive evaluation.

When the numbers of evaluated social scientific research achievements are two or more, to choose an optimal one from a number of social scientific research achievements is called decision-making method of multi-objective fuzzy comprehensive evaluation. The basic steps are as follows.

Step 1 Make the multiple attribute comprehensive evaluation for each social scientific research achievement by using above method of fuzzy multiple attribute evaluation

Step 2 Quantify the comments level set V, and compute the membership degree of all achievements. Let the comments level set be $V =$ {5 points, 4 points, 3 points, 2 points}, then the membership degree of the k-th social scientific research achievement is

$$N_k = B_k V^T = (B_k^1, B_k^2, B_k^3, B_k^4) \cdot (5, 4, 3, 2)^T = 5B_k^1 + 4B_k^2 + 3B_k^3 + 2B_k^4.$$

17.4 Evaluation Example of Social Scientific Research Achievement

From Sects. 17.2 and 17.3, the evaluation indexes for the evaluation of the books and papers of social scientific research achievements are presented as degree of innovation, complete degree, difficulty level, achievement value and the indexed and cited situation, and the estimation scale can be divided into four grades. Suppose that the judgment matrix $D = \{r_{ij}\}_{n \times n}$ are given by juries as follows.

$$R = \begin{pmatrix} 0.04 & 0.35 & 0.39 & 0.22 \\ 0.09 & 0.17 & 0.35 & 0.39 \\ 0.26 & 0 & 0.30 & 0.44 \\ 0.39 & 0.09 & 0.22 & 0.30 \\ 0 & 0.43 & 0.35 & 0.22 \end{pmatrix}$$

and the evaluation attribute weight vector $A = (0.35, 0.35, 0.1, 0.1, 0.1)$, then we have $B = AOR = A = (0.35, 0.35, 0.1, 0.1, 0.1)$ O $\begin{pmatrix} 0.04 & 0.35 & 0.39 & 0.22 \\ 0.09 & 0.17 & 0.35 & 0.39 \\ 0.26 & 0 & 0.30 & 0.44 \\ 0.39 & 0.09 & 0.22 & 0.30 \\ 0 & 0.43 & 0.35 & 0.22 \end{pmatrix}$

By using $M(\bullet, \oplus)$ operation, we get $B = (0.11, 0.23, 0.35, 0.31)$. From this result, this achievement should be rated as the third prize.

Now we suppose there are two achievements, they are denoted as achievement 1 and achievement 2. The evaluation result of achievement 1 is $B_1 = (0.11, 0.23, 0.35, 0.31)$.

For achievement 2, the judgment matrix is given as

$$R_2 = \begin{pmatrix} 0 & 0.6 & 0.3 & 0.1 \\ 0 & 0.6 & 0.3 & 0.1 \\ 0.1 & 0.30 & 0.4 & 0.2 \\ 0.1 & 0.2 & 0.1 & 0.6 \\ 0.3 & 0.2 & 0.2 & 0.3 \end{pmatrix}$$

and the evaluation attribute weight vector is also $A = (0.35, 0.35, 0.1, 0.1, 0.1)$, so we get $B_2 = AOR_2 = A = (0.35, 0.35, 0.1, 0.1, 0.1) \begin{pmatrix} 0 & 0.6 & 0.3 & 0.1 \\ 0 & 0.6 & 0.3 & 0.1 \\ 0.1 & 0.30 & 0.4 & 0.2 \\ 0.1 & 0.2 & 0.1 & 0.6 \\ 0.3 & 0.2 & 0.2 & 0.3 \end{pmatrix}$

$= (0.003, 0.49, 0.28, 0.18)$

Now we suppose the comments level set is $V = \{5$ points, 4 points, 3 points, 2 points$\}$. Thus

$$N_1 = B_1 V^T = (0.11, 0.23, 0.35, 0.31)\,(5, 4, 3, 2)^T = 3.1,$$
$$N_2 = B_2 V^T = (0.003, 0.49, 0.28, 0.18)\,(5, 4, 3, 2)^T = 3.2.$$

So $N_1 < N_2$, which means achievement 2 is better than achievement 1.

17.5 Conclusions

In this paper, a new comprehensive quantitative evaluation model is presented based on fuzzy mathematics to evaluate the social scientific research achievements. This method has the advantages of scientific in decision principle, simple in computing, and easy to carry out in computers. Therefore, it has a great theoretic value and applied value in practice, and provides valuable decision references for the department of the scientific research management.

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Chapter 18
Research on the Measurement of Coupling Degree of Facing to Objects

Xianmei Fang and Xiaobo Gao

Abstract In the object-oriented system, the coupling is two objects asked of the interaction of the measure, the coupling depends on indirect object of the complexity of the mouth, citing or the point that the coupling enter and through what data the interface passes. So coupling is more complex software attributes in the object-oriented system. How to conduct objective and quantitative measure of the coupling and cohesion of the object has become a hot spot in the study of software engineering. This paper on the basis of deep analysis is dependent on relationships and properties between the class and object, considering again the measure of the class coupling is not only influenced by other class of attributes methods, in fact, it is also influenced by this class of attributes, methods, and based on this, having put forward a new measurement method of coupling. And then it has tested the effectiveness of the proposed method by experiments and provided a new concept for the measure of the object-oriented software coupling.

Keywords Coupling degree · Facing to objects · Method · Attribution

18.1 Introduction

The basic concept of coupling is to improve the basic goal of independence module, and it is also the important factor of influencing the quality of software. If you want to reduce the cost of maintenance software, you must decompose the software into modules as independent as possible, striving to reduce coupling and

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the complexity of the software so as to facilitate the comprehension, testability, reliability, and maintainability of the software [1].

The software is a combining site of structured coupling measure of the software design and object-oriented software design. Due to regardless of the structured software design or the object-oriented software design or high quality software design, one of many principles is following the principle of low coupling[2]. "High cohesion and low coupling" is one of the aims of software development. In order to objectively evaluate software module coupling, people put forward many measurement method and principles, which provided guidelines for those programmers who developed low coupling module or object.

18.2 The Methods of the Coupling Measure

There are a variety of methods of the coupling measure, they were: object class of the coupling between the response of the class, message transfer coupling, data abstraction coupling, in-fan and out-fan coupling, coupling factor, and the coupling based on the flow of information and put forward by Briand, etc. Some main couplings are:

Coupling between object classes (CBO) is expressed by the following formula [3]: $\mathrm{CBO}(C) = \{D|\mathrm{uses}(C, D) \vee \mathrm{uses}(D, C)\}$

Methods attribute or examples in the class of Y are used in the process of realization of USES (X, Y) definition class X.

The Response of RFC (Response for Class): RFC $(c) = |\,\mathrm{RS}\,|$, including RS is the response of the class c for news set. RS $= \{M\}\ U\ \{\mathrm{Ri}\}$, $\{M\}$ is the method of collection of the class, {Ri} is the method sets by i directly calling.

Data abstraction coupling (DAC) is expressed by the following formula:

$$\mathrm{DAC}(c) = \{a|a \in A_t \wedge T(a) \in C\} \tag{18.1}$$

At (x) is the sort of the realization of the x attribute set among them—that is the class of the non-inherited members x. At (x) is the sort of x attributes set, T (x) is the definition of x attribute types, and C is the set of all class system [4].

The coupling factor (COF) is used for measuring system coupling,

$$\mathrm{COF} = \frac{\sum_{i=1}^{TC}\sum_{j=1}^{TC} \mathrm{is\ client}(c_i, c_j)}{TC^2 - TC - [2\sum_{i=1}^{TC} |\mathrm{Descendents}(c_i)|]} \tag{18.2}$$

Isclient (c_i, c_j) means that c_i calls to the kind of c_i methods or properties, if c_i at least calls to the methods or properties of c_j, and c_i, and c_j are non-inheritance relationship, the isclient (c_i, c_j) value is 1, with value 0 in other conditions. Descendents (c_i) said the derived class c parents class set, and TC2-TC equals having a kind of system of TC maximum coupling [5].

Although these metrics methods and standards reflects the comparatively thorough research in the class cohesion degree measure, but it still exists in executive class coupling measure that classic measurement standards and methods treat all properties and methods without distinction but as the same, which causes that the quantity of coupling can not correctly reflect the real situation. In addition, the classic measurement standards and methods only consider the correlation between the attribute and the method in all kinds of system, but ignore the influence of the class of these properties and methods to coupling measure in categories, which can not reflect the actual situation of coupling.

18.3 The Qualitative Measurement Framework of Coupling Relationship

In the object-oriented system, coupling mainly measures from the design document and the source code of the static cent fold and from dependent relationship between categories. The typical metric frames are three categories [6]:

1. Two different types of association put forward by Eder, respectively is:

   The association between interaction of methods, which is produced by sending of message;

   The component association. Each object has a unique identifier, object o can quote object p. Through the identifier of object *p*;

   The association of inheritance between categories.

2. Hitz and Montazen put forward that the decoupling measures are divided into two levels according to the state of an object and the state of realizing the object, respectively is:

   Level of CLC coupling. CLC means the coupling between the two classes of a dependent state in the system survival cycle.

   The object class coupling OLC. OLC means the coupling between two objects of a dependent state in the system operation process.

3. The coupling measure between the interaction of categories proposed by Brland. The type of coupling strength between the interaction, the component of class connections and conflicts of tracks; the type of interaction determined the coupling mechanism of two kinds, including the interaction between type and attribute, the interaction between type and method, and the interaction between method and method; And connections between categories can be inherited, friendly and other; Collision course includes lose and output.

LLC is a software program structure of measurement modules connected between the degrees of a kind of measure. Coupling grade depends on the module of the complexity of the interface, going into or calling to the locations and

methods of the modules, and the amount of data transmitted through the interface. In the design of software, we should pursuit coupled system as loosened as possible. Owing to the design, testing, and maintenance of any module in this kind of system is relatively independent. Because the contact between modules is less, so the possibility of errors spread between modules is smaller. The coupling degree between the modules directly affects the intelligibility of the system, as well as the testability, reliability, and maintainability. The following are the definition and explanation of some concepts used in this paper [7]:

Making affect (C) represents the part that program P (including internal and external of C) had influence on the attributes and methods of C, affected-by(C) represents the part that the program P (including internal and external of C) was affected by C, among which, C is the basic component of the program P, and it can be a class (or object), interface, and bag: [8].

$$\begin{aligned} \text{affect}(C) &= \{c | c \text{ affect } C, \quad c \in P\} \\ \text{affected} - \text{by}(C) &= \{c | c \text{ is affected by } C, \ c \in P\} \end{aligned} \tag{18.3}$$

When calculating coupling, in the past, we only considered the external influence of components, and actually this is not comprehensive. The influence of the component members actually comes from both the external and the internal, so we must consider it comprehensively [9].

18.4 The Measurement Tools, Implementation, and Calculation

18.4.1 The Source Code Analysis

Data are key part of the successful measure tools. The source code analyzer's main function is extracting software code information through lexical analysis and grammatical analysis. Lexical analysis is a subroutine of grammatical analysis, grammatical analysis identifies a mark when calling to lexical analysis each time, and determines the grammar structure of the program according to this mark, and stores it in memory so as to realize the automatic collection of measurement data. Of course, this is not all the information to be used in future measure computation, we only store the useful data information in the middle information base.

18.4.2 The Middle Information Base

The role of middle information base is used to store directly useful information in measure computation, so it can provide all the information of entities and

relationships that is needed in measure computation. The establishment of the middle information base can be classified into two parts:

The establishment of the conceptual model The conceptual model is the function description of the middle information base, and it has decided the scope of knowledge obtained from this information base. The source code is nothing more than two part of information, namely, entity and relationship. The entity refers to the components of program composition, and the relationship is the composition structure among them. In the object-oriented program, coupling mainly refers to the degree of interdependence among the objects. So for the coupling measure, the entities and relationships that we can identify are as follows:

1. The entity-system (s), class/type (C/T), method (M), and attributes (A):
2. The relationship-system and class (s.c), system and method (s-M), system and attribute (s-A), class and method (c-M), classes and properties (c-A), and methods and properties (M-A), the relationships of composition are shown in Fig. 18.1.

From Fig. 18.2, we can see that a system is made up of class, global method, and global variables (property); A class consists of its member function and data members. The system coupling, that is, the interdependence between classes is generated by the calling and citing between classes and methods, classes and properties, and methods and methods. Therefore, in the system and class (S-C), we should recognize which kinds or types is the system made up of; and identify which global methods is the system composed of in the system and method (s-M); in the system and attribute (s-A),we should recognize which global variables is the system composed of; in the class and method (c-M), we should identify which

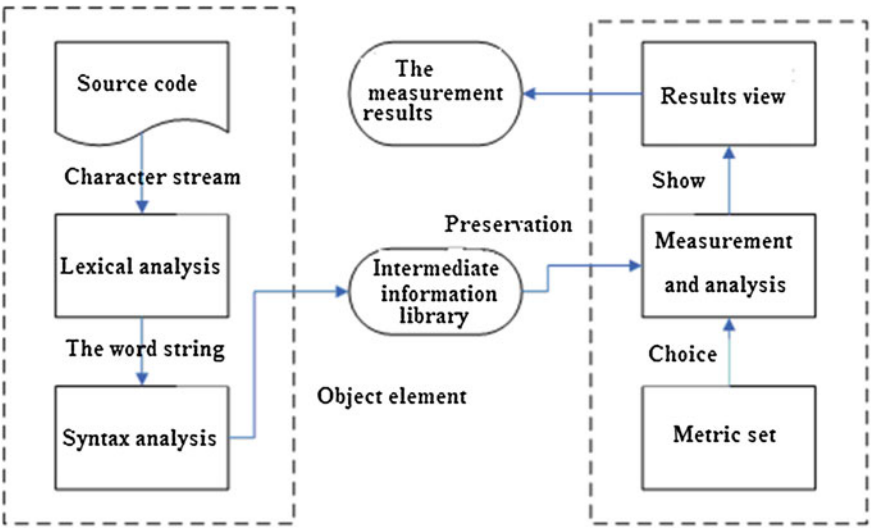

Fig. 18.1 Operation tools

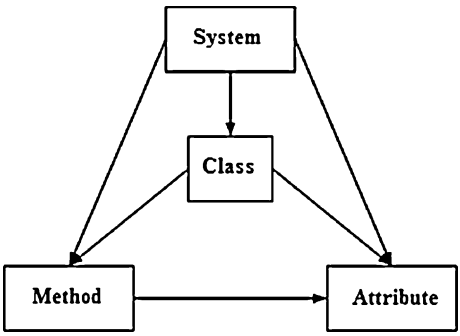

Fig. 18.2 The relationship diagram of entity composition

methods of members in different nature is the class composed of and the calling relationship between classes and methods.

The pattern design Due to the information stored in the middle information base needs to be directly used in the calculation and analysis of the measure results, it requires shielding the difference between different languages. Therefore, after the grammatical analysis of the source code, we have to store information in an unified structure in the middle information base.

According to the established conceptual model, the information stored in the middle information base should include three parts: the basic information of the project, the information of global entity project (including the global method and variable of the system definition), information of class definition (including the methods stated in classes and the basic information of member variables), the information of realizing method, and the basic information of the project records the basic attribute information of the project, such as the name of the project, the basic information of the global method and the global variables in the record system of global entity information, the basic information of realizing information record methods with the method, and the information of the calling of methods and variables, etc.

18.5 Experimental Measurement Data Analysis

First, the definition of the object system between weighted coupling [10]:

$$\mathrm{WCBO}(S) = \sum_{C \in S} \mathrm{WCBO}(C) \tag{18.3}$$

Then, the definition of the weighted CBOs:

$$\mathrm{WCBO}(C) = \sum_{c \in C} \omega_i |\{D|\mathrm{uses}(c, D)\}| + \sum_{b \in C} \lambda_i |\{A|\mathrm{uses}(A, b)\}| \tag{18.4}$$

Table 18.1 JUnit source code metrics of coupling

Class name	Software version	Measurement results
Base test runner	JUnit3.4	0.4105
	JUnit3.5	0.3708
	JUnit4.4	0.3423
Test result	JUnit3.4	0.1462
	JUnit3.5	0.1344
	JUnit4.4	0.1123
Test case class loader	JUnit3.4	0.3562
	JUnit3.5	0.3439
	JUnit4.4	0.3323

Next, the weighted coupling standardization (normalized) can be defined, and standardized weighted coupling $\mathrm{WCBO}(C) = \frac{\mathrm{WCBO}(C)}{|\{D|\mathrm{uses}(C,D)\vee\mathrm{uses}(D,C)\}|}$

The method of using examples with formula (8) is to a practical software for measurements of the class. JUnit is recognized by the experts in the field of object oriented Kent. Beck and Erich. Gamma develops an open source tools in cooperation. JUnit 3.5 JUnit 3.4 in the basis of reconstruction for many times, functions, and software quality are improved. Also JUnit4.4 and JUnit3.5 are conducted on the basis of the reconstruction of many times, functions, and software quality is improved. We choose JUnit3.4, JUnit3.5, and JUnit4.4 with weighting method of coupling JUnit the source code of base test runner, test result, test case class loader for coupling of measure. Results are listed in table 18.1

The metrics data comparison shows that, with the increase of version, the software of coupling has declined. Namely, the software quality is higher, which is in line with practice. Obviously, the new method WCBO indeed is accurate, comprehensive, and effective.

18.6 Conclusion

In an object-oriented program, coupling is kind, objective, and the interdependence of the components. In this paper, the existing famous kind of coupling measure is further analysis which points out the existing defects and deficiencies. On the basis of the comprehensive analysis of the class attribute and properties, methods and properties, and further methods and the relationship between the method and its property, it points out that a kind of coupling is not only affected by other classes' attribute and measure in fact, it is also affected by this classes' attribute and method. The factors should be considered comprehensively, therefore, a new measurement method-WCBO (Weighted CBO classes is put forward). Then, measuring the coupling of JUnit with a new measurement method of open source software, we can see the new method is comprehensive, accurate, and valid through the experimental data. This paper puts forward a new coupling

measurement method on the basis of deeply analyzing the dependent relationships and properties between the classes and objects. And then, the effectiveness of the method is verified through the experiment, which provides the theory basis for the object-oriented software coupling measure.

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Chapter 19
Semantic Description Framework of Product Concept Based on How Net

Lin Yu, Zhengming Zhang and Lie Zhao

Abstract To reduce ambiguities and misunderstandings in product design and promote information communication, this paper attempted to utilize and combine the intuitiveness of visible model and the richness of product concept in semantic, proposing a semantic description framework based on How Net. The framework could comprehensively take structure, function, and behavior into account. Application-specific dictionary construction method was proposed to prepare standard taxonomy for the framework; then the framework is finally established through the dynamic roles in How Net. Using a central wing panel assembly fixture as an example, the effectiveness of the framework was verified.

Keywords Semantics description framework · Product concept · How Net

19.1 Introduction

Generally speaking, there are two most direct representations of product in modern product design: visible models and invisible naming concepts (referred to "product concept" for short). Product concept implies abundant engineering semantic information, including function, behavior, structure, etc. [1, 2]. By applying

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constructive strategy, How Net builds concept definition with a closed sememe set, organizing the concepts which are static and isolated into a network structure by adopting dynamic concept descriptions [3, 4]. The constructive strategy of How Net allows for defining concepts expressed by Chinese characters as they are one-syllable words, the meaning of which could be conveyed [5]. This paper hence proposes a concept semantic description framework for product design based on How Net, integrating the structure, function, and behavior of products in a unified way [6].

19.2 Introduction of How Net and Product Information Model

19.2.1 How Net

In How Net, the semantic of words are described by "concept" and a word could be expressed as several concepts. The minimum meaning unit of a "concept" is "sememe". How Net designs the knowledge database markup language (KDML). KDML adopts semantic expressions to describe knowledge through a series of restrictions and symbols. With the help of "dynamic role" in How Net, semantic expressions describe the complex relationship between "concept" and "sememe", forming a complicated network structure.

19.2.2 Product Information Model

Product information model is the base for establishing the semantic description framework of product concept, which clarifies the roles of elements and the relationships between them in the description framework [7]. The product design process is generally driven by functional requirements and targeted by obtaining the structures which meet the function needs; On the other hand, the purpose of the structures is to represent some certain products, the shape and size of which are required for accomplishing the functions of products; while the satisfaction of such demands is realized by some certain behaviors (indicates "how to realize the function of the structures"). As function and behavior of products are usually implicit, the structure becomes the only one which could be seen intuitively among the three; meanwhile, except for the representation in the visual aspect, the structure is able to convey information through the term which names it. Therefore, the terms which are used to name products are also regarded as a part of product information in this paper. For establishing semantics description framework of product concept, the paper focuses on two aspects:

1. Determine the taxonomy which are universally recognized in relevant field and guarantee correct semantic analysis of product concept by establishing "taxonomy dictionary" for design with the help of How Net.

2. Establish semantic description framework of product concept based on standard taxonomy.

19.3 The Development of Taxonomy Dictionary in Product Design Field

The development of taxonomy dictionary mainly focuses on the retrieval of sememes. According to the product information model, the taxonomy dictionary in product design will mainly include dictionaries in the domain of structure, behavior, and function. As behavior and function usually relate with each other, the taxonomy dictionaries of the both are merged here, which are collectively called function/behavior taxonomy dictionary. Generally speaking, structure, behavior, and function all have corresponding attribute and attribute value, so corresponding taxonomy dictionaries of these attributes and attribute values should be established as well.

19.3.1 Structure Sememes

Structural information is the core in product information model. In 3D product design platform, product structure includes two aspects: organization structure and geometry structure. As it is hard to form an independent semantic structure unit by those geometry elements such as point, line, and face, the taxonomy dictionary of geometry structure in the paper mainly focuses on geometrical features.

In order to obtain the specific structure sememes from the product design, this paper puts forward some guiding principles as follows:

1. For the terms which have been generalized out by experts and used as basic component classes, the closer they are away from the root nodes in the classification tree, the higher priority they will have to become sememes; otherwise, the lower priority they will have.
2. Specific terms could be considered as sememes.
3. Those terms which are synonyms of sememes (such as “fixtures”, “technological equipment”, etc.) could be regarded as sememes.

19.3.2 Function/Behaviors Memes

Function/behavior terms belong to “event” in How Net. Sememes of event class are mainly used to describe inter-concept relations as well as inter-attribute relations. There are more than 1,700 sememes of event class in How Net, which could

basically meet the requirements in product design. In order to obtain the specific function/behavior terms in product design, the paper proposes several guiding principles too, which is similar to the structure sememe:

- Terms of function basis could be considered as sememes.
- Those terms which are synonyms of sememes.

19.4 Semantics Description Framework of Product Concept

Terms which are used to name products could be described in a standard way after obtaining the sememes in product design. The semantic description framework of product concept establishes semantic relationships of terms through making use of the relationship of function, behavior, and structure. This paper defines the description framework of the terms which name products in How Net as follows:

DEF = {Structure Type | type of structure: {behavior | behavior}, {function | function}, {attribute | attribute}}.

Function/behavior description framework is mainly used to express the semantics of verbs. According to the theory of role framework of How Net, function/behavior description framework should reflect those roles which may involve in the events described by the framework, such as the purpose of function/behavior, the agent of behavior, the instrument, the patient of behavior, and the relevant attribute.

DEF = {Type | Type: purpose = {*}, agent = {*}, instrument = {*}, patient = {*}, attribute = {}}

19.5 Examples

This paper explains the semantic description framework by taking the assembly fixture of an aircraft central wing panels as an example.

Taxonomy dictionary is the basis of establishing semantics description framework of concepts in this paper. Based on the construction methods of taxonomy dictionary mentioned before, this paper establishes corresponding taxonomy dictionaries for structure, function/behavior, and attribute in Protégé according to the knowledge of the aircraft tooling design and some general knowledge in mechanical design. As shown in Table 19.1.

Table 19.1 Descriptions of main nomenclatures in fixtures

Term	How Net describe
Aircraft central wing panel	DEF = {fixture, purpose = {install: location = {~}, patient = {part: whole = {part: Part position = {centre}, whole = {wing}}}}
Bone base beam	DEF = {part: Isa = {beam}, Part Position = {base}, whole = {bone}, modifier = {horizontal}}
Bone column	DEF = {part: Isa = {column}, whole = {bone}, modifier = {vertical}}
Bone beam	DEF = {part: Isa = {beam}, Part position = {capstone}, whole = {bone}, modifier = {horizontal}}
Clip board subassembly	DEF = {subassembly: purpose = {position: agent = {locator}, cogent = {auxiliary device}, patient = {product}, instrument = {~}}{clamp: agent = {locator}, cogent = {auxiliary device}, patient = {product}, instrument = {~}}}
Channel steel	DEF = {Profile: material Of = {beam}}
Sleeve	DEF = {sleeve: purpose = {fasten: patient = {ear}, location = {~}}}
One aperture ear	DEF = {ear: Of part = {aperture: quantity = {one¯}}}
Reinforcing plate	DEF = {stiffener : purpose = {strengthen: patient = {?}, method = {~}}}
Long ear	DEF = {ear: modifier = {long}}}
Two big ear	DEF = {ear: of part = {aperture: quantity = {two}}, modifier = {big}}
Screw sleeve	DEF = {sleeve: purpose = {protect: patient = {screw}}
Stent	DEF = {part: purpose = {prop up: patient = {?}}, part position = {base}, whole = {implement}
Left mainstay	DEF = {mainstay, purpose = {prop up: patient = {?}, instrument = {~}}, modifier = {lefl}}
Right mainstay	DEF = {mainsta: purpose = {prop up: patient = {?}, instrument = {~}}, modifier = {right}}
Top beam	DEF = {part: Isa = {beaml}, part position = {capstone}, whole = {bone}, modifier = {horizontal}}
Clip board	DEF = {locator: purpose = {position: part of touch = {part: part position = {skin}, whole = {product}}, modifier = {form value: board}}
Form value bolt	DEF = {bolt: modifier = {form value}}
Double screw bolt	DEF = {double screw bolt}
Lugs	DEF = {tool: purpose = {join: instrument = {~}, patient = {locator}}}
Knurled nut	DEF = {nut: {knurled}}
Front locator	DEF = {locator: purpose = {position}, modifier = {Form Value: block}{front}}
Angle section	DEF = {Profile}
Position Subassembly	DEF = {subassembly: purpose = {position: agent = {locator}, cogent = {auxiliary device}, patient = {product}, instrument = {~}}
Shape locator	DEF = {locator: purpose = {position: part of touch = {part: part Position = {skin}, whole = {product}}, modifier = {form value: block}}
Binding clasp	DEF = {clamper: purpose = {clamp agent = {~}, patient = {product}, instrument = {~}}, modifier = {fast}}

(continued)

Table 19.1 (continued)

Term	How Net describe
Substructure	DEF = {part: purpose = {Prop Up: patient = {?}}, Part Position = {base}, whole = {implement}}
Handle	DEF = {fittings: whole = {implement}, purpose = {alter state good: state fin = {difficult}, state in = {easy}, content = {operation}}
Compression bar	DEF = {part: whole = {implement}, purpose = {press: patient = {?}, method = {lever}}}
Pin	DEF = {pin: purpose = {fasten: instrument = {~}}}
Washer	DEF = {washer: purpose = {spread: patient = {force}, instrument = {~}}}
Bolt	DEF = {bolt: purpose = {join: partner = {nut}{washer}, patient = {?}}}
Cushion block	DEF = {cushion block: purpose = {prop Up: patient = {?}, instrument = {~}}{spread: patient = {force}, instrument = {~}}, modifier = {thick}}

19.6 Conclusion

With the purpose of improving the information communication in product design and reducing semantic misunderstandings and ambiguities, this paper proposed semantic description framework of product concept, based on How Net. The framework simultaneously took the structure, function, and behavior of products into consideration, which was beneficial to combine the intuitiveness of visible model with the rich semantic of concept. Based on product information model and How Net, we established taxonomy dictionaries of structure, function/behavior in product design, and built the semantic description framework of product concept by adopting dynamic roles in How Net, according to the relationship of function, structure, and behavior. Finally, this paper described the concepts of the names in assembly fixtures of an aircraft central wing panel certainly, using the taxonomy dictionaries and semantic description framework which have been established, verifying the feasibility of the technologies proposed.

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Part III
Data Mining and Applications

Chapter 20
Research of Data Mining in Customer Relationship Management

Ying Wang and Ting Zhou

Abstract According to the concept of data mining and customer relationship management (CRM), we clarified the connotation of CRM based on data mining first. Further, based on the core ideology of solutions in CRM and typical mining methods of data mining, we constructed the system structure of CRM based on data mining from four aspects that are customer contact, data storage, data mining, and business application. Among them, the data mining plays the core role. Next, combined with the characteristics of CRM and data mining, the realization process and implementation steps of data mining in CRM have been revealed. Later, including but not limited to new customer obtaining, customer subdivision, cross marketing, customer retention, and customers' profitability analysis, we discussed the application direction of data mining in CRM. Finally, we concluded the application value and significance of CRM based on data mining.

Keywords Data mining · Customer relationship management · CRM · Data warehouse

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20.1 The Connotation of Customer Relationship Management Based on Data Mining

Data mining (DM) is the process that draws information and knowledge which are hidden, prior-unknown but potential-useful from practical data which are abundant, incomplete, noisy, fuzzy, and random [1]. It is the application of technologies like artificial intelligence and model identification in data base.

By systematic customer research, effective resource integration and comprehensive business process management, customer relationship management (CRM) that is primitively proposed by Gartner Group can preferably serve, attract, and maintain customers, which will contribute to the realization of maximizing customer yields in enterprises [2].

The connotation of CRM based on DM is to build a huge data warehouse which contains abundant information of markets and customers first. Then based on the customer data warehouse, we draw valuable customer information and find potential markets and customers by various technologies of DM, which will help to increase customer satisfaction, improve customer relations, and obtain market competitive advantages and higher commercial profit.

20.2 The Connotation of Customer Relationship Management Based on Data Mining

20.2.1 The Core Ideology of Solutions in Customer Relationship Management

The essential idea of CRM is to build learning relationship between customers and enterprises. From the contact with customers, the CRM system can obtain problems encountered by customers and good suggestions about their products. In the process of dealing with problems, important information of customer's name, address, personal preference, and purchasing habit are acquired in the meantime. Based on the information, one-to-one personalized services are offered and new market demand is created [3].

In general terms, CRM is composed of trigger center and mining center. The trigger center refers to the communication between customers and CRM system by various channels like call center, fax, web, and email. The mining center refers to the intelligent analysis of customer data, which is conductive to enterprises' decision making.

Therefore, an effective solution of CRM is required to possess the following elements: smooth channels of customer communication (Trigger Center), effective analysis of customer data (Mining center) and fine integration of CRM, and enterprise resource planning (ERP).

20.2.2 Typical Mining Methods of Data Mining

People expect to construct different modes in accordance with different decisions. According to the partitioning methods of IBM, in line with the difference of established data modes, the analytical methods of DM are divided into the following four types:

The first type is correlation analysis which uses the association rules in DM. The purpose of correlation analysis is to excavate the relationship hidden among data. Analyzing product relevance and customers' purchasing behavior will assist enterprises' decision making [4].

The second type is sequence mode analysis. It focuses on analyzing the before and after sequence relationship between events, such as "If a customer firstly bought A, after a period of time, he bought B and then bought C" will form the customer's "A–B–C" behavior pattern.

The third type is classification analysis. Through analyzing sample data in customer data base, classification analysis will make accurate description for each category or raises classification rules. Then other customers' records will be classified on the basis of the classification rules [5].

The last type is cluster analysis. Based on the relevance between the selected sample, cluster analysis divides the whole data base into different clusters. The main purpose of cluster analysis is to make the congeneric customers have high similarity and the inhomogeneous customers have huge otherness [6].

20.2.3 The Construction of System Structure of CRM Based on Data Mining

Combining the essential idea of CRM with the application value of DM, we establish the system structure of CRM based on DM. As shown in Fig. 20.1, the system structure is composed of customer contact, data storage, DM, and business application. Among them, customer data is the foundation, DM is the key, and business application is the purpose [7].

Customer contact refers to a variety of channels like call center, web, email, fax, and telephone through which enterprises get touch with customers. It is not only an effective way to obtain customer information, but also the final embodiment of the practice of CRM in enterprises.

Data storage refers to store customer data gained from customer contact. The selected customer data are to be preprocessed before data storage. The ways of data storage in CRM mainly contain data base, data warehouse, data mart, and other approaches [8].

Based on data collection formed in data preparation, DM will excavate information to discover knowledge and patterns hidden behind massive customer data which are useful for CRM. It is the core of CRM based on DM. Besides,

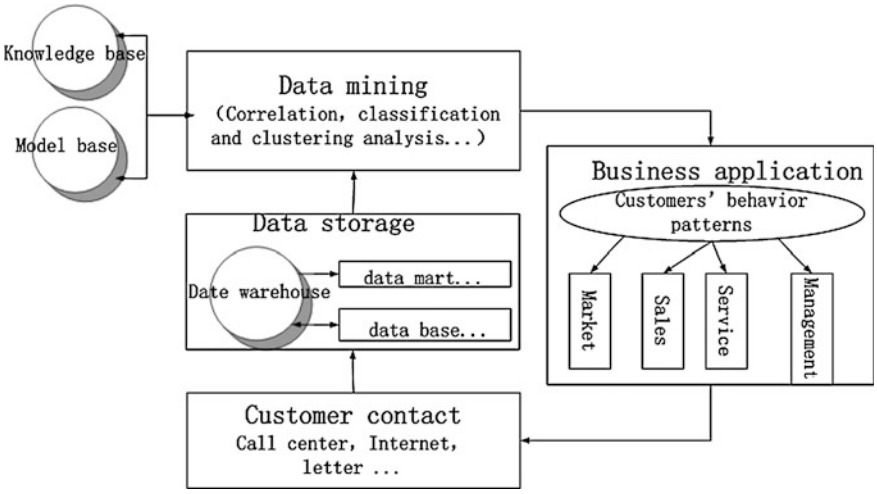

Fig. 20.1 The system structure of CRM based on data mining

interaction with knowledge base and model base is going on during DM, which means valuable information in the knowledge and model base are utilized to support DM and new excavated knowledge and model will be saved in relevant base to perfect the bases.

Before discovered knowledge are put into business use, various database development tools and visualization tools like JAVA, ASP and VB are utilized to form good human–machine interface, which will be much convenient for users. Then customers' behavior rules, patterns, and other knowledge are respectively transmitted to departments of marketing, sales, service, and management.

In general, customer information is collected by customer contact center. Then the collected data will be preprocessed and placed in data warehouse for data storage. Next extraction transformation loading (ETL) and online analytical processing (OLAP) technologies are used to deal with customer data. According to the predetermined business target, corresponding models of DM will be established to excavate information. Finally, excavated behavior pattern of customers will be applied in business to adjust business operation and enhance customer services. Thus, we will realize the application of DM in CRM [9].

20.2.4 The Realization Process of Data Mining in CRM

From different perspectives, the realization process of DM in CRM can be divided into two categories generally. One is the process of DM with technology as center. The other is the process of DM with business as center. In this research, we consider the latter will be more helpful for the achievement of effective CRM based on DM.

As shown in Fig. 20.2, the process of DM with business as center focuses on the definition of business problems, return on investment (ROI) and the understanding of data. Therefore, this DM process mainly describes the definition of data and ROI form business application perspective. Then the application of description of DM and the model of prediction will proceeds, also the ROI will be predicted. Finally, according to the mining results, we configure mining mode and test real ROI.

Since CRM is both a management mechanism and a management technology, the realization of it contains not only business problems, but also technology problems. As a result, the application of DM in CRM should make comprehensive consideration from technology and business aspects.

20.2.5 The Implementation Steps of Data Mining in CRM

The integration of DM and business system of CRM is the core of intelligent CRM. After DM analyzing each department data automatically, analysis results are applied to business system. The implementation of CRM based on DM is a circularly dynamical and adjustable process. Based on the realization process of DM in CRM mentioned above, the implementation of DM in CRM primarily has the following steps [10] (Fig. 20.3):

First of all, enterprises shall understand projects' objectives and demands from the business perspective. Then the knowledge will be transformed into a problem definition of DM. Besides, the application type of the problem should be explicated and the preliminary plan should be given out.

After the explication of application type of business problems, elementary data are to be collected. Various activities like recognition of data's quality problems, assumption of hidden information are put into effect to examine the interested data subset.

Previously selected data should be preprocessed before DM. A series of necessary pretreatment works like conversion, cleaning, and merging shall be done on

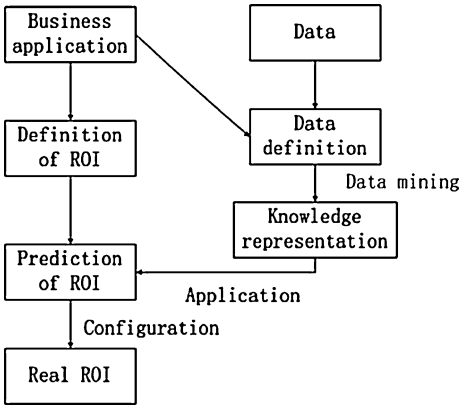

Fig. 20.2 The process of data mining with business as center

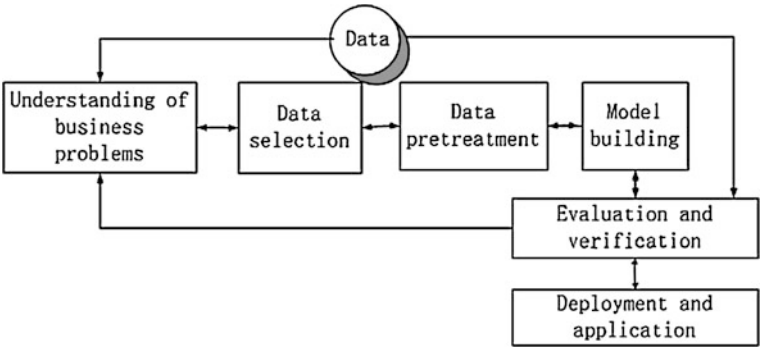

Fig. 20.3 The implementation procedure of data mining in CRM

selected data, which will eliminate data noise and increase data's completeness, accuracy, and reliability. The data pretreatment is made up of data access, data sets creation, and data cleaning.

In according to determined business target, based on the data pretreatment, training data, and test data are set up after selecting corresponding DM technologies and methods. Combining the training data with relevant algorithm, models and model interpretation will be built, which is the key of DM.

Next, use the test data to evaluate and verify established models. If anticipated goals are not achieved, the process will return to the model building or data selection. Repeat related process until satisfied models are found. What's more, if business targets deviate from the reality, primary definition of business targets should be reconsidered.

Satisfied models can be deployed and applied in enterprises to offer support for decision making ultimately. At the meantime, the successful probability of the models should be tested during the application. If dissatisfied situations are found, models need to be amended and improved promptly.

20.2.6 The Application Direction of CRM Based on Data Mining

The application of DM technologies and methods will assist enterprises to manage customers in each stage of their life cycle. Combining the knowledge discovered by DM with CRM will realize new customer obtaining, customer subdivision, and other business application based on which individual service strategies are put to use. The application direction of DM in CRM includes but does not limit to the following aspects [11]:

New customers will be obtained. Keeping customers and obtaining potential customers are important means for the long-term development of enterprises. Potential customers will be recognized by establishing forecast models and

excavating classified customer information. Further, potential customers will turn to real customers with the help of targeted marketing activities.

Customer subdivision is the foundation of determining enterprises' products and services. Decision tree, cluster analysis, and other methods in DM are used to excavate abundant customer information in data warehouse. Customers are classified in accordance with their information like consumption custom, income and personal preference, which will make customers in the same market segment have similar preference and demand.

Cross marketing is the process that enterprises sell new products and services to regular customers. It is set up on the principle of win–win. Correlation analysis, clustering analysis and other methods are generally applied to cross marketing to achieve the best sales match.

According to statistics, the cost of obtaining new customers is much higher than maintaining regular customers. Thus customer retention, especially diamond regular-customer retention is of great importance to enterprises. Based on the features and behavior patterns of customer loss recognized by DM, positive and targeted measures are taken to prevent customer loss.

In addition, DM technologies are utilized to analyze changes of customers' profitability in different situations, which will facilitate implementing appropriate market strategies. Life cycle value model which is based on the classification and forecast technologies in DM will forecast customers' overall profits in predetermined time period.

20.3 The Significance of Customer Relationship Management Based on Data Mining

The DM technologies integrate data base, OLAP, and CRM to form OLAP tools based on DM, which will promote the management of the relationship between customers and enterprises. The application value and significance of the implementation of CRM based on DM mainly embody in the following four respects:

First, the achievement of intelligent information processing is apparent. Facing a mass of information, intelligent processing methods based on DM technologies like intelligent data analysis and intelligent decision support are introduced in CRM system. By discovering personalities and rules of customers' behaviors, beneficial commercial information which can furnish valuable references for enterprises' decision making will be successfully gained.

Second, personalized market service will be promoted greatly. The CRM based on DM will build learning relationship with each customer to deep understand customers. Depending on the ever-changing demands of customers, personalized marketing strategies, and customer service strategies will be provided to increase customers' satisfaction.

Third, the diversification and integration of communication channels will be improved commendably. The CRM based on DM puts customer data collected by various communication channels like email, call center, and Web together in the data warehouse of CRM system. Relatively complete and consistent data are the precondition and guarantee of effective DM and convenient communication.

Fourth, centralization and share management will smoothly come true. The CRM based on DM utilizes the data base or data warehouse whose main characteristic is sharing to store and manage whole customer information. Specially, the CRM based on DM not only seamlessly integrate the information of sales, marketing management,and customer service backstage, but also maintain the data's consistency, integrity, and coherence. It will contribute to supply with all-round customer service ultimately.

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Chapter 21
Management and Analysis Based on Data Mining

Han Zheng and Xiaobo Gao

Abstract As a kind of data analysis method and technology that finds out the potential information in a great deal of information, data mining has become the social focus. In the process of the information construction of the electric power industry, there is a great deal of historical data and it is urgent to apply the data mining technology to research and develop an analysis decision system to solve the key and prominent problems in the operation management of the power supply enterprises. This essay presents detailed comparison and analysis of the data mining algorithm. Based on the characteristics of the electric power management analysis, it focuses on discussing the clustering analysis algorithm. The electric power data management analysis system based on the data mining technology designed by this essay can process the data of mixed type and get good mining effect. The clustering analysis of the customer data of electric power can obtain good classifications and help to prediction customer's purchase behaviors.

Keywords Data mining · Electric power data · Management analysis · Clustering algorithm

21.1 Introduction

The fast development of the modern information technology leads an information wave globally. The channels to produce information are more and more. The information updates faster and faster. Hundreds of millions of data are produced in

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various sectors [1]. However, the development and application of the data in the database is mainly search inquiry with inefficiency. Additionally, a considerable amount of data has very strong timeliness. The value of the data lowers rapidly with the time. Although simple data inquiry or statistics can meet some low level needs, what the people need is to find out the general knowledge that has guiding significance for various decisions from large quantity of data resources. This knowledge highly summarizes and abstracts a great deal of the data. But there is lack of means to discover the hidden knowledge in the data, which results in "data explosion but lack of knowledge" [2]. With the widely use of the database and computer networks and the using of the advanced automatic data generation and acquisition tools, the amount of the data owned by people has been growing sharply and mass data emerges in an endless stream [3]. For example, every day, up to 10,000 of customer purchase data is stored in POS system in super markets; every hour, various synchronous satellites send 50 siga (kilomega) bytes remote sensing image data to the earth. Obviously, a great deal of information can provide convenience the people, but at the same time, it brings about a series of problems. For example, too much amount of information is too much for people to master and digest; it is hard to distinguish whether some information is true or not, thus, it makes it difficult to correctly apply the information; different information organization forms result in that it is hard to together process the information effectively. These changes cause the traditional database technology and data processing means cannot satisfy the requirements. The rapid development of the Internet also makes various resources in the internet exceedingly rich, making it is like looking for a needle in a haystack to search information in the internet.

21.2 Data Mining Technology

Data mining has the branch of broad sense and narrow sense. From broad sense, data mining means the procedure of discovering the hidden, internal, and useful knowledge or information from a great deal of information. From narrow sense, data mining means a key step in knowledge discover an important step for taking useful model of establishing model.

The theory basis of data mining provides guidelines for developing and studying on it. As is known to all, the development and the exploitation of the data mining theory are related to many subjects. Data mining involves with machine learning, pattern recognition, statistics, intelligent database, knowledge acquisition, data visualization, high-performance calculation and expert system, and other fields. There have been many data mining products such as Business-object, SAS, Dbmines, and so on. Data mining is a kind of profound level method for analyzing the data. The idea platform for it (or called data inventory theory) is data warehouse (or data mart). People look the original data as the source to form the knowledge, like mining from the ore. The original data can be structured, such as the data in the database. It also can be half-structured, such as text, graph, image data, even the heterogeneous data distributed in the networks. The methods of discovering knowledge can be

mathematical and nonmathematical; can be syllogistic and inductive. The knowledge discovered can be used for information management, inquiry optimization, decision supporting and process controlling and so on. It also can be used for maintaining the data itself. Therefore, data mining is a general cross subject, which brings together researchers in various fields, especially the scholars and engineering technicians in the fields of database, artificial intelligence, mathematical statistics, visualization, and parallel computation and so on.

21.3 Data Mining Framework in Electric Power Data Management and Analysis

Data mining technique procedure is like mining or panning from the mine. Must determine where the gold mines for mining. Similarly, starting with the angle of practical applications, the whole data mining process must be based on the profound understanding the mining objects. Different objects require for using different data mining techniques. This essay combines the practical need in the electric power marketing system and establishes a data mining model as shown in Fig. 21.1.

21.4 Application and Realization of the Data Mining Algorithm in the Electric Power Data Management and Analysis System

Clustering analysis is a method to classify the data reasonably. It classifies the objects into groups or categories by certain rules. These categories are not given in advance but are determined based on the data characteristics. The target of

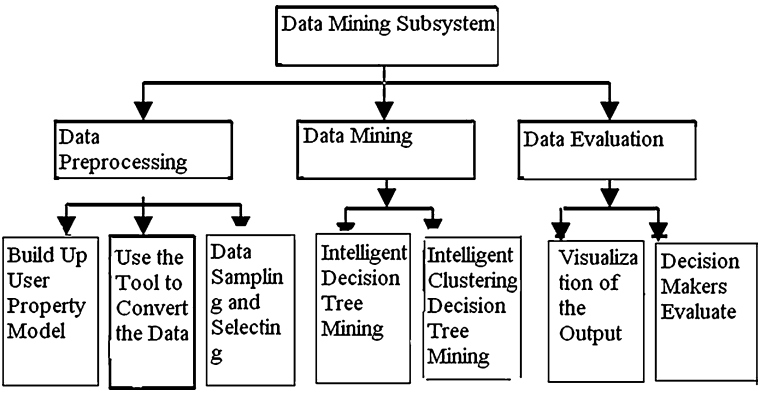

Fig. 21.1 Data mining model

clustering is to bring the data together into a category to minimize the similarity between the categories and maximize the similarity within category. The basic difference between classification problem (monitoring) and clustering problem lies in: in the classification problem, we know the classification property value of the training set, while in the clustering problem, we need to find out this classification property value in the training set. Clustering analysis is an important part of the multivariate statistical analysis. There have been multiple algorithms in the traditional statistical methods. With the emerging of the data mining technology, many algorithms have been put forward. At present, clustering analysis has been widely used in many fields, including pattern recognition, data analysis, image processing, and market study and so on.

Supposed that the data set is to be clustered includes n data objects. These data objects can be used to refer to persons, units, documents, countries and so on. Many inner-based clustering algorithms choose the two following typical data structures.

(1) Data matrix (or called the structure of the objects and the variables); it uses p variables (also called measure or property) to refer to n objects. For example, it uses age, height, weight, sex, and other properties to refer to the object "person". This kind of data structure is the form of the correlation chart, or can be looked as the matrix of $n * p$ (n objects * p variables).

$$\begin{bmatrix} x_{11} & \cdots & x_{1f} & \cdots & x_{1p} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ x_{i1} & \cdots & x_{if} & \cdots & x_{ip} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ x_{n1} & \cdots & x_{nf} & \cdots & x_{np} \end{bmatrix} \tag{21.1}$$

(2) Dissimilarity matrix (or called object–object structure): store the similarity between every two objects among n objects, the expression form is one $n*n$ dimensional matrix.

$$\begin{bmatrix} 0 & & & & \\ d(2,1) & 0 & & & \\ d(3,1) & d(3,2 & 0 & & \\ \vdots & \vdots & \vdots & \ddots & \\ d(n,1) & d(n,2) & \cdots & \cdots & 0 \end{bmatrix} \tag{21.2}$$

Here, $d(i, j)$ is the quantification expression of the dissimilarity between object i and object j. usually, it is a nonnegative value. The more similar or "closer" the object i and j are, closer to 0 is its value; more different the two objects are, larger

is its value. Due to $d(i, j) = d(j, i)$ and $d(i, i) = 0$, the simplified matrix above can be obtained.

The similarity means how similar the objects are. It is calculated based on the property value of the description objects. It is usually used to measure the similarity of the numerical variables. There are three common methods, as follows:

(1) Distance measurement: Murkowski distance is the standardized distance measure method in geometry problems.

$$\|x_a - x_b\| = \left(\left|x_{i1} - x_{j1}\right|^q + \left|x_{i2} - x_{j2}\right|^q + \ldots + \left|x_{if} - x_{jf}\right|^q\right)^{1/q} \tag{21.3}$$

When $q = 1$, it is called Manhattan distance; when $q = 2$, it is called Euclidean distance.

(2) Cosine measurement: use the angle between vectors or the cosine of the angle to measure the similarity.

$$s^{(c)}(x_a, x_b) = \frac{x_a^T x_b}{\|x_a\|_2 \|x_b\|_2} \tag{21.4}$$

One important characteristic of cosine measurement is not relying on the length of the vectors, namely when $a > 0$, it meets

$$s^{(c)}(ax_a, x_b) = s^{(c)}(x_a, x_b) \tag{21.5}$$

(3) Extending Jaccard coefficient similarity: duality Jaccard coefficient similarity is the ratio of the sharing property x_a AND x_b of the object and all the property x_a OR x_b they shall have. To extend it, obtain.

$$s^{(J)}(x_a, x_b) = \frac{x_a^T x_b}{\|x_a\|_2^2 + \|x_b\|_2^2 + x_2^T x_b} \tag{21.6}$$

21.5 System Design Analysis

This essay combines the practical situation of domestic electric power system and uses the advanced information technology to perform multi-layered, multi-angled and all-directional analysis and mining to design the electric power management and analysis decision supporting system. In this system, various data can be shown continuously, three-dimensionally and dynamically, which can be conveniently for

the managers to flexibly and fast extract and discover the useful information according to different demands to reveal the inner laws of the electric power markets and marketing, helpful for the managers to master at any time the electricity customer structure and customer characteristics. In this system, it mainly considers how to discover the information needed by decision according to the existing customer profiles. The problems of the electric power management and analysis that the data mining can solve include: market demand analysis and management, sale analysis of electricity power, important customer identification analysis, customer identification analysis, and comprehensive analysis of electric business and the analysis of other market behaviors.

Data filtering is that according to the content to be shown, choosing the smallest data set that meets the needs in which the noisy, polluted and incomplete data is to be eliminated. In this process, three aspects of the contents such as the time, angle, and original data are mainly considered. In order to reach certain purpose, people make an abstracted model for the prototype. In this system, the established model is that the original information is quantitatively and qualitatively analyzed and processed and then that it is converted into intuitive information to provide a basis for the decision makers to determine the best management decisions. Result shows the data in the established data model to the users to use by figurative ways. In which, the revolving pivot table which can complete getting and revolving functions shows the results quantitatively from the micro-aspect. While various statistic figures show the results from macro-aspect qualitatively. They also can complete the getting function.

In the process of realizing the electric power management and analysis system, lots of program codes are compiled, in which, the algorithm is realized through using JSP codes, partial codes are as follows:

```
//Defining local variables
Var zbz=Drop Down_zb. Item (Drop Down_zb. Selected Index);
Var per_a=Math.abs (TextBox_A.Text)/100;
Var per_b=Math.abs (TextBox_B.Text)/100;
Var per_c=Math.abs (TextBox_C.Text)/100;
Var per_d=Math.abs (TextBox_D.Text)/100;
//Setting figure facts
Active Document. Sections ["Customer Identification in Golden Period_ Total Sales Table"]. Facts. RemoveA11;
Active Document. Sections ["Customer Identification in Golden Period_ Total Sales Table"]. Facts. Add (zbz);
Active Document. Sections ["Customer Identification in Golden Period_ Area Figure"]. Facts. RemoveA11;
Active Document. Sections ["Customer Identification in Golden Period_ Area Figure"]. Facts. Add (zbz);
//Function
f_evaluate_theory_abcd (view, fact, result, order, per_a, per_b, per_c, per_d)
```

{Var i,j; Var exp; Var flag=1; Var pm_zyl=tem_ranking special col; Var pm_pml="ABCD rank col"; For (i=ActDoc. Sections [vie]. Columns. Count; >=1; i)…}

21.6 Conclusion

As a kind of data analysis method and technology that finds out the potential information in a great deal of information, data mining has become the social focus. In the process of the informatization construction of the electric power industry, there is a great deal of historical data and it is urgent to apply the data mining technology to research and develop an analysis decision system to solve the key and prominent problems in the operation management of the power supply enterprises. This essay presents detailed comparison and analysis of the data mining algorithm. Based on the characteristics of the electric power management analysis, it focuses on discussing the clustering analysis algorithm. The electric power data management analysis system based on the data mining technology designed by this essay can process the data of mixed type and get good mining effect. The clustering analysis of the customer data of electric power can obtain good classifications and help to prediction customer's purchase behaviors.

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Chapter 22
Network Security Awareness Modeling Based on Data Mining Method

Yunhong Guo and Guangyao Lu

Abstract In this paper, we analyzed the present problems and put forward the network security situation awareness framework based on data mining. The framework of network security situation by model and the whole process of the generation network security situation. We have described formal model for the construction of network security situation measurement based on d-s evidence theory, frequent mode, and sequence model extracted from the data on network security situation based on the knowledge found method and convert the pattern on the related rules of the network security situation, and automatic generation of network security situation figure.

Keywords Network security · Situation awareness · Data mining

22.1 Introduction

The traditional network safety equipment such as intrusion detection system (IDS), firewalls, and security scanner operation independent of each other, almost do not know they are protecting network assets. Network system is suffering from various security threats, including the network worms, large-scale network attacks, etc., and network security situation awareness is an effective way to solve these problems [1, 2]. The general process is perception network security incident took place in a specific period and the network environment, the comprehensive control

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The chapter is retracted because the findings have previously been published elsewhere.

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safety data, this paper analyzes the system under attack; provide global network security, and the view of global security situation and to predict the future trend of network security [3, 4].

There exist some difficulties when implementing network security situation awareness. (1) Warned the number of events from the generation of various securities sensor is huge and false-positive rate is too high. (2) The trivial warning from large-scale network attack (such as. DDoS) is very complex and the relationship between them is difficult to determine. (3) The type of data generated from security sensors warning events is very rich, although there is a lack of knowledge necessary alarm processing, the automatic acquisition of these knowledge is quite difficult [5].

22.2 Basic Concepts and Related Work

For the convenience of description and avoiding confusion, the associated notional definitions are given as follows:

Security Situation. It refers to the state of the global security supervision and network, the network attack was in a specific time window, and influences the overall goal of network security. Generally speaking, the security situation in the two aspects of information contained, the time dimension and space distribution dimension [6, 7]. Security events. It refers to the warning event to produce a variety of network security situation sensor and lead to network intrusion or from surveillance parameters beyond threshold. It is represented as a multi-tuple:

$$e_i = \{\text{detectTime}_i, \text{eventType}_i, \text{attack}_i, \text{srcIP}_i, \text{desIP}_i, \text{srcProt}_i, \text{desPort}_i, \text{protocol}_i, \text{sensorID}_i, \text{confidence}_i, \text{severity}_i, \text{other}\}$$

where det ectTime$_i$ refers to the time of alert event happens, eventType$_i$ refers to the type of alert event, attack$_i$ refers to the class of attack of the detected alert belongs, srcIP$_i$ and desIP$_i$ refer to the source and destination addresses of alert event, srcPort$_i$ and desPort$_i$ refer to the source and destination ports of alert event, protocol$_i$ refers to the type of protocol, sensorID$_i$ refers to the sensor detected that event, confidence$_i$ refers to the confidence level of the alert event, severity$_i$ refers to severity level of the alert event, other$_i$ refers to the other information of the alert event [8, 9].

Security Situation Modeling. It refers to the process of analyzing the alert events generated from various security sensors and finally generating the global security situation of network. It consists of following functions:

Event Simplification. $[e_1, e_2, \ldots, e_n] \rightarrow e_m$, the redundant alert events are simplified, which have the relation of repetition or concurrency, to reduce the amount of effective events.

Event Filtering. $[e_i, P(e_i) \notin H] \rightarrow \phi$, the alert event is removed or marked as irrelevant event if the property $P(e_i)$ does not belong to a certain legal set of H. The alert events can be deleted if some key attributes are absent or out of the predefined ranges of values [10, 11].

Event Fusion. $e_i \overset{confidence}{\longrightarrow} e_i$, It mainly solves the problems of alert collision and alert mergence by using the information fusion techniques such as the Dempster-Shafer evidence theory, so as to improve the confidence level of alert events and reduce the false positive rate [12].

Event Correlation. $[e_1, e_2, \ldots, e_n] \overset{correlatoin}{\longrightarrow} e_{n+1}$, the current network security events, activities, and situations can be inferred from different types of alert event sources by using the mathematical or heuristic methods, so as to improve the detection rate and reduce the false negative rate [13, 14].

22.3 A Framework for Network Security Situation Awareness

The framework for network security situation awareness proposed in the framework for network security situation awareness put forward based on knowledge discovery and consists of two parts: modeling of network security situation and generation of network security situation, as shown in Fig. 22.1. Modeling of network security situation is to build formal model is used to measure of network security situation based on d-s evidence theory, support general process of fusion and correlation analysis of the various types of alarm events from security situation sensor. Generation of network security situation mainly includes three steps: first of all, acqumng attack mode, through the interactive knowledge discovery by introducing FP-Tree algorithm WINEPI algorithm 12 and 13; second, the found frequent mode and related rules of the sequential patterns alarm events; finally,

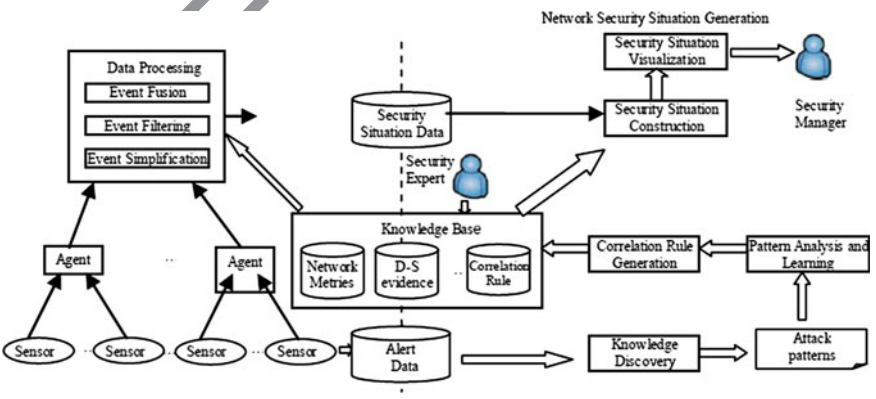

Fig. 22.1 The framework for network security situation awareness consists of two parts, one is to process various events and construct the formal model of network security situation, the other is to acquire attack patterns through knowledge discovery and generate network security situation graph dynamically

realize the dynamic generation of network security situation based on network security situation map generation algorithm.

The main goal of the model is to construct network security situation standardized data model suitable for measuring the network security situation, and support the general process is simple, filter, and fusion of alarm events from security situation sensor.

Data used for modeling of network security situation is all types of safety warning from the heterogeneous sensor collection of distribution network in supervision. Process model of network security situation is by several stages.

In the initial stages of the pretreatment, all received security incident is converted to the standard format, can be understood as data processing module through the standard alarm events. Alarm incidents may come from different sensors, have different formats, such as id events, records of the firewall, log files host system, and information from net flow, etc. Purpose would be for all the standard of each sensor event attributes to a unified format. Our framework, we provide different pretreatment module for the corresponding sensor, will this information from a particular attribute value of the sensor information model in this paper the definition. Based on the information models, each original event pretreatment and conversion, a standard format, each attribute fields are set to the appropriate value.

In this phase of the security situation in the data processing, standardization received warning events as input, and then executes simplified, filter and standardization of the fusion of the alarm events. The purpose of these activities is simplified redundant alarm event the same attack from several sensors to detect. A typical example is, IDS events simplified may produce many detection event for each port scanning bag when performing port scanning attacks, there are lot of events that can be reduced greatly simplified the same kind of events from the same source and the same destination host in a given time period. The aim is to eliminate filtering events that event not satisfied constraint requirements, and these constraints in the knowledge base form of storage requirements of attribute or rules according to the demand of the network security situation awareness. For example, can delete events, if these events of the key attribute does not exist or the needed range, because they are meaningless analysis network security situation. Through the simplified handling and filtering, repeat security incident, the number of security incidents is greatly reduced and the abstract degree is improved, and security status of the information implied preservation.

The foundation of event fusion function is Dempster-Sharer (D-S) evidence theory. The objective of event fusion is to introduce the different confidence level to the security events that received from different sensors and have already preprocessed, simplified, and filtered, quantitatively evaluate these security events by fusing multiple attributes, so as to effectively reduce the false positive and false negative of security alerts and provide support for the inference, analysis, and generation of network security situations. The general process of D-S evidence theory based event fusion is to infer the security situation of current system based upon the observations of the system security status, $E_1, E_2, \ldots, E_m$. Based upon

D-S evidence theory, let the frame of discernment (FOD) be $\{T, F\}$, T refers to the correct alert, F refers to the false alert, and $T \cap F = \phi$. As the most fundamental concept of D-S evidence theory, basic probability assignment (BPA) needs to be defined for given evidence supporting a system status.

Definition 1 BPA Function m:

$$(P\{T, F\}) \rightarrow [0, 1] \tag{22.1}$$

$$m(\phi) = 0 \tag{22.2}$$

$$m(T) + m(F) + m(\{T, F\}) = 1 \tag{22.3}$$

where $m(T)$ refers to the confidence level of a security alert detected by a sensor. In our framework, the confidence level is represented by the attribute confidence in the format of alert event, and the initial values of this attribute are specified based upon the default values in the detection rules or human experiences.

D-S Evidence theory also provides the combination rule for multiple evidences, which is Dempster rule. The security alert events are fused based upon this rule, not only to reduce false alert rate and improve the confidence level of event detection, but also to identify attack behavior through the fusion of characteristics of multiple low level security events. For instance, let the basic probability assignment function of two evidences be m_1 and m_2, the basic probability assignment function of combined evidence is

$$m(e) = K^{-1} \sum_{e_1 \cap e_2 = e} m_1(e_1) m_2(e_2) = m_1(e_1) \oplus m_2(e_2) \tag{22.4}$$

where K refers to the normalization factor,

$$K = \sum_{e_1 \cap e_2 = \phi} m_1(e_1) m_2(e_2) \tag{22.5}$$

This method can be utilized repeatedly to cause the security events from multiple sources to be effectively fused. Suppose there are multiple events $e_1, e_2, \ldots, e_n$, and the corresponding basic probability assignment function are $m_1, m_2, \ldots, m_n$, then these n evidences are combined into one evidence and the corresponding basic probability assignment function is

$$m_{1\ldots n} = K_n^{-1} \sum_{\cap_i e_i = e} m_1(e_1) m_2(e_2) \ldots m_n(e_n) \tag{22.6}$$

where

$$K_n = \sum_{\cap_i e_i = \phi} m_1(e_1) m_2(e_2) \ldots m_n(e_n) \tag{22.7}$$

When the security situation in the sensor receiving security alerts events, the first thing is to calculate events of the parameters of the system based on the confidence level set or rules. It can effectively reduce the interest rate issue wrong alarm quantitative the degree of confidence from the original event level. In this phase of the alarm data processing, the alert events from sensors collect quantitative confidence level, redundancy, and doubt warning events can be greatly reduced ability to attack the recognition by increasing the warning based on safety fusion Dempster rules.

There are two network security situation data sources used for knowledge discovery: a group of security alert is the simulation of occurrence attack, and the other is a historical security alert events. The function of knowledge discovery in our framework is to find and extract knowledge from these groups warning, needs related security situation. Because of the complexity of the warning from the event generated various types of the security situation in the sensor, the process is almost entirely by hand implementation work. In this paper, we propose a method based on knowledge discovery, it provides the security situation mining methods related rules through the pattern mining, analysis and reference group security alert events, the last generation network security situation figure.

We found that there are a lot of meaningless frequently set of the original model warning from security situation sensor through the analysis test data, and the most frequent mode of the system involve configuration or harmless visit. Therefore, it is necessary to establish a mechanism of alarm incidents filtering D-S evidence theory foundation, will perform statistical analysis based on the confidence of the alarm events. First, the distribution of all kinds of security incident is through the automatic statistical analysis tool; Secondly, no significance of events is the importance of delete, through the evaluation each type of alarm events based on the simplified and filtering rules, the D-S evidence theory basis for the event handling.

In this paper, frequent model and algorithm using the sequential patterns found to get security situation knowledge from group security alert events. Frequent model refers to the correlation of one of attribute events, the goal is to infer the constraint in the attribute of events and conversion filtering rules behavior in add correlation. Also, sequence model refers to the succession of events; the relationship between the purposes is to discover the order relation or consequences in the event to further change to the rules of combination of little events. Usually, the relationships among the attributes of events need to consider the relationship among almost all attributes of security alert events, such as detectTime, eventType, attack, srclP, desIP, srcPort, desPort, protocol, confidence, severity, etc., while the relationships among the events only consider the occurrence sequences among the correlative alert events which have the same or associated attack attribute value.

The generation of network security situation refers to the correlation of network security events, construction of network security situation graph, and assessment of the global network security situation. Net-SSA periodically update the network security situation graph based upon the security situation data calculated from

event fusion and correlation. After certain alert event is processed and inserted into evidence base, Net-SSA schedules and activates the associated rules and launches the process of situation correlation, and correlates the security situation by using above mentioned knowledge discovery algorithms. If the correlation results indicate certain type of security attack, then the network security situation graph is dynamically updated in accordance of system settings, and notifies the network security administrator.

22.4 Conclusion

We also show the application of Net-SSA and show that the framework of accurate modeling and effective support of the generation of network security situation. As the study continues, we plan to explore global security situation assessment and investigation of the problem real-time prediction of the upcoming serious security attack.

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Chapter 23
Study on Geographic Information Database Updating Approach

Hongmin Liu

Abstract With the extensive application of massive geographic information database and the increasing demands of geographic information actuality, geographic information database update is becoming important. With incremental updating, it can satisfy some demands of real-time updating for geographic information system and geographic information service, improve updating efficiency, and reduce historical database expansion. This paper discusses the incremental updating method of geographic information database based on feature matching. At present this method was already applied in fundamental geographic information database of Fujian Province, which plays a satisfactory role. Procedures developed in this paper are based on ArcGIS geodatabase, which does not consider entity data organization, which need to be discussed further.

Keywords Database · Arc GIS · Data updating

23.1 Introduction

With the process of urbanization and infrastructure construction, geographic information changes rapidly. The current GIS geographic information system has the high status need to keep their vitality. Geographic information to the current situation of the database is one of the most important factors affecting the use value [1]. Data present situation is becoming a user's the focus of attention of the metropolis, complete all the large-scale topographic map database construction. Users set higher request continuously updated geographic information database of [2].

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23.2 Related Study

Geographic information database updates including data update and update the warehouse. Generally speaking, the use of field investigation data update antenna or remote sensing images, cadastral map, topographic map and special information from different resources, update the existing data warehouse data updated with the latest update data in the database.

Generally speaking, there are two steps for geographic information database updates. The first step is to update the data, and the second is using the latest data update GIS database. Other research that the two steps for one, use all sorts of methods and practical data, such as space superposition analysis and spatial correlation analysis of data in a database directly update [3]. However, this method has not applied to practical production. At present, the renewal layers of features or class map of the use method is more common GIS database updates to the actual application. Update the data for those parts, edit the data in the database is a commonly used method, it is inefficient.

23.3 Analysis of Geographic Information Database Update Requirements and its Common Methods

23.3.1 The Requirement Analysis of Geographic Information Database

Geographic information change involves new increase, disappear, or change things. Change the object's shape of changes, including the change of the property or both. For example, traffic diversions, will change the geometry of the road, and other changes of a road, such as widening and repaving, can make the way of the performance of the width and other road conditions change.

To solve the three changing cases, geographic information database update adopts three operations correspondingly: newly adding feature, deleting feature, and changing feature. In addition to implementing these operations in database, there are other requirements while updating. First, the consistency of data must be maintained while processing. To satisfy the demands of all kinds of spatial analysis and symbolic representation, before and after loading data into database, these data must undergo processing of edge matching and join. Then, there must adjust the relation of the new features and the original ones to implement edge matching, the seamless and consistency processing of properties. Second, incremental update method must be considered. With the cycle of geographic information database construction getting longer because of the rapid growth of geographic information, it needs to adopt incremental update to reduce the workload of data update, and implement real-time updating. Third, the historical data should be retained. The

original data should be switching to historical database while updating data in order to provide change comparison. In addition, feature entity's organizational information should also be updated for the database that all features are organized as entities.

23.3.2 The Common Updating Methods for Geographic Information Database

At present, there are several common update methods for geographic information database are as follows:

(1) Update by layer. Generally, geographic information database is organized based on scale and feature layers. A simple method is replacing the whole layer with the changed layer. This method is suited for the case of largely changed data, such as resurvey. For layers that have only a few changed features, this method will bring large workload and redundancy of historical database.
(2) Update by map sheet or region. Current geographic information database adopts a management of map sheet or regional separation, so update in the unit of map sheet or region is practical. However, for the database whose data is organized with entity and seamless joined, this method involves great processing of seamless join and entity organization.
(3) Online Editing. In the case only a few features have changed, directly connecting to the database and editing its data with GIS software is usually adopted. It is a simple method, but when the updating data quantity is large, the workload will be large, and it is not available without connecting to the database.

Generally, the real-time update of geographic information database involves a small number of features, but frequent update. Therefore, an incremental update method is needed, which only update the changing parts and can reduce the workload. This paper researches a feature matching method to update geographic information database.

23.4 Research on the Incremental Updating Method of Geographic Information Database Based on Feature Matching

For the incremental updating of geographic information database, there are two conditions in practice. One is using new data such as remote sensing image to update the extracted data from database and then put these data into database. The

other is directly using data from various sources, such as aero photograph, remote sensing image, and thematic map, to update the existing data in database. This paper separately discusses these two update methods for the above two conditions.

23.4.1 Update Based on Feature ID Matching

This updating method is available to update layer which has less change. It only needs some edit for the extracted data from database. In each layer, database assigns a unique ID for each feature to identify it, so that feature ID can be used to maintain the matching relation before and after update. When extracting data, we add a new field to each extracted feature class which is used to record each feature's original ID in database and set a default value named MINID which is an impossible ID value such as a negative number, to the new field. While editing the extracted data, the value of this field must be kept unchanged. We can draw three matching relationships for feature updating, adding, deleting, and changing.

(1) The ID value of the updated feature is MINID. It indicates the feature that is newly added and directly added to the database while updating.
(2) The ID value of the updated feature is a normal ID value. It indicates the feature is always in the original database, its properties or geometrical information may be changed or not. We need further to compare the feature's geometry and properties to the corresponding feature in database. If its geometry and properties have not changed, it does not need to be modified. Otherwise, we need to replace the corresponding feature's geometry and properties in database with the new one, and put the corresponding feature into historical database.
(3) There is an ID in database, but we do not find a corresponding one in feature class after updating. This case indicates that the corresponding feature is deleted, and we also need to delete the feature in database and put it into historical database.

For some special conditions, we need to edit feature's ID value manually to ensure correct edge matching. For example, we extract a polygon feature which consists of several rings, and it may be separated into several polygon features after editing, then we should combine these polygon features into a single one, and assign the original ID to it.

23.4.2 Update Based on Feature Geometry Matching

Layer is a basic unit in geographic information data and each layer has different geometric type, there does not exist geometry overlap among the features that has different classification code in the same layer. This provides a condition to implement database update through geometry matching for the same coding features in the same layer.

For the area which ground surface information changes greatly before and after update, the workload is too large if we adopt a method of editing the extracted data from database to update. Usually, we utilize data from a various data source, including remote sensing image, aerial photographic image, cadastral map, and all kinds of thematic information, even surveying or re-surveying maps, to get new data. The new features do not have corresponding IDs in database, so ID matching method is not practical. For this situation, we can adopt geometry matching method to update database. For different geometry types, we adopt different methods to determine whether the features are matched. Point feature matching means that one point must absolutely coincide with the other. Multi-point feature matching means that the partial or total points of the two multi-point features coincide. Linear feature matching and areal feature matching mean that the two linear features or areal features partially or entirely coincide. Note that for linear and areal features, the boundary superposition (the end points of linear feature or the boundary of areal feature) is not considered as feature matching. Feature geometry matching can be implemented by overlay analysis. We must compare whether the feature coding is the same before in geometric matching.

For the three updating cases of feature adding, deleting, and changing, we can get the corresponding matching relationships:

(1) The geometry of updated feature completely matches the feature's geometry in database. We should further compare the feature's properties.
(2) The geometry of updated feature completely mismatches the feature's geometry in database, which indicates the new features generated, and we need to put it into database.
(3) The geometry of feature in database completely mismatches the updated feature's geometry. This indicates the feature disappears after updating. We need to delete the feature in database, and put it into history database.

We make such that matching be carries out on the basis of updated layer, and record features which are already matched to avoid repeated comparison and consider the edge matching processing while updating. If the feature in the updated layer joins with the updated extracting frame, then we first find the matching feature which join with the boundary while finding, calculate the edge matching relation, and carry an edge matching process. As shown in Figs. 23.1 and 23.2. Feature A partially falls in the extracting frame and partial out the extracting frame. The part that needs to

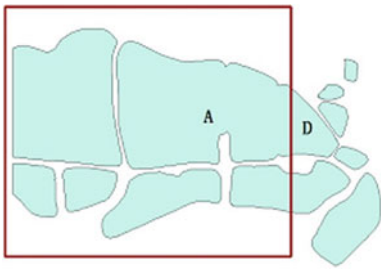

Fig. 23.1 Before feature update

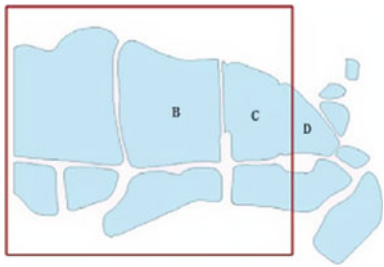

Fig. 23.2 After feature update

update is cut into two features: B and C. Now we need to update the new feature C into database into replace the original part of A and carry out an edge matching process. Then update the part of B into database.

23.5 Update Process and Results

With C# and ESRI's ArcGIS Engine 9.2 as a component library, this paper implements geographic information database incremental update modules based on the above discussed two incremental updating methods. Because there exist many corresponding relations between the layers and features in database and those to update, this module adopts XML file to provide configuration information, including database connecting information, coordinate range information, updating method, and corresponding relation between the feature class in database and the updating feature class such as the corresponding relation of feature name and field. For fields, field name, type, and default value also defined so that conversion can be carried out in updating process. For the updating method based on feature ID, the procedure will automatically generate a configuration file while extracting data; for the updating method based on geometry matching, we need to write a configuration file manually. The procedure of feature ID matching method of geographic information database is as shown in Fig. 23.3.

''ArcGIS also provides offline editing function. To implement update, it extracts some features which need to be updated from database and then put them into database after editing [4]. This method can not only extract feature's part to update. For seamless database, several features could be combined into a big one after seamless processing, and what need to be updated usually are its parts. For example, highway may cross a specific province after seamless edge matching process, but its change may be a small portion. So if we use this method, the updated data will be very large, and it does not well integrated with the management of historical database.

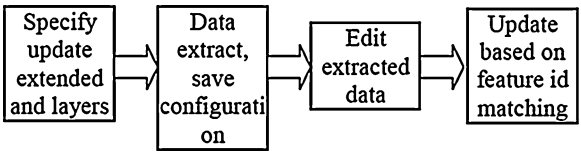

Fig. 23.3 Process of feature id matching update

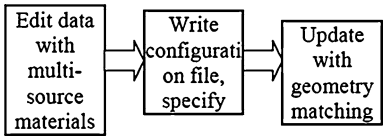

Fig. 23.4 Process of feature geometry matching update

Therefore, we use the extract- and-update method. Considering that the incremental updating method frequently needs update a small amount features, we provide two modes for the updating method based on feature ID matching: one is extracting features whose layers are intersects with the cutting frame and then updating after editing; the other is the same as above, but only extract features selected by user. For the later one, it only matches a small amount features which are extracted, and does not need to delete the original features in database.

The process of geometry matching is as shown in Fig. 23.4. Corresponding relationships between layers in database and those to be updated should be specified in a configuration file. Note that update extent must be larger than the data extract frame, otherwise it will cause some mistakes in edge matching.

Figures 23.5 and 23.6 show the comparison between before and after data updating. Results show that residential area (in the rectangle box) changes.

Fig. 23.5 Residential area before update

Fig. 23.6 Residential area after update

23.6 Conclusions

With the increasing demands for geographic information actuality, GIS requires that it can quickly collect changing information and update it to the existing massive geographic information database. This paper discusses how to use incremental update method to update geographic information database, puts forward a feature matching method to implement the incremental update of geographic information database to reduce the workload, which implements the seamless join between the updated data and the original data while updating.

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Chapter 24
Accounting Lending Attributes Sinking Based on the Metadata and Cloud Data

Siping Bai

Abstract Lending attributes the existence of several hundreds of years, of China also has the nearly 200 years history, its existence has certain historical reason and the theoretical basis, the rapid development of information technology, the modern information society by borrowing attributes of accounting information recorded cannot reflect the overall economic information, cannot satisfy people comprehensive information needs. This article from the "metadata" and "cloud data" technical theory, in combination with the new trend of development of accounting information, the "borrowing attributes" limitations were discussed and deduced "leasehold attributes" will "sunken" this for a fact.

Keywords Metadata · Cloud database · Lending attributes

24.1 Research Background

In August 1999, 12 organizations including American Institute of Certified Accountants, five accounting firms (Price Waterhouse Cooper, Deloitte, KPMG, Ernst and Young, and Anderson), Edgar On-line, Microsoft construct the basic XBRL executive commission. In order to better promote the application of XBRL, XBRL executive commission decided to set up XBRL international organization [1]. Since the birth of XBRL in 1998, XBRL gained rapid development. Especially, as the newest standard and technology of financial information process, XBRL has extensive functions [2]. All corporate information, especially financial information,

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can be processed effectively through Internet on the computer [3]. Once information distributor input the information, he can easily transform the information into written document, PDF file, HTML homepage, or other corresponding file format without reentering. Meanwhile, information which is gained through XBRL can be easily applied in all fields like financial analysis without print or reentering. XBRL increases the transparency of revealing corporate financial report and also increase the efficiency and ability of handling financial report information.

XBRL has been applied in China. The Shanghai Stock Exchange and The Shenzhen Stock Exchange have begun to research and experiment on XBRL technology. In order to carry out national information development strategy, comprehensively increase accounting information management level, further deepen accounting reform and fully exert accounting functions, the Ministry of Finance announce exposure draft of China XBRL Classification Standard Structure Norm, China XBRL Classification Standard Basic Specification and Finance and Accounting Information Resource Core Metadata Standard in November in 2009 and formerly announce Interim Provisions to Progressively Promote Application of XBRL.

24.2 Financial and Accounting Information Resource Metadata

24.2.1 Concept of Metadata

The most essential and abstract definition of metadata is data about data. It is a widely existing phenomenon. It has its specific definition and application in many fields.

In the field of data warehouse, metadata is defined as descriptive data and environmental data. Generally speaking, metadata has two functions. First, metadata can provide user-based information. For example, business description metadata that record data can help users using data. Second, metadata can support system to manage and maintain data. For example, metadata that is about data storage can support system to access data in a most effective way.

In the world of information, metadata is defined as a kind of structural data that provide information resource or data. It is a structural description about information resource. Its function is to describe the characteristic and attribute of information resource or data itself and regulate organizations of digital information. In addition, metadata has positioning, exploring, testing, evaluation, and chosen function.

In exposure draft of Financial and Accounting Information Resource Core Metadata Standard by our Ministry of Finance in November in 2009, financial and accounting metadata is defined to describe data from data set in all forms of financial and accounting information resources. And core metadata data is to subdivided to describe metadata entities and factors which are the most basic attributes of financial and accounting information resource data set.

24.2.2 The Structure of Metadata

In exposure draft of Financial and Accounting Information Resources Core Metadata Standard announced by our Ministry of Finance, structures of financial and accounting information resources metadata, mainly including seven aspects which are English name, XML remark, definition, form of data, value, annotation, and value examples are described. The file format of value example can be JPG format. It is a collection of scanned document of original evidence including 6,500 independent files when certain actual resource business happens. It means that every metadata has a detailed description.

24.2.3 Meanings of Quoting Metadata by Financial and Accounting Information Resources

In exposure draft of Financial and Accounting Information Resource Core Metadata Standard, five required metadata or metadata entities and seven optional metadata factors or metadata entities are defined. To sum up simply, name, keywords, resource description, duty officer, URL, date, format, language, right management, currency, attachment, resource number are included. Also, it is stated that user can extend the metadata contents defined according to the characteristics of financial and accounting information resource and requirements of resource utilization. Seen from it, any business operation generated by corporations can be defined and described by metadata. Meanwhile, metadata can provide all necessary information with compiled code. This can facilitate search and utilization of financial and accounting information resources, and help to build communicative bridge between corporate business system and decision supporting system. Also, it is helpful for the storage of these resources.

24.3 Cloud Data and Cloud Computing

From above discourse, we can conclude that business operation generated by corporations can be described in detail by using metadata. And this is sure to result in diversified data forms, and explosive increase of data volume makes corporate data environment close to the extreme of volume. Meanwhile, data maintenance and management is increasingly heavy. Database administrator (DBA) is backing up, optimizing, expanding the volume, and increasing availability in a circular manner. The problem we are faced with is how to solve storage and computing problem of immense data.

24.3.1 Cloud Data

Cloud Data that is CloudDB or shortened as CloudDB is a kind of data storing network resources. It regards different relational database as a series of simple bivariate table and operate based on a simplified version of SQL or access objects. CloudDB solves the problem of data collection and sharing. Through it, database users do not need to control machine with running original data, neither do they need to know their place. In this ideal state, CloudDB can support infinite concurrent users and provide with inexhaustible data application resources. That corporation applies metadata form to describe business operations may lead to increasing data volume and arouse storage problems. This can be solved by metadata.

24.3.2 Cloud Computing

Cloud computing is regarded as super computing mode based on internet. Corporate and personal users can acquire the computing ability through internet. The fundamental principle is that computation is spread on a large number of distributed computers instead of non-local computers or distance servers, thus users can be provided with sufficient computing abilities and super computing ability can become possible through internet free flow. Thus, it is possible to solve the problem of immense data computation because of corporate business operation describing metadata.

24.4 Debit–Credit Bookkeeping

24.4.1 Emerge of Debit–Credit Bookkeeping

Debit–credit bookkeeping originated in Italy from 13 to 14th century. Characters of debit and credit in debit–credit bookkeeping keep accounts using their original meanings and reflect creditor's rights and liabilities. With the development of commodity economy, debit–credit bookkeeping is continuous developing and improving. Characters of debit and credit are losing their original meaning, and have become bookkeeping symbols endowed with profound economic intension. Debit represents stationary point of capital movement (that is temporary lingering point as capital movement has no end point theoretically), which means that accounting bodies can know where the capital is going (usage, direction, and existing form of capital); credit represents the starting point of capital movement, which refers to where capital that accounting entities own comes from (currency representation of certain specific assets). In 1,494 an Italian mathematician named Luca Pacioli published his work Summa de Arithmetic, Geometria, Proportioni et Proportionalita.

It symbolizes that debit–credit bookkeeping had become recognized double entry bookkeeping. It also symbolizes the beginning of accounting in modern history. Therefore, Luca Pacioli is regarded as Father of Accounting in Modern History.

24.4.2 Theoretical Basis and Restrictions

Debit–credit Bookkeeping takes "capital=liabilities+ owners' right" as theoretical basis and "accounting objects" as theoretical foundation, and debit and credit as bookkeeping symbols. It reflects the capital movement. It is a double entry bookkeeping with bookkeeping principle that debit goes along with and equals to credit.

24.4.3 Restrictions of Debit–Credit Bookkeeping

From the theoretical basis of debit–credit bookkeeping, we can see that it has certain restrictions. It only reflects valuable information but does not reflect invaluable information. It only reflects economic activities related to balance sheet but can not fully reflect other important information, for example, stock price information. It only reflects accounting objects i.e., corporate internal information, but can not reflect other important information in supply chain of electronic information times, for example, suppliers' material information and information about client's demanding abilities. The information that debit–credit can not reflect is the important information that corporate operators and investors demand in electronic information times. When applying debit–credit bookkeeping, we should know that every business operation should be recorded to two or more than two accounts to debtor or creditor. This is a very complicated process involving many links such as preparing accounting vouchers, setting up accounts, registering books, and so on. Meanwhile, in the rapid development of information technology in modern information times, society demands comprehensive information. It is unknown whether people can change accounting information from capital movement theory to economic information theory.

24.5 Conclusion: Sinking of Debit–Credit Bookkeeping

From above discourse, it can be seen that debit–credit bookkeeping reflects capital movement. At first, it can not satisfy economic information theory of comprehensive information demand in electronic information times. Second, it is complicated and hard to understand to apply the debit–credit bookkeeping theory to actual operations. Third, it is an embarrassing phenomenon that the two characters of debit and credit have similar meanings but symbolize completely opposite-sided

capital movement. Based on the above reasons, can debit–credit bookkeeping drop out? Now it is the time. The maturity of metadata handling technology and the application of metadata in financial and accounting information facilitate corporations to fastly promote application of financial and accounting information resource metadata handling (corporations use metadata standard to describe and store in the long-term process of informatization as information resources in financial and accounting fields generated by business operations are concentrated). Another serious problem will occur: redundancies and repetition of data recording. It can be concluded from the above discussion that recording problems of recording business information resources can be solved by applying metadata method. And metadata method can have a more detailed record of business than debit–credit bookkeeping. Meanwhile, paradox of increasing data volume brought by the above process, and storage and computing problems of immense data volume can be resolved by applying CloudDB and Cloud computing. It can be seen that keep debit–credit bookkeeping does not need to coexist with and metadata. Which one should go down from this stage? Considering global economic integration and corporate information demands, we can have the answer that debit–credit bookkeeping should sink.

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Chapter 25
On the Construction of Internet Data Center in Colleges

Xiangya Tao and Cheng Yang

Abstract With the evolution of the communication though network and the storage technology, the construction of internet data center (IDC) is also accelerating its development. Based on the analysis of the current status of IDC construction, the article also studies the construction of its network, sever, memory system, application system, self-service system, and computer room to provide macroscopically with the reference to setting up IDC in the colleges.

Keywords IDC · Current status · Construction · Study

25.1 Introduction

The application of Networking and Information Technology in education has different forms in different times. From ISP/ICP to.COM, and then to internet data center (IDC), they all reflect innovation and changes of Networking and Information Technology. IDC is the coalition of traditional data center and Internet. It not only has the features of traditional data center like "reliable host, concentrated data", etc., but also has such features as quick response, comprehensive and systemic data service, and flexible access method, etc. IDC is a platform of data resource cluster and resource service. It pays special attention to not only service

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capacity construction such as data storage room environment, safety assurance, network bandwidth, software environment, and data storage host performance, etc., but also the construction of IDC service concept and mechanism. IDC university construction is to centralize and share good quality teaching resources, so that optimization of teaching can be realized and education equity can be promoted.

25.2 Current Situation and Problem Analysis of IDC University Construction

25.2.1 Current Situation of IDC University Construction

IDC university construction is a gradual and progressive process. The initial data center is a server and a data storage center of teaching resources; with the increase of teaching applications, an ERP system is needed, which is a management and application center of teaching data; then the data center also assume the function of calculating, and it gradually becomes a teaching data processing center; next, simple calculation cannot meet data requirement. The data center has to face teaching resources, face digital applications of teaching. It has to be developed into a service center which is based on the internet, has integrated data processing and management abilities, and a teaching resource type database.

In recent years, the integration of teaching resources in universities has been accelerating. The consequent requirements of data center further grow. The data center has gradually become independent forces in the running of college education and administrative resources and the IT physical carrier and the cardinal number of code in a university. In the construction wave of IDC, universities are also an important physical carrier for the IDC development. Higher requirements are put forward on its availability and operation efficiency.

Currently, IDC in Chinese universities is mainly at the level of education data application center, education data operation service center. In the future we will see more and more IDC becoming an independent business agency in universities. In the university education information construction, its construction criterion not longer rigidly sticks to the following specific areas: providing storage for education, providing computing, and providing processing, etc. It should expand to areas of resource service [1]. This requires IDC to continuously strengthen soft environment, so that it can provide better and more human teaching information data for education.

25.2.2 Problem Analysis of IDC University Construction

For IDC, high availability of the whole information systems is the most important, while high availability of the data section which is the core of information systems is of top priority. The construction of IDC currently has the following problems: (1) infrastructure is not enough, including the availability of network application, data backup and disaster recovery, anti-virus system and the overall system needs to be further strengthened; (2) the data processing of memory system implements distributed, serial processing, adding the differences of interconnection rights of server systems, and data outlet, which greatly affects the storage and extraction rate of data; (3) the data of IDC is less secure, storage data among application systems mutual licenses and there is no unified management of authority which is likely to cause undue privileges and directly affects the security of teaching resources. IDC in many universities often suffers the attack of virus and hacker [2]; (4) IDC netted texture is difficult to ensure the uniformity in the exchange of data storage. At the same time it increases the relevance of application system. As a slight move in one part may affect the whole situation, local problems easily affects the overall efficiency of IDC, which affects the quality of information services.

25.3 Study of University IDC Construction

According to the IDC construction situation and the analysis of the problems in construction, the author thinks university IDC construction must strengthen its work and improve construction quality and level in the following aspects.

25.3.1 Network Construction

The efficient operation of University IDC mainly counts on a high-performance network to provide data resources service to education. This requires continuously optimizing the network structure, updating and upgrading the core equipment of IDC network in order to improve the operational efficiency of the network. This high-performance network should include: (1) AN construction of IDC: including AN infrastructure building, AN hierarchical division, and AN performance design, etc., which should make the built overall network the best; (2) IDC data interconnection platform construction, that is, each independent teaching resource library of IDC should realize the high quality of interconnection and data interchange. (3) IDC teaching subscriber access system construction: the system should be able to ensure that teachers and students store and quote IDC data in a safe and reliable way, or maintain equipments of teachers and students stored in IDC, which requires IDC

provides correspondent internet access method such as dial-up access, dedicated access, and VPN, etc., [3]. (4) IDC network management construction: because IDC network structure is very large and complex, the network construction is to ensure that the external services of network are uninterrupted and are of high performance. A high-performance network management system should be constructed.

25.3.2 Server Construction

Server constructions of university IDC can be divided into many aspects, generally into basic service system server and application service system server, mainly as follows: (1) Basic system servers: For the purposes of ensuring IDC provides services to education, this kind of server should include Network Management Server, directory server, firewall server, system performance monitor server, all security servers, DNS server, etc.; (2) Database server: For the purpose of ensuring IDC provides basis of various application services for teaching subscribers, IDC database server construction should be able to support for high-capacity access and ensure the variety of database; (3) Application server: this is a server which provides related application services for teaching subscribers by IDC. To ensure business expansion of IDC, application server should have good ductility to ensure the variety of the supportiveness of application software; (4) Data backup server: to ensure the safety and reliability of teaching subscribers, as IDC servers have a great variety and many databases, data backup should support multiple models, various data formats and have a large capacity; (5) Load balance construction of servers: for many servers to work coordinately, a load balance administration mechanism is needed, which is one of the important technical supports for IDC to provide data service of high performance and high reliability to teaching subscribers. The load balance of server can be accomplished by hardware (like network switching equipment) or software.

25.3.3 Memory System Construction

Memory system construction is one of the key construction content in university IDC. It has to ensure that its data storage capacity is large enough. With the widely application of various multimedia application technologies, teaching information resources data grows rapidly like a geometric set. The capacity of data has developed from Level GB to Level TB. Such a large data requires a safer and more reliable storage system in university IDC. In addition, as the dense crowd at university, the centralized amount accesses IDC is very large, so the storage system construction should consider that it must have high data processing efficiency. Also, storage system should have very good expansibility to meet the requirements of IDC developments.

25.3.4 Software System Construction

Software system construction requires substantial investment of university IDC. It is the means for IDC to carry out external services on the base of internet, server and storage system building. IDC software system construction should mainly include: (1) Web system: it is one of the content for IDC to carry out Web-Hosting services. Web system software should have Web system function that provides data services to multi-teaching subjects; (2) E-mail system: E-mail system should support multiple e-mail protocols, such as SMTP, POP3, IMAP4, Web-Mai-, and Voice-Mai-, etc. Meanwhile e-mail system should also have very good expansibility; (3) Database system: IDC should build multi-vendor database systems, such as databases of Orac-e, Informix, SQ-Server, SyBas, etc., to meet the requirements of various teaching subscribers. (4) Security system: such as firewall software (Except hardware firewall), anti-hacking software, anti-virus software etc. It is a premise to ensure that IOC provides data security services to teaching subscribers; (5) Data backup software: backup software should support multiple backup devices, machinery of a variety of manufactures, multiple databases, which can ensure the variety of IDC data construction; (6) Application development system: IDC should provide development system platform corresponding development tools to meet the human requirements of teaching subscribers.

25.3.5 IDC Self-Service System Construction

University IDC receives great attention by universities and welcome by teachers and students because of its good quality teaching data service. IDC should strengthen its self-service system construction. It includes: (1) customer relationship management system (CRM): CRM is a basic service system on which IDC and teaching subscribers establish a good relationship. Its application in university IDC can precisely provide information such as teachers and students' developments and new requirements; (2) Network and server management system: IDC has a large network and server systems. To manage these systems, a powerful network, server, and application management system is needed to ensure IDC teaching service quality [4]; (3) IDC internal management system: it can ensure that each data system within IDC can work uniformly and coordinately and complete teaching service of high quality; (4) Charging system: The charging system is a guarantee of IDC income, which is beneficial for the healthy development of IDC construction.

In addition, university IDC construction should also strengthen central machine room construction. Machine room construction is the largest part of IDC preconstruction investment. As IDC subscribers store their important data and application in IDC storage equipments, the requirements for IDC room environment where storage equipments are placed is very high. IDC room environment

mainly includes power supply system, security system, wiring system, communications system, and air-conditioning system, etc. Among these power supply system is of the most importance, which is the key of computer room construction. As a large numbers of devices of IDC need great electric power, reliability, and expansibility of power supply system is of great importance. Loss of data resources caused instantaneous power cut or power failure sometimes can be huge. The power supply system mainly includes service power, UPS construction, distribution cabinet, electric wire, socket, illuminating system, grounding system, lighting protection system, and self-generating system, etc.

25.4 Conclusions

This paper research starts in the application of IDC in university teaching resource construction. With the thorough construction of university digital campus and further development of information construction, data of office system, student management system, education administration system, and logistics system, etc., will also be brought into IDC and then IDC will truly complete large-scale construction. Currently, university IDC, as the IT base that provides teaching resources data service, it provides platforms for the construction and application of all teaching resources in universities; it also provides virtual space for various modes of practice teaching; it is a new means of which a brand new educational technology applies to teaching. IDC construction is still in its growing period of construction and has no unified strict standards. Due to the differences of IT application in different universities, the meanings of IDC differ from each other. Under these circumstances, the research on IDC construction is of great importance. In this paper, several important dimension of IDC construction is studied, which regulates a certain extent of IDC construction areas and solves the problems of how to construct. All in all, IDC energizes the reform of university digital teaching. It now has been a trend of information technology construction and will be developed faster and better.

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Chapter 26
Study of Composing Web Service Based on SOA

Rongwang Yin

Abstract Automated service composition refers to automating the entire process of composing a workflow. This involves automating the discovery and selection of the service, ensuring semantic and data-type compatibility. We gave some basic notions and recent research of Web Service, and then classified Web Service Composition approaches according to the methodology they used. Furthermore, we analyzed every approach's motivation and its shortages, as well as outlined the essential problems of Web Service Composition. Finally, we concluded and discussed the developing trends.

Keywords SOA · Composition approaches · Web service

26.1 Introduction

In the application area, in order to be able to deal with the application environment that is complicated and changeable, most enterprises would build the IT system based on service-oriented architecture (SOA). They would adjust it and put it into application at a rapid pace according to the changes in the environment so as to adapt to the requirements of the business. From the perspective of the software techniques, the premise of service-oriented computing (SOC) is to "software as service". In addition, the core of SOC is to how to work in coordination with these software services in order to finish the facing application tasks. However, the traditional stacks of Web service do not equip with systems that offer common use

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to the services of discovery, composition, and execution. Therefore, they cannot support the dynamic interaction and composition between Web Services. With the appearance of Web Services, both of the academic and industrial fields, have made profound research of how to make use of Web Techniques, reuse existing, and rich Web Service resources by means of service composition, and produce new service resources that can meet the complicated applications at a rapid pace. They have brought out a series of methods for Web Service Composition. The definitions of Web Services and Web Services Composition have been given in Sect. 26.2 of this paper, basing on the current achievement of Web Service researches. In Sect. 26.3, a methodology used in Web Service Composition has been proposed to classify the Web Service Composition and their limitations have been pointed out. In Sect. 26.4, the research content and key problems on Web Service Composition have been brought out. Finally, the conclusion summarizes the whole paper and future jobs are being looked forward to.

26.2 Basic Concepts

Multilayer Structure of Web Service usually, a Web Service can be divided into five logic layers: Data Layer, Data Access Layer, Business Layer, Business Façade, and Listener. The nearest Web Service of Client tier is Listener while the furthest is Data Layer. Business Layer can be further divided into two sub-layers: Business logic and Business façade. Any physical data that is needed by Web Service is able to be saved in the Data Layer. The Data Access Layer is above Data Layer, which can offer data services to Business Layer. Data Access Layer can separate the business logic from the data storage in the bottom, which can protect the integrity of data. The Business Layer offers a simple links that can directly reflect the process of offering Web Service.

This system structure is very similar to the system structure of n layers application that is defined by Windows DNA. Listener in Web Service acts as the expression tier in the application of Windows DNA. If the service returns a response, Listener is responsible for making the response that is from the Business Layer into a message and then sends it back to the client tier.

Web Service Protocol The Web Service techniques can be divided into three key components: Description Stack, Discovery Stack, and Wire Stack. Description Stack deals with all kinds of techniques that describe Web Service in order to promote the common use of business process model and workflow structure in the relationship of B2B. Discovery Stack deals with techniques used for services of catalogues, discovery, and examination. Wire Stack is composed of techniques that offer information flow to operation engine of Web Service. Figure 26.1 shows the stack of Web Service.

Web Service Composition Web Service composition is the ability to offer value-added services through the composition of basic Web Services. Services composition is not only an important way for reusing service resources, but also a

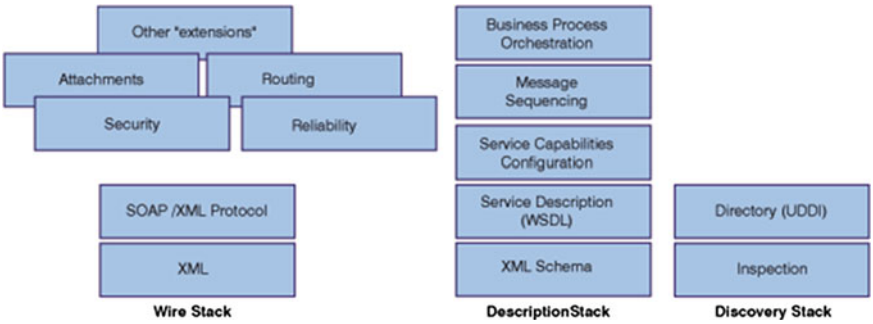

Fig. 26.1 Web service protocol

new channel to build a complicated application system and software based on Web. In the environment of distribution, different service components may offer the same function. If one of the components in certain service has changed in its functions, that service is required to do dynamic transfer in service components when asked, in order to make sure that the service is not being influenced. The dynamic transfer goes to another service component with the same functions.

26.3 Current Research Condition

Artificial Composition Methods What Document [1] brings up is typical artificial composition framework. In these frameworks, users need to produce a workflow by means of photos or text editor. In addition, they need to hand it to the engines of workflow process. Triana [1, 2] provides a user interface which is graphical. Users select the services they need from the tool box and put them into the layout manager. These services can be obtained from UDDI by means of key words. Moreover, in Triana, compositions that conduct services using local tools can be found.

BPWS4J [3] provides a plug-in unit to enable users to organize a map of workflow on the level of XML. This map of workflow and documents that relate to compositions and that serve the WSDL are handed to the execution engine. Self-Serve [4] allows users to build a workflow by means of service constructions. The service construction and UDDI can interact and find service in need. Use of an execution model based on P2P. Combination map (a state map that is labeled) is to be executed. One of the biggest features of this system is to introduce the concept of service container. The container has service sets with the same functions. In the process of construction, the service container will choose service that is actually in need according to the models of the members and an evaluation service.

There are certain defects for all of the above systems: In the first place, when the amount of the service offered increases, the discovery and choice of service methods are not able to be known timely. Therefore, it does not have scalability.

In the second place, they require the users to have knowledge about the basis. For example, in BPWS4J, users need to build a workflow on the level of XML. In the third place, if there are problems of certain services, the execution of the whole workflow will face failure. Even if in Self-Serve, service container may choose a service replacer.

Composition Methods of Semi-Automation For composition techniques using semi-automation like Documents [5], they make another pace in the process of composition and consider some characteristics of semantics in the choice of services. However, users still need to select services they are in need from appropriate service lists, and link these services according to the agreed subsequence. Sirin [6] brings up a system that is able to make consistent semantics in every stage that services have chosen. Cardoso and Sheth [5] have brought up a framework that is able to recommend services that meet the requirements of users. It mainly matches service template (ST) and service object (SO) that are appointed by users. While Chen [7] brings up a framework based on knowledge, which is able to offer suggestions when users are building the workflow. The system allows users to store workflows, which is beneficial to the reuse of workflow. The systems solve part of the problems of artificial composition, but they still do not have scalability when great amounts of services are accessed to users.

Automatic composition techniques of workflow such as [8] automate the whole composition process by means of artificial intelligence and relevant techniques. McIlraith and Son [9] is a service composition framework based on Agent. It guides compositions by using services of generic procedures and semantics. Agent acts as the gateway for Web services and is responsible for the choice of service. The framework assumes the existence of a generic procedure. If the generic procedure disappears, the composition will fail to work. In addition, if Agent is not able to match a service, execution will stop. SWORD [10] is to describe automatic compositions by using services based on rules. Users appoint initial and final state and then planners try to make a series of services a link that can meet the requirements. Here it requires that users appoint states. Moreover, there is no automatic service discovery mechanism in it. All the same, compositions also execute according to certain services. When certain services fail to work, it is very hard to ensure the successful execution of the whole process.

An important aspect in the composition workflow is the discovery of services. The researches on the aspect mainly focus on using DAML-S to describe services. Matchers compare the descriptions of DAML-S of the service requester and the service provider. Sycara [11] puts forward a framework based on DAML-S matcher and DAML-S virtual machine. The framework does not use workflow warehouse techniques. Therefore, when receiving a request, the workflow has to recalculate it every time. In addition, it does not distinguish the workflow in execution and out of execution. All kinds of workflows build on the available basis of service being executed. The result is that the workflow it built cannot be reused or shared, as nobody can ensure the service that is available now will still be available in the future. Sheshagiri [12] puts forward anther framework. It has two main characteristics: one is to describe the functions of services using DAML-S;

the other is to produce workflows using backward Chain Algorithm. One common defect of these frameworks is that it lacks Fault-tolerance Mechanism. In addition, there is no container to store workflows in these frameworks. Workflows that were built before can be reused through the container. It need not be recalculated every time. Finally, these frameworks do not distinguish abstract workflows with specific workflows, while the distinction is beneficial for sharing workflows. (Although they have been distinguished in Pegasus [13], it does not put forward a mechanism to advertise abstract workflow with specific workflow service.)

26.4 Research Content and Key Problems of Web Service

Currently, the research aspects of Web Service home and aboard mainly focus on these two aspects. One is to build a descriptive language that can be understood between computers and that can fully describe the behaviors, functions, attributes, and restraints of Web Service; the other is to put forward a model or system structure that supports self-discovery, composition, and execution of services. The common objective is to use the content that can be stored both in the Web and the machine and create intelligence automatic service and business process infrastructures. Considering the combination of the above, implementing functional complementation is a natural choice.

In conclusion, build conceptual modeling on services using ontology domain model effectively in the Web Service, which can guide the design of Web service application. Combine Web Service and Semantic Web dynamically utilizing the information of semantics in the Web Service, which can improve the quality of Web service. The semantic Web is the combination of semantic Web and Web Service, which can offer effective support to the discovery, execution, explanation, and combination of Web Service. Among them, in the environment of distribution, the collection, expression of semantics, and the exploration of appropriate knowledge and inference method of Web Service are subjects that need further research.

26.5 Conclusions

Currently, for the research on Web service composition, the industrial field focuses on the research of business process; while the academic field makes research on automatic composition of Web Service with the core of semantics and inference by means of artificial intelligence planning. From the perspective of application, the techniques and methods put forward by the industrial field have good implementation ability, but its composition process is complicated and easy to have mistakes. The application systems that developed have relatively low flexibility and expandability. The methods put forward by the academy field have certain

automatic degree but it contains formalized descriptions. In conclusion, how to build a automatic, active and inferential Web Service and accomplish service check with semantic technologies and develop common and intelligent Web Service composition system are key problems that need to be considered during the process of Web Service working in the application field.

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Chapter 27
Research on Parallel Association Rules Mining on GPU

Qingmin Cui and Xiaobo Guo

Abstract In this paper, general-purpose computation on graphics processing unit (GPGPU) is playing an important role in super-computing. We proposed a parallel association mining solution based on graphics processing unit (GPU) using Compute Unified Device Architecture (CUDA)–Cuda Apriori. The support-counting step for candidate frequent itemsets is off-loaded from CPU to GPU. First, candidate frequent item sets and transactions are partitioned in the pattern of thread block and grid of thread blocks of GPU. Second, the task of support counting is performed in parallel by massive threads with the simple matching computation, suitable to stream access model of GPU. In our experimental work, we simulated transactions on both our Cuda Apriori and the standard Apriori.

Keywords Association rule · Data mining · GPU · Support counting

27.1 Introduction

The rapid increase in the performance of graphics processing unit (GPU), coupled with recent improvements in its programmability, have made it a compelling platform for computationally demanding tasks in a wide variety of application domains [1] (called General Purpose GPU, GPGPU). Current-generation GPUs are designed to act as high performance stream-processors. Their performance is derived from parallelism at both the data and instruction levels. Additionally,

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current-generation GPUs are architected to take advantage of the independence of the data-elements in traditional graphics scenarios. This data-independence enables a memory-model that is simple and fast. Although these characteristics allow for high levels of performance, they pose challenges when conventional (i.e., non-graphical) applications are ported to the GPU. The streaming architecture can be a difficult programming environment for developers accustomed to working with traditional CPUs. In particular, the simplified memory model is restrictive when it comes to implementing well-known data structures such as linked-lists, trees, etc. Thus, although the GPU provides a new opportunity for optimizing the runtime performance of conventional algorithms, these algorithms must be redesigned into a form that is appropriate for the parallel, stream-architecture of GPUs.

In this paper we use the GPU to our advantage by demonstrating that offloading support counting computation to the GPU allows Apriori to function effectively at significantly higher frequent item sets-processing. To this end, we ported the Apriori [2], the newest generation GPU. In the experiment we simulated transactions on both our GPU-based version of Apriori (called compute unified device architecture, Cuda Apriori) and the standard Apriori. The results show that Cuda Apriori produces a 10-fold performance enhancement of frequent k-item sets mining ($k > 2$) step to Apriori and outperforms it by up to 80 % on the whole.

27.2 Cuda Apriori Algorithm

Apriori is a heavy computational task. Let $|I| = m$, there are 2^m subsets to be the candidate frequent itemsets at worst and selecting all frequent k-itemsets need to scan the whole transaction once. Agrawal and Srikant [2, 3] etc., are a class of Apriori-like algorithms with characteristics of large candidate frequent itemsets generation and transactions scan multi-times. Another is Fp-growth [4] algorithm, which adopts frequent-pattern growth to overcome the fault of Apriori. Fp-growth has better behavior at dense transactions and is opposite to the sparse. Especially, it is unreal to construct FP tree in main memory for large database (Table 27.1).

The parallel algorithms based on Apriori-like or Fp-growth usually run on shared-memory systems or clusters platform, whose bus and message transfer delay cannot be neglected [4–6].

In this section, we give a new association rules mining algorithm employing G80 and the Compute Unified Device Architecture (CUDA): The transactions and candidate frequent itemsets are partitioned, and support counting task suited the stream model is parallelized using massive threads on multi-processors of G80.

27.2.1 Data Partition and Task Parallelization

The G80 contains a set of multiprocessors, each of which contains a set of stream processors that operate on single instruction multiple data (SIMD) programs.

Table 27.1 Notations

k-itemset	An itemset having k-items
L_k	Set of frequent k-itemsets (those with minimum support) Each member of this set has two fields: (1) itemset and (2) support count
C_k	Set of candidate k-itemsets (potentially frequent timesheets) Each member of this set has two fields: (1) itemset and (2) support count
B^i	Block of G80 with id i
$T^{i,j}$	Thread of G80 with id j in block B^i
D^i	The dataset local to the block B^i
C_k^i	The candidate set maintained with the block B^i during the kth pass (there are k items in each candidate)
$C_k^{i,j}$	The candidate set maintained with the block B^i and thread T^j during the kth pass (there are k items in each candidate)

The stream processors in the G80 are general purpose. They are quite different from earlier GPU design, which had fixed numbers of special-purpose processors (e.g., vertex and fragment shades), very limited support for arbitrary memory accesses (scatter/gather), and little or no support for integer data types.

Figure 27.1 illustrates the Programming Model of CUDA. A unit of work issued by the host (equal to CPU) to the G80 is called a kernel and defines the computation to be performed by a large number of threads, organized in blocks. Each multiprocessor executes one or more blocks. Blocks are organized in grid. Each kernel is executed as a batch of threads organized as a grid of blocks.

Each thread is with thread ID, which is the thread number within the block. To help with complex addressing based on the thread ID, an application can also specify a block as a two- or three-dimensional array of arbitrary size and identify each thread using a 2- or 3-component index instead. For a two-dimensional block of size (B_x, B_y), the thread ID of a thread of index (x, y) is (x, B_y) and so is a three-dimensional block. Each block is identified with block ID, which is the block number within the grid. An application can also specify a grid as a two-dimensional array of arbitrary size and identify each block using a 2-component index instead. For a two-dimensional grid of size (G_x, G_y), the block ID of a block of index (x, y) is (x, yG_y).

The strategy of partitioning the transactions and candidate frequent itemsets is: let the total number of threads in one block be t, and the total number of blocks in one grid be b, parallel computation model based on G80 is shown in Fig. 27.2. Candidate k-itemsets C_k^i are averaged to $C_k^{i,j}$ ($i = 0, 1,\ldots,b-1$; $j = 0, 1,\ldots,t-1$) in block B^i, while transactions set D is averaged to D^i in whole grid. Every thread $T^{i,j}$ counts the support of every itemset in $C_k^{i,j}$ based on D^i, then every block B^i can complete the C_k^i and a grid does C_k.

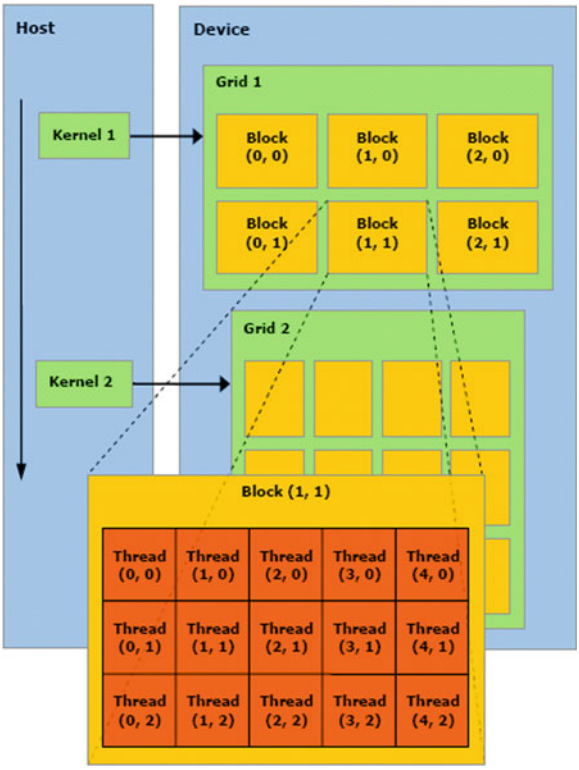

Fig. 27.1 Programming model of CUDA

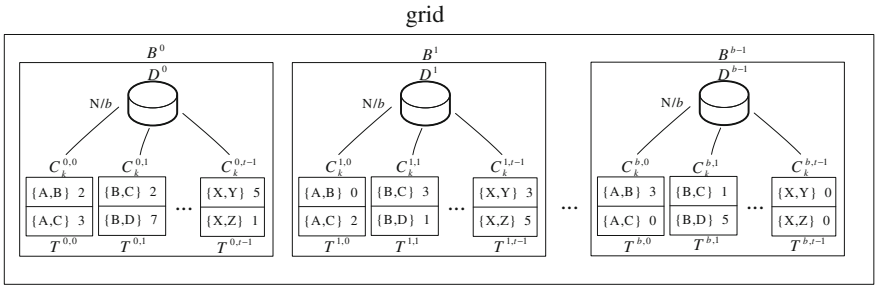

Fig. 27.2 The transactions and candidate itemsets partition

27.2.2 Support Counting on G80

Apriori implemented by CPU widely uses a hash-tree for determining the candidates in C_k contained in a given transaction d, while such a data-structure would be difficult on GPU given the simple memory model of GPU. Thus we opted instead

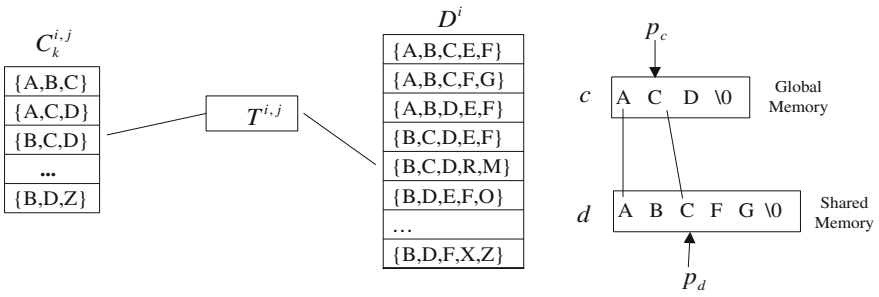

Fig. 27.3 Support counting on G80

to use the parallel rendering pipelines of G80 to build a string match method as Fig. 27.3 shows:

To process support counting, the following steps are required:

(1) To sort every item in $C_k^{i,j}$ and D^i in lexicographic order. It can be done by the host before the invocation of kernel. It does not product extra spending compared to the sequential Apriori algorithm.
(2) Thread $T^{i,j}$ continuously reads a transaction d (such as {A B C F G}) of D^i from Global Memory to Shared Memory shared by all threads in one block. This memory is on-chip and can be accessed much quicker than Global Memory. We retain candidate k-itemsets in Global Memory because the length of every k-itemset is k, which is very small and only scans once relative to single d.
(3) Thread $T^{i,j}$ increases support counts of every element c in $C_k^{i,j}$, if c is contained in d. The procedure of judging whether $c \subseteq d$ or not follows:

Step 1: Data points p_c and p_d respectively reside in the first element of c and d.
Step 2: If p_c points to '\0', then $c \subseteq d$ is correct and the procedure is over, otherwise, if two elements pointed to by p_c and p_d are equal, both p_c and p_d move next and the current step should be repeated. If not, go to Step 3.
Step 3: P_d moves next. If p_d points to '\0', $c \not\subset d$ and the procedure is over, otherwise go to Step 2.

Support counting on G80 adopts the sequential access model on the GPUs memory, which is very fit to the stream model of GPU.

27.3 Experiments

We compared Cuda Apriori with Apriori. All experiments were performed on a Dell Compatible PC with an Intel Pentium D CPU 3.7 GHz, 1G-byte main memory and Geforce 8800GTX graphic card. 768 MB of RAM, and 128 stream processors, organized into 16 multiprocessors. Each stream processor executes at 1.35 GHz. The raw (theoretical) compute power of the 8800GTX is approximately

350 GFLOPS. Apriori is implemented using Microsoft Visual.net 2003 and Cuda Apriori using CUDA.

We use synthetic 10 datasets, ranging from 100 K to 1 M, to find out the relationship between the performance of Cuda Apriori and the size of datasets. Average size of frequent itemsets is comparatively small as Apriori algorithm has a good exhibition under short pattern.

The efficiency estimation includes the support-counting price and total price. The support counting price of Apriori notated *CAsc* is (the time consumed by CPU at supports counting/$(k-1)$); corresponding to that, CudaAsc is (the time consumed by G80 at supports counting/$(k-1)$). k is the length of max frequent itemsets. Apriori's total time notated as CAac is measured as the time elapsed from the initiation of the execution to the end time of the association rule generation completed. So is the Cuda Apriori, and notated as CudaAac.

27.3.1 CAsc Versus CudaAsc and CAac Versus CudaAc

First of all, we compare CAsc to CudaAsc in Fig. 27.4 (T is average transaction length and I represents average size of frequent itemsets). The results are very encouraging: we get a 10-fold performance enhancement. On the other hand, Fig. 27.5 shows that CudaAac is able to outperform CAac by up to 80 %. CAac/CudaAac is far smaller than CAsc/CudaAsc, because the time of frequent k-itemsets mining ($k > 1$) only occupies half of the whole cost which also includes data input, initial frequent 1-itemsets and the finial rules generation etc. In spite of L_1 mining also can adapt our method, we use the traditional implementing fashion that single item's support counting is carrying out at the same time of reading transactions as data is seldom distributed on disk.

27.3.2 The Cost of Data Transfer

The extra cost of Cuda Apriori is data transfer. Candidate k-itemsets should be copied from host to G80 before support counting, and counting results from G80 to

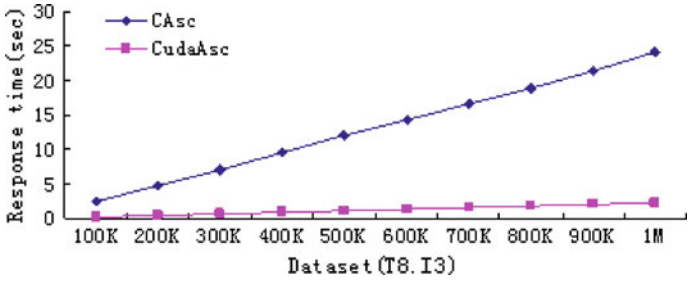

Fig. 27.4 CAsc vs. CudaAsc

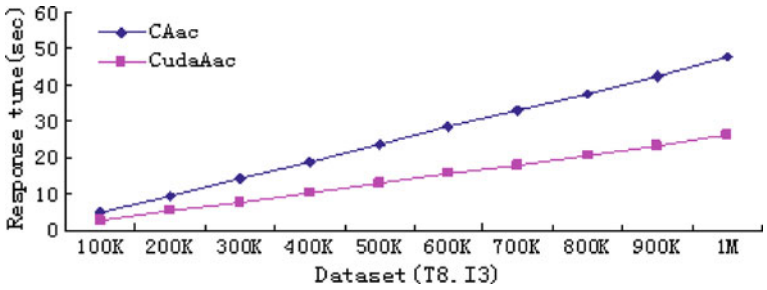

Fig. 27.5 CAac vs. CudaAac

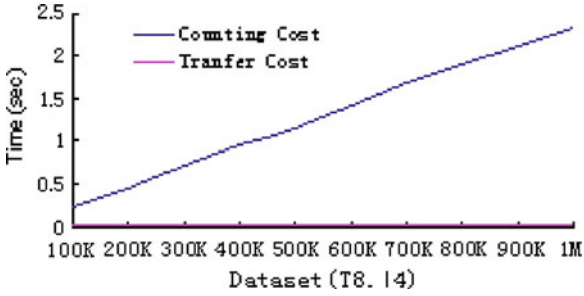

Fig. 27.6 The cost of data transfer

host after that operation. The data transfer cost and support counting cost of G80 containing the data transfer cost is given as follows.

Figure 27.6 shows the cost doesn't vary under the all datasets. The transfer rate between the G80 and host, under the CUDA, is about 2 GB/s so that it hardly brings influence on the total executing time of Cuda Apriori.

27.4 Conclusion

The result shows that Cuda Apriori produces a 10-fold performance enhancement of frequent *k*-itemsets ($k > 2$) mining phase to Apriori and outperforms it by up to 80 % on the whole. In spite of the data, transmission of Cuda Apriori between GPU and CPU is the extra cost to Apriori, its performance reducing can be neglected with the high 2 GB/s speed road.

With the rapid progress of semiconductor technology and graphic chip, the company is taking GPGPU in market seriously. GPUs are developing towards lower latency of memory, with more multi-processor and higher transmission rate. Schemes including neural networks, concept lattice, and other data mining algorithms are waiting for migrating to GPU.

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Chapter 28
Study on Development of Electronic Information Industry Based on Statistical Data

Jian Lu, Yuan-Yuan Liu, Hui An and Chun-Tao Lu

Abstract The Electronic information industry has the features of high technology and is labor intensive. In the later 30 years since Chinese openness and reform, it has been giving a lot of contribution to the economic development. However, the developments of electronic information industry in each part of China are imbalanced, compared to the coastal areas; the electronic information industry in inland areas is small in scale and higher in fluctuations. The provinces with central cities have advantages in developing the electronic information industry. Although after 2008 some electronic information industry in coastal areas had transferred, it still needs hard work by inland areas to achieve appreciable scale.

Keywords Economic growth · Export · Historical scale · Electronic information industry

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28.1 Introduction

As is well known, the electronic information industry has grown rapidly during the past 30 years of reform and is opening up. It is the driving engine of the economic development and the export growth for China. However, how has the electronics industry promoted economic development in China? What about its contribution to China's exports? Are there some different development paths for the electronic information industry among different regions or among different provinces in the same region? How about the development characteristics of electronic information industry for each period during the past 30 years? Can we judge the potential industrial transfer of electronic information based on the situation of economic adjustment in China in 2008? In the remaining parts of this paper, we will use statistical data to answer these questions.

28.2 Basic Characteristics of Electronic Information Industry

It is generally accepted that the electronic information industry is a high-tech industry and is intensive on capital/technology. Compared with agriculture or general manufacturing, electronic information industry is indeed more intensive in capital and technology. But compared with other high-tech industries, electronic information industry has more demand for labor force. If the electronic information industry is subdivided, we can find that the electronic information industry contains many items of production and services, which must be provided by labor. Therefore, under the trend of intra-industry specialization, the electronic information industry is developed in China, which is intensive in labor. China's advantage in low labor costs is the guarantee for its electronic production to compete in world market. Since the reform and opening up, many companies have occupied a place in the world electronic information market, which makes China a "world factory" of electronic information industry, and contributes to China's rapid economic growth.

There is an uneven regional distribution of the electronic information industry, although it has achieved rapid development in China. Most of the output of the electronic information industry is created in coastal areas, one of the reasons being the coastal location is more convenient for exportation. The other reason is that the electronic information industry is characterized by intensive production, which constrains the enterprises to expand largely across regions. As long as the gain from transferring outwards is less than the profits in coastal areas, the enterprises would keep expanding locally. However, as China has experienced a rapid growth in the last 30 years, the rise in wages and raw material prices in the coastal areas has become more and more serious. Therefore, some enterprises find that to keep expanding in the coastal areas is more and more unprofitable, and they have to

move their factories to less developed inland regions, resulting in the intra-national transfer of the electronic information industry in China.

Caused by the important position of electronic information industry in Chinese economic development, the number of researches on this subject is very large. Research is mainly focused on topics about the impact of foreign direct investment to the electronic information industry [1], electronic information industry's impact on the development of other economies [2]' the contribution of the electronic information industry to a province's development [3], and western China's concrete response in developing the electronic information industry [4]. The electronic information industry factually includes production and services for both the hardware and the software of electronics and telecommunications. However, according to China's statistics, the production of hardware has been credited to the secondary industry, while the software production is generally credited to the tertiary industry. This difference is also reflected in the development of hardware and software. Compared to the hardware industry, the software industry is more apt to transfer because the transfer cost is almost zero. On the other hand, the software industry puts forward high requirements for human capital. If there are not plenty of software technicians in the transfer destination, the transfer of software industry is also very difficult to realize. In China, the less developed inland regions are generally backward than coastal areas in education inputs, teaching level of universities, and environment of research and development, hence the software industry will merely transfer to areas where the level of education and human capital gets up to the transfer threshold. And in those areas a new industrial cluster will be formed, resulting in new uneven development within the less developed regions.

28.3 Basic Development Situation of Electronic Information Industry in Regions of China

We adopt the panel data of electronic information industry [5] in all provinces of our country for 30 years since reform and opening up and the statistical data on Cabinet [6]. First, we analyze the development situation of electronic information industry in the east, middle, and west regions of our country. Because the number of provinces in the east, middle, and west areas of our country is different, we only select six provinces in the three regions to make comparative analysis. The development of electronic information industry in the regions of our country is not balanced. The electronic information industry of the eastern region increased on the way of geometric series from 1992 and left middle and west regions behind. Comparatively speaking, the industry difference between middle and west regions is not large. It was just the annual average increase of 30 % on electronic information industry of west regions and fluctuate increase speed (reduction of 20 % even turned up in some years, which can be seen in Table 28.1) of middle and west regions after 1992 which led to obvious differences in the electronic industry

Table 28.1 The growth rate of East middle and West China's added value of electronic information industry in the last 30 years

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
E	1.07	0.88	1.31	1.12	0.93	1.42	1.63	1.47	1.28	1.16
M	1.01	1.06	1.28	1.06	0.91	1.33	1.47	1.34	1.22	1.04
W	1.25	0.97	1.19	0.95	1.08	1.43	1.61	1.33	1.22	0.98
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
E	1.44	1.11	1.10	1.33	1.13	1.93	1.33	1.07	1.07	1.30
M	1.36	1.19	0.90	1.15	1.06	1.83	1.16	1.05	1.01	1.31
W	1.36	1.19	0.90	1.15	1.06	1.83	1.16	1.05	1.01	1.31
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
E	1.28	1.28	1.39	1.11	1.34	1.44	1.44	1.32	1.23	1.26
M	1.30	1.20	1.26	1.11	0.91	0.96	1.18	1.21	1.39	1.15
W	0.87	1.04	1.67	1.11	0.66	0.81	1.22	1.20	1.14	1.04

between the east and middle and west regions. This conclusion confirms the views of Fujita etc., [7].

The differences in electronic information industry is not only reflected in the large regions, but also in different provinces of the same regions. The advantage is of Jiangsu and Guangdong in six provinces of the east.

The coastal regions are the same as that of eastern regions in the country, which is very obvious. The difference is, compared to the provinces of middle and west regions, among the six provinces of east regions, except Hubei, electronic information industry of Fujian, Zhejiang and Shandong has increased substantially, but Jiangsu and Guangdong is still dominant among them, and the development of other provinces cannot achieve on the same level as Jiangsu and Guangdong.

While the electronic information industry of east regions increased rapidly, the electronic information industry of middle and west regions were also increasing. Although this increase was very slow compared with east regions, but it does not mean that the increase of middle and west regions can be ignored. If we study the data of electronic information industry of middle and west regions, we can find the following two phenomena easily.

For 30 years, the development of electronic information industry of middle and west regions has been led by some dominant provinces. Hubei in middle regions, and Shaanxi and Sichuan in west regions have occupied the first two places in electronic information industry of local regions for 30 years. Sichuan and Shaanxi in west regions also left other provinces behind.

The development of electronic information industry of middle and west regions was not stable. Henna province and Hubei province in middle regions experienced troughs in succession in 2003 and 2004. The data fluctuation of Sichuan province and Shaanxi province in west regions is even more drastic. And that, with increase on data, the fluctuation of Sichuan and Shaanxi did not slow down, but became even more drastic.

What kinds of factors lead to the above two phenomena's? According to common explanation on development of electronic information industry, the electronic information industry is an extravert type industry, its development is affected greatly by the export volume, but why Sichuan and Shaanxi which located in inland and have no border crossings can occupy a leading place in west regions? (According to export volume, the total export value of Shaanxi province is less than Xinjiang, but its electronic information industry is stronger than Xinjiang) Are there other factors which caused such great differences among different provinces of the same regions? We need to make a time-phased study on the data of electronic information industry.

28.4 Relevance Among the Development of Electronic Information Industry and Development of GDP and Total Import and Export Value in All Regions

What is the relationship among development of electronic information industry and development of GDP and total import and export value in all regions? Now there are many relative researches on industry cluster [8] and particular economic policy [9] to the GDP and export. By comparing the data of added value of electronic information industry of all provinces to relevant coefficient of GDP and total import and export value, we can validate whether they have certain relevance.

First, let us see the relationship between the industrial added value of electronic information industry and GDP of all provinces which we have analyzed. In recent years, under the leading of east provinces, especially Guangdong and Jiangsu, all provinces treat electronic information industry as new growth pole of local economy, and promulgated some corresponding policies. However, not all developments of electronic information industries of all provinces are consistent with that of GDP. Similarly, comparing the data of six provinces each in east, middle and west regions, we can find out that, the electronic information industry of most provinces in east and middle regions has strong relevance with GDP, while in west regions, only electronic information industry of Guizhou and Sichuan has strong relevance with GDP. And among the provinces that take leading places in west industry, we can find that the electronic information industry of Shaanxi has weak relevance with GDP. This shows that in west regions, the electronic information industry has not become the growth pole of economic development.

Now let us see the relationship between electronic information industry and imports and exports. We can find that, added values of electronic information industry of the east provinces keep relevance with data of imports and exports for significant level of 1 %, and only the relevance in Fujian and Hebei province is a little weak. However, the relevance of added values of electronic information industry and trade volume of the middle provinces is obviously weaker than the relevance between added value of electronic information industry and GDP.

Electronic information industry of Jiangxi and Anhui keep well relationship with imports and exports, and electronic information industry of Shanxi, Hunan and Henan have weaker relevance with imports and exports. The development of electronic information industry in Hubei has certain relationship with the increase of GDP, but has much weaker relationship with its imports and exports. In the west provinces, there is an obviously weaker relevance between electronic information industry and imports and exports in Sichuan and Guizhou, and the added value of electronic information industry in the other provinces has no relevance with imports and exports. A large number of data have proved that, the cognition that development of electronic in formation industry is promoted by the increase of imports and exports is not right, at least, it is not right in most middle and west provinces of our country.

Through the above analysis, we have found that, the electronic information industry of Sichuan and Shaanxi has increased remarkably for 30 years, but why does the increase have no significant relationship with GDP and imports and exports? The reason for unremarkable relationship with GDP should be that, the electronic information products of Sichuan and Shaanxi take little proportion in their imports and exports, the fluctuation of electronic information industry is not reflected in that of imports and exports, while the non-significant relationship with GDP cannot prove that the added value of electronic information industry of the two provinces has no relationship with GDP, maybe the fluctuation of electronic information industry of the two provinces is drastic, and has time-lag with the fluctuation of GDP, so the data of electronic information industry cannot coincide with the data of GDP of that year.

28.5 Time-Phased Analysis on Development of Electronic Information Industry

The rapid development of Guangdong and Jiangsu started in 1992. 1992 was the year when Deng Xiaoping made his remarkable inspection tour in the south and the reform and opening up was intensified. Great changes also happened in the development of electronic information industry in the provinces of middle regions in 1992. Comparatively speaking, the increase of electronic information industry in Sichuan and Shaanxi started earlier in 1984. If we select 1977–1987, we can get the figure on rough development of electronic information industry in the provinces of the three regions in the first 10 years of reform and opening up.

Comparing the figure for 30 years and first 10 years of reform and opening up, we find that the provinces which occupy leading places in electronic information industry of our country actually have their own industrial development basis. Jiangsu has good basis, it not only occupies a leading place in Liaoning, Jiangsu, Hubei, Guangdong, Sichuan and Shaanxi province, but also left other provinces in

east regions behind. In contrast, the basis of electronic information industry of Guangdong province is very weak, it did not reach one-sixth of output value of Jiangsu province in 1977, Guangdong province did not achieve the second place in the east coastal provinces until 1983, but before 1987, it still fell behind Jiangsu. Sichuan and Shaanxi also had superiority in the provinces of west regions in 1977, and the superiority was expanded in 1980s. Although Hubei province had no obvious superiority in middle regions, it developed remarkably and expanded the dominant position in the 1980s.

From the above analysis, we find that there are at least two factors which affect the electronic information industry. One is the trade volume of each province, which mostly depends on the geographical position of the provinces. It is the main factor for development of electronic information industry; another effect factor is the industrial scale of the provinces when market economy turns up. Since electronic information industry has strong centrality on capital and technology, it cannot develop without foundation. Only depending on original industrial chains, electronic information industry can develop adequately in places suitable for technology research and development and human capital investment. In this way, the superiority of some provinces can be maintained through long accumulation at the beginning of reform and opening up. Of course, if the industrial policy is competent, and the industrial agglomeration is formed well, the original superiority can be expanded. By comparing the data for 30 years and first 10 years in middle and west regions, we can see this phenomenon.

We should also ask the questions: where did the industrial superiority of the provinces come from at the beginning of reform and opening up? The answer is very obvious—it came from the industrial investment of our country in the planned economy period. Electronic information industry was developed in our country after liberation, so the distribution of electronic information industry had great effect on the industrial scale of all provinces in planned economy period. In planned economy period, the distribution of industrial industry was planned according to large region (East China, Central China, Southwest China, etc.,), the central cities which belong to grand administrative region all obtained the richest administrative resources of the region, a large number of excellent enterprises (except resource-based enterprises), colleges, and universities and research institutions were established in the region, which made these central cities different from other provincial capitals on modes and degree of economic development. Through the above analysis, we have found that the development of provinces with regional central cities is better than the development of provinces without regional central cities. In 1977, the initial industrial scale of Jiangsu took high proportion among that of the provinces with regional central cities. Afterwards, the front-runners in electronic information industries of all regions are all the provinces with regional central cities.

28.6 Suggestions on Future Development of Western Electronic Information Industry

The west region locates in the inland, although it has inherent disadvantage on industry development. It also has comparative advantage on labor input. Therefore, it is necessary for the enterprises to consider the problem on how to grasp the industry transfer opportunity based on the practical situation of local places. On the one hand, the west region should build well investment environment, and on the other hand, it should also select good enterprises which can maintain sustainable development. For example, in the electronics industry, selections on software, hardware, and specific products are different. The enterprise should strongly support the products with good market prospect, high profit, and well updating and upgrading capability, while in the support process, the enterprise should intensify research and development and learning, and develop proprietary brands. Only in this way, the west region can take hold of the electronic information industries transferred from other regions. The dependence of electronic information industry on technical knowledge determines that the discourse power of industry will be grasped by the person with intellectual property, once the electronic information industry of west region grasps the discourse power, it will get rid of the disadvantageous condition on economic development such as inland condition and transportation condition more easily than other industries.

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Chapter 29
Web Data Mining Technology and Instrument Research

Yunli Lei

Abstract Network data source has been widely used in daily life and work. To mine and utilize these materials in an excellent way leads to complicated engineering. Data mining technology can solve this problem quite well. Through data mining to mine and utilize the network resources, we can find out the required content to the maximum limit. This article pays attention to the introduction of Web data mining and Web data mining classification. Finally, it will introduce some popular data mining instruments on the market.

Keywords Web mining · Mining instrument

29.1 Introduction

In the general condition, various data will be stored in the database for helping us with maintenance and to manage the data. The database has the standard structure that special database will manage these data [1]. In the 1990s of the twentieth century, data development in the computer network environment obtained explosive growth [2, 3]. The redundant data become more and more. Data information on the Web is different from the traditional data storage [4]. On the Web, data resources are cluttered with huge data quantity and worse constitutive property. These data cannot express by data muddle [5, 6]. Therefore, the data mining technology of the Web requires some different single database mining technology. It is more complicated than the single database mining [7–9]. Data mining is the technology that finds out and abstracts the most useful information from the huge data set or database for the users. Data mining application in the Web field is the Web data mining technology.

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29.2 Web Mining

29.2.1 Data Character on Web

Various data on the Web are based on hypertext. They include advertisement, finance, news, education, e-commerce, government, and different information. This condition improves the data mining difficulty. At the same time, it provides abundant original resources for the data mining. Web data has the following characteristics (Fig 29.1).

Complexity. Whether it is the enterprise, government, or different committees in colleges and universities, the network is everywhere. The Internet can browse domestic network and it can skim through the abroad network information all over the world. Web network openness leads the huge data information to the explosive development. Based on the incomplete statistics, there are 1 billion web pages in ceaseless growth.

Isomerism. The data environment of the Web has isomerism. From the special view, web site information is the huge complicated database that stores various Web information. Moreover, that huge database divides into different databases under various layers. Each database is the data source and every data source is isomeric.

Dynamics. Web data increases everyday and updates everyday. No matter advertisement, finance, news, education, and e-commerce, even the government information renew the independent web page, interlinking, and research record. Therefore, the Web data are dynamic with ceaseless change.

Semi-structured. The non-Web database has fixed data that can easily manage. However, the Web data are complex and update constantly. The data at each station have independent character and design. These data will have no special data model description after data collection. Therefore, the Web data are semi-structured data that related to the fully structured.

How to rapid abstract the useful information from this huge, isomerism, dynamic, and semi-structured data is the content to research Web data mining.

29.2.2 Web Data Mining Summarizes

Web data mining applies data mining technology into the Web, and abstracts the interested information from Web text, Web information, Web data, and other Web services. This technology stretches over several computer techniques with computer

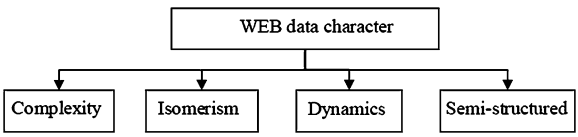

Fig. 29.1 Web data character

language, statistics, artificial intelligence, network technology, and computer information. Whether at home or abroad, the research on Web data mining pays attention to the search engine design, semi-structured information abstract, key work abstraction, and new type application. Researchers and scholars start from the relative profession field. They research and design from different angles. The process of Web data mining has many phases. It includes resource collection, resource preprocessing, resource evaluation and abstraction, resource integration, mode identification, and verifying analysis.

Web data mining has three parts; content mining, user visit mode mining, and structure mining. The details are given in Fig. 29.2.

Content mining. We content mining places important position in the Web data mining. Content mining aims at semi-structured data such as image data, audio/video (AV) data, and other multimedia data mining. These data are on the web pages. Web content mining is the web page content mining and abstract knowledge in the Web text. Web content mining is based on a web page, find information from the large amount of Web data, and the process of abstract useful knowledge. Web content mining has two strategies: directly mines the text content and change content on the search instrument.

User visit mode mining. It means when the user accesses the web page, it will leave some access record and relative data. Through these files and access records we can analyze and research the useful information to forecast user behavior mode and habit mode that can provide personalized service for users. This common mode can evaluate user search mode or tendency that can provide different Web structures for the various users. User visit mode mining includes three phases: data preprocessing, mode identification, and mode evaluation. Through these three phases in processing we can obtain a lot of useful information to perfect the web site access ratio.

Structure mining. In Web, structure means tree structure or image structure, the linkage structure among Web pages, and the directory structure in the URL. Structure mining means to classify and cluster the content in order to find knowledge, internal structure character based on the page structure and Web structure. Moreover, rebuild Web station structure, sequence web page, and find the authority page to determine the expression mode of enterprise name, address, or other information on the web page. This method can improve the search engine.

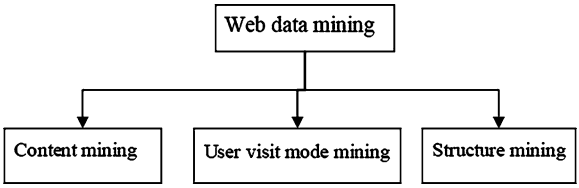

Fig. 29.2 Web data mining classification

29.3 Web Mining Technology Research

Web data mining comes from data mining. The data mining method is of two types: one is building based on the statistical model, and use decision tree, classification, clustering, and association rules. The other is to build artificial intelligence model of machine learning, user neural network, and genetic algorithm (Fig. 29.3).

From computer technology, Web data mining technology uses many computer techniques. With the increase in research in various fields, the new application emerges endlessly. The common techniques have association rules, classification technique, clustering technique, path analysis technique, and sequence pattern technology (Fig. 29.4).

Association rules mean search relative data information. The data information comes from the user access record in the database. For example, the user visits the page, clicks on the product and the relationship between these web pages. From this information, we can evaluate user interests that can provide better service for the web site management. The common algorithm is Aprior algorithm.

Sequence pattern technology means the sequence pattern mining. It is the set of records that might emerge from the other set of records on the time sequence. For example, 'One customer buys the Panasonic LX5 camera might buy the new memory card or camera bag'. Sequence mode technology is important in the e-commerce field. The Web service log will record every user access in the period of time. The timestamp is relative to these user affairs. The record during the processing period will determine and belong to the user affair for a while. The common method is period analysis.

Classification technology means to find the common character in some data and classify them. Classification technology analysis root in Web user information and log. From the information, we can obtain the special user character. For example, we can classify the users of the same class which access cosmetics zone constantly. Recommend the newest cosmetics or special offer cosmetics. Data

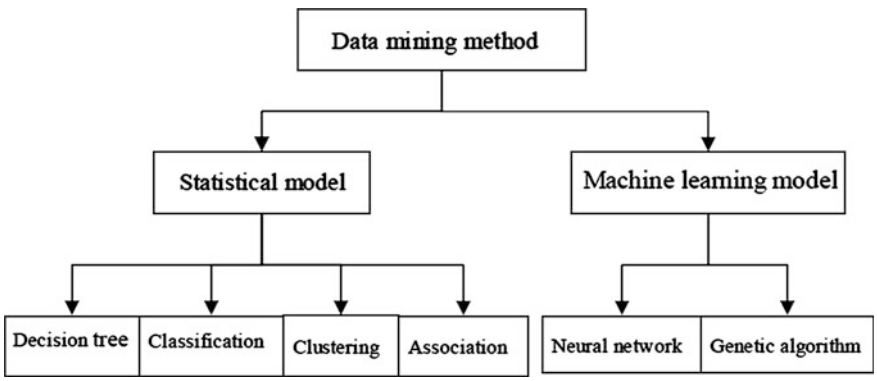

Fig. 29.3 Web data mining method

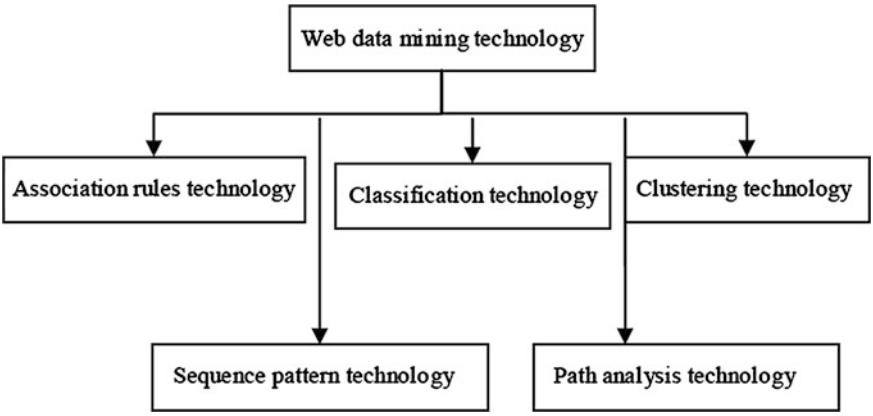

Fig. 29.4 Web data mining technology

classification technology has the common method of Bayes classification, Bayes network, genetic algorithm, decision tree classification, and case-based reasoning.

Path analysis technology is the unique mining technology in Web data mining. Each web page has the relationship. We can visit the other subpages from the home page. Other subpages can back to the home page. This will form the web page structure. Based on the user's access path, we can mine out the common access path and common technical image.

Clustering technology means unguided learning classification. It uses mathematics to classify the research and analysis of physics or abstract object. Clustering analysis can clearly evaluate data distribution; identify the dense or sparse field with wide application. Clustering algorithm has so many methods such as partition-based method, model-based method, dense-based method, grid-based method, and the method that based on hierarchical method.

29.4 The Introduction of Web Mining Instruments

29.4.1 Instrument Classification of Web Data Mining

With the data mining technology development, the importance looms large. Many companies design the independent data mining software. The data mining instrument needs to demonstrate from five parts. The first is mode class quantity. The second is operation convenience. The third is the data storage amount. The fourth is solving ability of complicated questions. The fifth is whether to provide the interactive port with other productions.

Based on the software platform, the instrument can divide into data mining software that is based on DOS, the software based on window, the software that is based on another Linux type. Aiming at the scope of application, the data mining

instrument can divide into common data mining instrument and special data mining instrument. The common data mining instruments are DBMiner system from Canada, the Mine Set system from SGI Company, and the QEUST system from IBM. The special data mining instrument means the data mining instrument in the particular field. The special data mining instrument has the SKICAT system. It can help in searching for the long distance quasar. The Advance S Court system from IBM aims at NBA data to help optimize the tactical combination. TASA system from Finland can forecast network communication alarm.

29.4.2 Web Data Mining Instrument

There are several data mining instruments. Based on the scope of application, they can be divided into the special mining instrument and the common mining instrument. The special minding instrument can provide a solution for the particular field question. The common mining instrument does not divide the detailed data and process the common data type. With the information quantity increase, the importance extruded and full of different mining instrument. The common instruments are QUEST system from Almaden research center of IBM, DBMiner system from Simon Fraser of Canada, SAS software from NORTH CARLINA University of America, MineSet system from SGI Company, WeKa, and so on. This article will introduce the mining instrument of UWM user navigation behavior, SAS, DBStar, and IBM Intelligent Miner.

Web Unitization Miner (WUM) is the sequence delver. The core center of WUM is MINI processor. The process is in charge of abstracting and evaluating the information from Web log, and find the user navigation mode. WUM provides access port for the user data delver as well as MINI language. The MINI language is similar to the SQL research language that can easily understand to the SQL language users. MINI language provides more flexible functions for users. The disadvantage is the users need to understand the evaluation and processing knowledge and MINI language before using the WUM instrument.

Statistical Analysis System (SAS) instrument is the largest applied software system with integration and modeling. The function includes data storage and management, data evaluation, image processing, report formation, data access, Econometrics and forecast, and operations research. It is a special model. SAS software system is in charge of finishing four assignments: data access, data support, database design, and data processing that follow the method of 'abstract-research-transform-modeling-evaluation' to finish the data mining and integrate with other instruments.

DBStar instrument is the data analysis instrument. It can find data quantity problems and the dependent relationship between data elements and other business rules on data driven. It can build inter-physical volume between the many data sources and the unique target data. The advantage depends on the data quality; track data change, and maintain the data consistency. It utilizes practical data to analyze the details without metadata. The disadvantage is the user interface is not good enough.

Intelligent Miner form IBM can automatically realize the data selection, data transform, data mining, and result expression. It can provide some custom made with expandability, advance language evaluation ability, and clustering filter capacity. It has fast search engine and great API parameter database that can build a personalized model for users. Moreover, it can process mass data, support parallel processing, and research at fast speed. The disadvantage is the image user interface is not perfect. It is slightly difficult to operate multiple mining to one object. The complicated structure cannot explain the error code. Moreover, the algorithm has no detailed expatiation.

29.5 Summary

With the network technology development, especially the global Web popularity, the Web has abundant information. How to effectively mine out useful information from the unformatted data is the new challenge in the data mining field. At present, e-commerce has huge online business, where the large amount of business include a lot of user information. Each customer will leave relative data on the Web. This is not only the purchase information but also relative data through search engine and site browse. All the interactive data will record by the background database. The abundant data set includes the market analysis of historical records and important information that benefit to market forecasting data drive. Using the perfect database technology, the company can easily search a mass of customer information. For usage of detailed data mining instrument, we need to select the correct tool under the different fields.

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Chapter 30
Measurement of Customer Equity from the Perspective of Data Mining

Pengfei Wang and Manyu Huang

Abstract As the uncertainty of individual customer's consumption behavior makes it difficult to measure customer equity, the present paper advances a dynamic method for the measurement of Customer Equity on the basis of a data-mining technique and the classification of customers. It starts by introducing the process and method for calculation, and subsequently it demonstrates the application of the method by empirical analysis. The method enables the measurement of Customer Equity in a more accurate and practical way, and hence it may offer significant support for enterprises to achieve more effective marketing.

Keywords Customer equity · Data mining · Customer lifetime value

30.1 Introduction

Nowadays, an increasing number of enterprises are turning from a product-centric to a customer-centric approach when they establish the marketing strategies under pressure from fierce competition. Practice has proved that the customer-centric competition strategy may help enterprises gain sustainable competitive advantages. The concept of Customer Equity appears when enterprises regard customers as equity under the guidance of customer-centric idea. In addition, the concept of Customer Lifetime Value has been advanced by many Western scholars. For example, Reichheld [1] defines Customer Lifetime Value as the present value of

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the expected benefits (e.g., gross margin) less the burdens (e.g., direct costs of servicing and communicating) from each customer. Consequently, Customer Equity is the sum of all Customer Lifetime Value. The measurement of customer helps to quantify the relationship between enterprises and customers so as to offer useful tools for marketing decisions.

Current measurement of customer equity is mainly implemented by summing up Customer Lifetime Value. For example Berger [2] advances a mathematics equation for the calculation of Customer Lifetime Value under two kinds of contexts: maintenance and migration of customers. However, it only applies to current customers and only demonstrates static characteristics of Customer Equity. Phillip [3] puts forward a customer relationship model on the basis of Markov Chain, but it still lacks quantified and dynamic analysis for taking both the maintenance of current customers and exploration of potential customers into consideration.

The measurement of Customer Equity focuses on a more accurate prediction of customers' future consumption [4]. However, it is difficult to estimate the customers' future consumption from the past consumption data, as the uncertainty for the individual customer's future consumption behavior is significant. In addition, potential customers should not be excluded and the dynamic characteristic should be taken into consideration when Customer Equity is calculated. Consequently, the classification of customers is helpful to overcome the above-mentioned disadvantages, as the customers who belong to the same category display more stable consumption behavior [5]. Hence the present paper aims to classify customers according to expenditure and gross profit on the basis of data-mining technique. It will then move on to a consideration of rules of customers' expenditure modes by using data-mining techniques for each category. Moreover, demographic variables (such as sex, age, occupation, and income) and consumption behavior variable (such as regency and consequence of consumption, money spent and changing rate of money spent) will be considered when data-mining technique is applied to determine inner and outer factors that influence the changing of expenditure modes for each category. Finally, as Customer Equity is predicted more precisely, higher quality data for marketing references may be offered.

30.2 Measurement Methods

30.2.1 Research Framework

The calculation of Customer Equity is achieved by summing up Customer Lifetime Value, while the conceptual framework for the calculation of Customer Lifetime Value can be illustrated as follows:

Among all the factors shown in Fig. 30.1 that influence Customer Lifetime Value, sales and the predicted period (i.e., customers' maintenance period) are

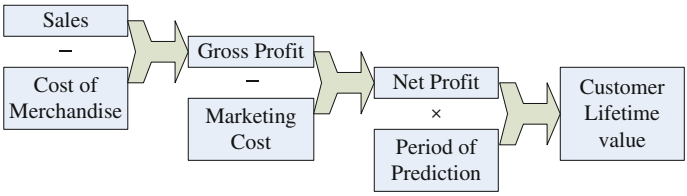

Fig. 30.1 The conceptual frame of the calculation of customer lifetime value

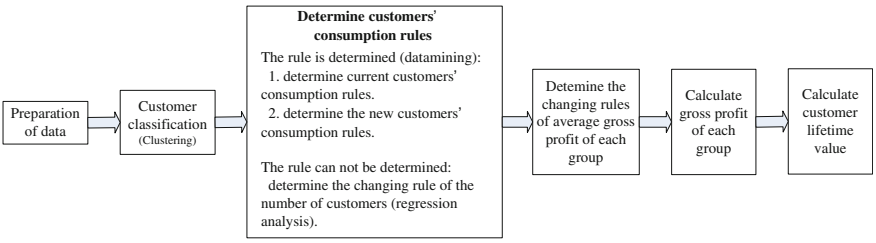

Fig. 30.2 Calculation process of customer equity

decided by customers, making thus the prediction of these variables crucial to the measurement of Customer Lifetime Value As the consumption behavior of the individual customer is to a great extent uncertain, the prediction of sales and the maintenance period will be inaccurate if the measurement is done from the perspective of the individual customer. In addition, this type of measurement only focuses on current customers and potential customers are ignored.

Thus, the present paper aims to determine consumption rules on the basis of customer groups which tend to have similar consumption behavior, so as to obtain more reliable results in terms of measurement. The Customer Lifecycle Theory explains that there should be a certain rule of consumption model during the maintenance of customers, and the determination of this rule may help to predict sales and the maintenance period, so that a more accurate prediction can be made.

In my proposed method, the calculation of Customer Equity is achieved not by summing up individual Customer Lifetime Value, but by seeking for consumption rules on the basis of customer classification. The process can be illustrated as follows (Fig. 30.2).

There are two situations to consider when Customer Equity is measured: one is when the consumption rules exist and the other one is when the rules do not exist. Hence, the present paper focuses only on the situation when the rules can be tracked.

30.2.2 Customer Classification on the Basis of Clustering Analysis

Accurate prediction of customers' future consumption is crucial for the calculation of Customer Equity. Yet, the great uncertainty of individual customer's consumption means that it is difficult to predict one's future consumption behavior only according to past consumption. In addition, the potential customers should not be excluded when Customer Equity is calculated, and the dynamic characteristics should be manifested. As the consumption rules of customer groups should be more stable and dynamic, so the classification of customers should be the precondition of the calculation of Customer Equity. Therefore, this paper will classify customers according to their expenditure and the gross profit which customers create for the enterprise by using the clustering method.

Here the paper uses *K*-means clustering to classify customers. N stands for the number of customers, *S*1, *S*2 … *SN* is their expenditures separately, P_1, P_2 … P_N refer to the gross profit accordingly, so that (S_i, P_i) means customer *i*'s expenditure and gross profit $(1 \le i \le N)$. Consequently, the distance (refers to the similarity) between customer *i* and *j* is as follows:

$$d_{ij} = \sqrt{\alpha\left(S_i - S_j\right)^2 - \left(P_i - P_j\right)^2} \tag{30.1}$$

α is weight, and $\alpha = \left(\sum P / \sum S\right)^2$

Here the k-medoid method is used for classification. The number of categories should be decided at first, supposing it *K*. The classification can be finished by using the data-mining technique, and the result will be more reasonable than those obtained by manual estimation.

30.2.3 Calculation of Customer Equity

30.2.3.1 Determination of Customers' Consumption Rules

The customers of an enterprise can be classified into different categories according to their consumption rules, and data-mining technology can be productively used for the determination of these rules.

Let us suppose that an enterprise has *N* customers, and the number of groups is *K*; *Ri* stands for the expenditure of customer *i*, and $Ri = \{C1, C2\ldots, Ct\}$, where *Cj* refers to the group customer *i* belongs to in period *j*, $0 \le Cj \le K$ ($j = 1, 2\ldots, t$). $Cj = 0$ means the churn of customer *j*, and *t* stands for the life period of customer *j*. *M* stands for the number of customers who have the same expenditure rule as *Ri*, if $M/N \ge P0$, and $L = \{C1, C2\ldots, Ct\}$ can be defined as a piece of consumption rule.

First, the consumption record Ri ($i = 1, 2, \ldots, N$) of all the customers is scanned, second, those customers who have the same consumption record are registered to see if the registered amount exceed the stipulated amount, those exceeding ones are initial consumption rules. Third, the initial consumption rules are scanned and compared, and those sub-rules (rules contains in other consumption rules) are filtrated, and the rest is used as final consumption rules for output. The detailed arithmetic is as follows:

$i = 1, j = 1, TLj = Ri, Mj = 1$; B: $i = i + 1$; for $k = 1$ to j if $Ri = Lk$ then $Mk = Mk + 1$; else $j = j + 1$, $TLj = Ri$, $Mj = 1$; next k if $i < N$ then goto B; $m = 0$; for $k = 1$ to j if $Mk/N \geq P0$ then, $m = m + 1, Lm = TLk$; next $kn = 0$; for $i = 1$ to m for $j = 1$ to m if $Li \in Lj$ then next I; else, $n = n + 1$, $Ln = Li$; next j next i output Lj, $1 \leq j \leq n$. Finally, n pieces of consumption rules can be obtained and they are saved in $L1$, $L2$ …, Ln separately.

30.2.3.2 Definition Current Customers' Consumption Rules

Each piece of consumption rules predicts the future consumption behavior of customers who belong to the rule, and the future expenditure and gross profit of each period can thus be predicted. The present paper adopts the Decision Tree method in order to judge to which consumption rule each customer belongs. Not only the expenditure record but also some demographic variables (sex, age, occupation, income, among others.) and consumption behavior variables (regency, frequency, expenditure, and the changing rate of expenditure) are all taken into consideration as distinguishing attributes, while the current consumption rules of customers are used as class attribute. As a consequence, the decision tree for distinguish customers consumption behavior can be obtained in this way.

Discriminate classification calculation is implemented by using the decision tree so as to decide current customers' consumption rule and the consumption period they belong to. In addition, this calculation can also be adapted to new customers.

30.2.3.3 Determination of the New Customer's Consumption Rule

After obtaining the consumption rules of current customers, the consumption rules of new customers must be determined. The new customers for each group originate from two sources: one is from the enterprises other groups; the other is totally new for the enterprise. Concerning the former, the consumption rule has been decided before the migration, so only the rules for the latter need to be determined. Accordingly, here the new customers refer to the new added customers. The rules of new added customers include the number of new customers and the percentage of new added customers adopts a certain kind of consumption rule.

The number of new customers can be estimated by time serial analysis according to the number of old customers of each group and the marketing cost for

each group. The percentage of the adoption of a certain consumption rule by new customers can be calculated on the basis of the average percentage of the adoption of a certain consumption behavior by new customers in each period.

30.2.3.4 Determination of the Changing Rules of Gross Profit for Each Customer Group

The performance and quality of product, price, income, etc., are all factors that influence the gross profit. However, it is unnecessary to research the changing rules of gross profit of the individual customer since all the customers are classified, and it may be helpful to estimate the changing rules of average gross profit of each customer group with similar consumption characteristics. The past average gross profit of a customer group relates to the current gross profit, as most customers are inclined to maintain their consumption characteristics. In addition, marketing expenses influence the gross profit of customers greatly, for instance, the price reduction of a certain product In this case, the reduction can be regarded as marketing expenses, and so to be taken as the main factor that influences customers' average gross profit.

The ARMA model of time serial analysis is used to build the changing model of gross profit of each customer group, where the independent variable is the average profit of customers from the last period and the marketing expenses in the current period. First, the average gross profit of each group in the period needs to be calculated. Here, $X_1, X_2 \ldots, X_N$ refers to the number of customers in period 1, 2, …, n. $S_1, S_2 \ldots SX_i$ is the gross profit of X_i in the year of i, Y_i is the average gross profit in year I, so $Y_i = \frac{1}{X_N} \sum_{m=1}^{X_N} S_m$, $1 \leq i \leq N$. Consequently, the average gross profit of the customer group in each period $Y_1, Y_2 \ldots, Y_N$ can be acquired.

Supposing that the marketing fee for the group in period N is $Z_1, Z_2 \ldots, Z_N$ and the ARMA model of time serial analysis for average gross profit of the group can be built as:

$$Y_t = b_0 + b_1 Y_{t-1} + b_2 Z_t \tag{30.20}$$

b_0, b_1, b_2 all the coefficients can be obtained by calculating, so the ARMA model for the prediction of gross profit of the group for next period can be thus determined. For instance, the average gross profit in period of $N + 1$ $YN + 1$ can be predicted by including YN and $ZN + 1$ (here $ZN + 1$ is the planned marketing fee for period $N + 1$) into the model.

30.2.3.5 Measurement of Customer Equity

The expenditure of each customer and the marketing cost of each period is now recorded. The span of the period is decided according to the enterprises' sales and the demand of application, so it can be a year, a few months, or a few weeks. For

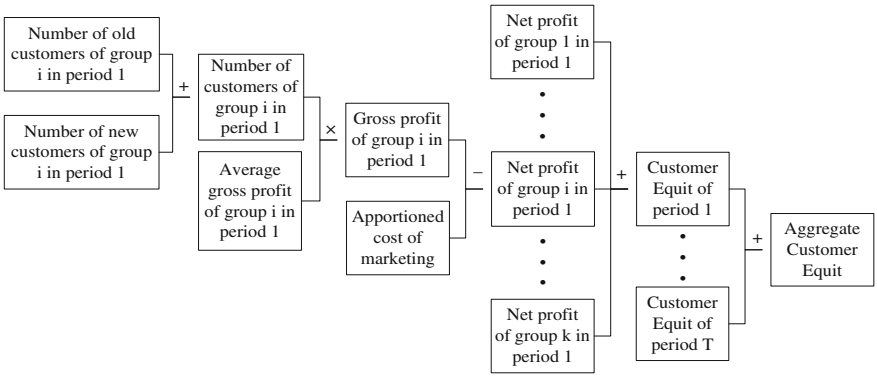

Fig. 30.3 Calculation method of customer equity when the consumption rule can be determined

the sake of the simplification of analysis, the present paper assumes that each period is a year, and the number of groups is K. I will then move on to predict Customer Equity from period 1 to T.

The aggregate Customer Equity is the summing up of Customer Equity in period 1 to T, and Customer Equity in each period is the summing up of the net profit from K groups. The profit of each group in each period, for instance, the net profit of group i in period 1, can be calculated as follows:

The number of old customers of group i in period 1 + the number of new customers of group i in period 1 = the number of customers of group i in period 1

The number of customers of group i in period 1 * the average gross profit in group i in period 1 = gross profit of group i in period 1

The gross profit of group i in period 1 − the apportioned cost of marketing = the gross profit of group i in period 1

Here, the number of old customers and new customers of group i in period 1 is determined by the rules mentioned in Sects. 30.2 and 30.3, and the average gross profit of group i in period 1 is calculated by Eq. (30.1). The calculation method of aggregate Customer Equity is illustrated in the following Fig. 30.3.

30.3 Conclusion

Customer Equity is a pioneering concept and its calculation is determined on the basis of customer database with the application of data-mining technology and statistical methods. Customer Lifetime Value and Customer Equity are currently an important reference for marketing decisions and the allocation of marketing resources in many foreign companies. Thus, the present study focused on this development tendency, and it researched a dynamic method for the calculation of Customer Equity by using data mining technology. In addition, the application of

the calculation of Customer Equity in the marketing decision of companies was implemented through empirical analysis. The conclusions reached are as follows.

First, the application of data-mining technology to the measurement of Customer Equity makes the calculation more precise and applicable. Although the measurement and application of Customer Equity have aroused great interest in many scholars, there are still many limitations in this respect. For instance, there are large gaps between the application and the theoretical assumptions of many models; most of the research conducted does not take the dynamic trait of Customer Equity into consideration. The present paper applies data-mining technology to the calculation on the basis of the theoretical models of Customer Equity.

The paper advances the calculation of Customer Equity on the basis of the classification of customers. As the great uncertainty of individual customer makes it rather difficult to predict the consumption behavior, calculation by classification of customers solves the problem successfully by making the calculation more accurate.

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Part IV
Information Management and Applications

Chapter 31
Study on Development Strategy of China's Foreign Project Contracting

Hao Li

Abstract The growth trend of China's foreign contracted projects will continue, and will promote the export of equipment, raw materials, labor, and promote the development of domestic construction, manufacturing, transportation, finance, and other related industries. However, there are some problems in the development of the foreign project contracting enterprises, from the macro-level point of view; the policy supply is inadequate, insufficient financial support for policy-oriented financial institutions. From the point of view of the enterprise level, China has not established a modern enterprise system fully with international standards, a single business structure, knowledge content, and added value of products and services. Therefore proposals put forward are as follows: Improve the level of foreign project contracting enterprises, standardize corporate governance, raise the level of scientific and technological innovation, and guide the direction of the business, to broaden the field of internal and external cooperation, composed of large enterprises to compete at a higher level.

Keywords Foreign project contracting · Market · Business

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31.1 China's Foreign Project Contracting the Situation Facing

31.1.1 International Engineering Contracting Market Trends

Global economic integration of world economy and trade maintained rapid growth, while expanding the total demand of the international engineering contracting market. According to the statistical analysis and prediction of the Standard and Poor's 150 of the world's major countries and regions, construction investment will reach 5,174 trillion U.S. dollars in 2010. China has joined the World Trade Organization (hereinafter referred to as the WTO), Chinese companies are allowed to enter the WTO members of the construction market, tariff barriers to reduce will bring China's foreign contracted projects reduce the cost of this for our company into developed countries, large construction the market has created the objective conditions [1].

31.1.2 Changes in the Structure of Investment, Improve the Contractor's Financing Capacity Requirements

Investors in the main structure of the global construction market are increasing the diversification. Governments must open more areas to private capital and foreign capital, especially the construction of energy, electricity, and transportation and other infrastructure projects; at the same time, private capital investment in infrastructure increased significantly, some large-scale industrial projects to provide for the contractor a broad market. Investors, the main changes in the structure change in the way contract, the contractor's financing capacity of the new challenges of the bidders ability to help the owners solve the problem of project funding has become the key to the successful financial strength become international engineering contractors to participate in international competition core elements.

31.1.3 The Scale of the Project Tends to be Large, on Contract Diversification

The rapid development and application of modern information technology, international contractors on the technical and managerial capabilities, and scope of service continue to extend financial services system is getting more sophisticated projects increasingly large. The traditional contracting approach cannot meet the

international engineering contracting market the needs of the total project contracting methods and way of franchising in the international engineering widely used [2]. Now widely used in the international construction market engineering general contracting and project management methods, including DB, EPC, CM, PMC, and BOT. This means a substantial increase in the profits that might make the general contractor, at the same time, it has also raised management of contractors, technology, and financing capacity to a higher demand.

31.2 Opportunities for Development of China's Foreign Engineering Contracting Industry

China's foreign contracted projects business growth trend will continue, and will promote the export of equipment, raw materials, labor, and promote the development of domestic construction, manufacturing, transportation, financial, and other related industries.

Over the years, the foreign project contracting as one of the important form of international assistance, contributed to promote the country's infrastructure and national economic development in Asia, Africa, and Latin America. It has set up Sino-foreign exchanges and cooperation between the bridges of friendship between the dissemination of our products, "cheap" brand image and the "responsible big country," the image of the country, China's foreign economic and political relations have played an irreplaceable role [3]. Despite the international financial crisis brought about by the adverse effects of China's foreign engineering contracting sector is still pregnant with the "structural adjustment, market extension, mentioning effectiveness" of an important opportunity.

Foreign Investment Statistics Bulletin, China's foreign direct investment in 2008 was $ 55.6 billion, an increase of 194 % over the previous year; which non-financial sector foreign direct investment of $ 40.7 billion. In 2009, the latest data of China's overseas investment were not disclosed, figures from the first quarter, compared to a year earlier decline, the main figures of the same period in 2008, including aluminum more than 100 billion $ in purchasing contracts .

Overseas project contracting enterprises to develop overseas investment activities "going out" innovations, foreign contracted engineering industry an effective way to achieve industrial upgrading, to enhance the operational capability and competitive advantage of Chinese enterprises in international capital. The companies' overseas investment activities of China's foreign contracted projects is closely integrated with the engineering contract, the main ways are: Investment operations involved in the development of hydropower resources and municipal facilities such as BOT, the PPP model in engineering contracting projects for the pilot and then invest in mining resources, building materials pastoral and commercial logistics-related industries, as well as the acquisition or joint ventures, equity participation and design institutes, engineering enterprises [4]. Investment areas to the traditional markets of Southeast Asia, Africa, and other enterprises are familiar with.

The large state-owned enterprises are the main body of the engineering firm to carry out overseas investment business, the advantages of rich experience in overseas operations and reliable information on the screening system, within the project review process and comprehensive risk control measures, for the successful operation of the business of overseas investment to provide support. Private enterprises have high investment enthusiasm, but are not able to capitalize on overseas investment business in the engineering field, so some of the projects are in the investment pattern of the central enterprises and private enterprises, after all, it is a best of their abilities, advantage in a complementary manner.

31.3 The Main Problem in the Development of Foreign Project Contracting Enterprises

The main diversification of China's foreign project contracting and legal construction lag, the lower the degree of concentration of the foreign project contracting industry. Although the state has issued a series of special policies to support the overseas project contracting, the supporting policies in the "big trade" system are to be improved at the same time, to guide policy and legal system building in the forward-looking market trends and international practice there are certain gaps. The legal system is not perfect, our country has not yet introduced the legislation in respect of foreign investment, overseas project contracting and foreign labor cooperation, involving multinational operations such as finance, taxation, credit, foreign exchange, statistical system is imperfect, not yet formed a system behind development of the situation. From the point of view of the enterprise level, China has not established a modern enterprise system fully with international standards, a single business structure, knowledge content and added value of products and services is not high, the lack of technological innovation at this stage of the lack of complex transnational business personnel, at the same time, enterprises are small, comprehensive strength is weak, a single enterprise fund-raising channels, the asset structure is irrational, capital strength and financing capacity. "Going out" strategy implementation, in order to advance the output of construction services in China, the government through relevant policies and business diversification and development of foreign contracted projects. But at the same time, the related policy-making lag, resulting in disorder of operation of the trade, low market concentration, the same level, no difference in the highly competitive, serious waste of resources situation. Small-scale enterprise management, the average turnover at a low level compared with international counterparts, it is clear this cannot be in the capital markets to raise funds to provide support and protection. International engineering contracting market is characterized by the specific circumstances of Chinese enterprises to learn from the experience of the development of foreign enterprises, financing "bottleneck" can clearly find that the biggest constraints to enhance the international competitiveness of China's foreign project contracting enterprises.

31.4 Foreign Project Contracting Business Strategy

31.4.1 The Main Features of China's Foreign Project Contracting

31.4.1.1 Operating Growing Strength

"Going to" the implementation of the development strategy, China's foreign engineering contracting companies increased their strength as the country, the status of companies showing a trend of diversification, in addition to state-owned companies, private, joint venture began to reveal the head and feet. International engineering contracting market, Chinese companies have to play in the transportation, smelting and other technical and managerial advantages. With the management and capacity to implement projects to enhance the implementation of the comprehensive capacity of the project gradually gained the recognition of the renowned international companies, especially in infrastructure construction projects in some countries hope that the Chinese companies to compete.

31.4.1.2 Cooperative Development Projects on the Rise

Resources development and cooperation-oriented projects rapid growth was an important feature of the foreign project contracting industry in 2005. The vast majority of resource development projects the need for infrastructure construction, resources development cooperation at the same time, also led to the development of the project contracting business. For example, oil and other national oil companies to jointly develop Sudan, Kazakhstan, and other markets, which greatly boosted the foreign project contracting business in the oil.

31.4.1.3 Exchange Rate System Reform is Far-Reaching

According to preliminary estimates, the reform in the RMB exchange rate system, about $ 300–500 billion in construction projects are directly affected in the engineering contracting industry. Appreciation of the RMB by 2 %, the direct economic losses to the foreign project contracting industry is 3.5–5.5 billion $. With the continuous advance of the exchange rate system reform, in addition to the direct economic loss of the engineering contracting industry, will also bring about indirect effects in other ways.

31.4.2 The Development of Countermeasures for China's Foreign Project Contracting Enterprises

Face of economic globalization, foreign project contracting enterprises must be a correct understanding of the difficulties facing efforts to increase the technology content and management level, the initiative to meet challenges, overcome difficulties brought about by the financial crisis to stand in the international market competition undefeated. In this process, the developments of countermeasures are given below.

31.4.2.1 Differentiation Strategy

Differentiation strategy is in the production process, and give full play and the use of a part of their product or service unique to all different from other company's products or services advantages as a guide sustainable and stable development in the direction in today's many industries. The difference has become the holy grail of some companies in the market. International engineering contracting companies should also take a hard look at its own resources and competitive conditions, allocation of resources differentiation theory docking target market, and strive to maximize efficiency; research and market segmentation pattern, play to their core competitiveness and comparative advantage.

31.4.2.2 Foreign Project Contracting Enterprises Should be Further Enhance

The ability of business public relations, financing capacity and project management capabilities, and strengthen the design, consulting, construction and operations management capabilities, to familiarize themselves with and master the standard system in developed countries, efforts to enhance the strength and grade and set a good brand image in the international market, building long-term competitive advantage, form a prominent feature of a group of professional, technical strength, internationally competitive large enterprise groups of foreign project contracting, to achieve the leaping development of China's foreign project contracting enterprises.

31.4.2.3 Standardize Corporate Governance, and Raise the Level of Scientific and Technological Innovation

Internal tonal contracting methods, the profound changes in today's global construction market, introduced a package of turnkey engineering mode, and band owned contracting methods have been widely used in large international projects in these modes. Large-scale contractors to manage increasingly scientific,

information technology, standardization, and technological innovation by the foreign project contracting business, electronic management, quality norms (ISO 9000), environmental management (ISO 14000) and occupational safety and health management system (ISO 18000) together constitute the a more comprehensive global unified business management standard system. This requires the construction enterprises in Liaoning Province, abundant capital, advanced technology and personnel are available; modernize the management of well-known enterprise groups to create a unique product and brand.

31.4.2.4 Guide the Business Direction

Foreign project contracting career development process of our government in a targeted manner to guide enterprises to make strategic adjustments in the target market, the mode of operation, scale of operation, to avoid major fluctuations in business development, and lay a solid foundation for the development of the company, enhance the company's operating capacity. The first is the strategic shift of the regional markets. In the mid-1980s, in the face of a severe recession in the Middle East market, the former MOFTEC timely to enterprises that target market should be transferred to Hong Kong, Macao and Southeast Asian countries from the Middle East, and through the Chinese embassy in Southeast Asia to help businesses understand the local market, support enterprises to participate in local projects bidding.

Just a few years, under the guidance of government departments, through the joint efforts of enterprises, our businesses successfully transfer of business objectives to the Asian market. Since then, our government has proposed developing markets in Europe and "diversification strategy", provides guidance for the timely adjustment of marketing strategy. Initially for up to 10 years time, the external economic and technical cooperation established in the office on the basis of the foreign aid of the various departments and localities as the department, the window to the outside of the region's business. Window company funds, lack of manpower, difficult to carry out the limitations of intermediary business will soon be exposed. In this regard, the former MOFTEC, the timely submission of the direction of foreign economic relations from the window company change to the operating entity business. Guide foreign economic company from the start with project management, independent management and engineering contracting projects, and enhanced benefit-sharing, accountability, powers and responsibilities of interest linked to the total package and subcontracting relationships to establish the status of the foreign economic company, with the construction of business entities foreign economy and the company's competitive strength. It can be said that the Foreign Economic Company successfully completed the transition is at this stage, Furthermore, the changes from the production management to capital management.

The face of highly active scene of the economic globalization of capital markets, the contact of the long-term capital shortage restricting the reality of business development, former MOFTEC, in conjunction with relevant departments to guide

foreign economic relations company specializing in engineering and construction business to the investment and engineering and building construction both change to enable enterprises to access to international capital markets to enter Hong Kong and other places, and the opportunity for success in the domestic stock market listing. In a number of enterprises build overseas, Dalian Foreign Economic Corporation, Northern International beach-goers of the capital market, has laid a solid foundation for the company's business development and business growth. Finally, there is a big help, supporting the superior support the strong. Investment in large projects, long duration, the risk, but large, very large projects are often competitive small and medium-sized project so intense, prone to economies of scale. In order to promote China's enterprises to grow and develop, to enhance competitiveness in the international engineering contracting market, with the reform of China's state-owned enterprise restructuring, the Commerce Department in conjunction with the Ministry of Finance and other departments issued a policy loan interest subsidy support for large projects, and achieved good results.

31.4.2.5 Take All Precautions and Risk Control

They insist on risk prevention in the first place, so that a planned, step by step, slowly and surely, struggling to explore the international market. The first is to strengthen the tender management, so that prior to control risk. Selected to tender for: Select a relatively stable political situation and she was more familiar countries and regions Project bidding, according to the process characteristics, first understand the competitors in the host country's labor policies and circumstances, the feasibility analysis of the key factors of the immediate and long-term goals. Track from the project, bidding to determine the key management personnel of the project, and to study thoroughly understand the owners tender, the terms of the contract on the project, the tender price structure, international (including the project host country), equipment, materials and other in-depth research and market surveys Based on this rationale, determine the price level. The second is to strengthen contract management, and clear the obligations of mutual responsibility and risk. Should be adopted in accordance with international practice, the international project bidding process, such as unreasonable or imperfections of some provisions of the contractor's tender documents, contract negotiations, the IDIC terms of the contract, ask to modify or supplement certain conditions. The company's total contracting Jordan compound fertilizer project, the contract.

31.4.2.6 Broaden the Field of Internal and External Cooperation, Composed of Large Enterprises to Compete at a Higher Level

World, the regional economic mutual penetration and mutual integration to speed up the economic complementarily between the developed and developing countries is more pronounced, both developed and developing countries to further

strengthen cooperation has become inevitable in the field of international project contracting. The rapid development and application of modern information technology provided technical support for Tran regional cooperation. Greatly improve the ability of financing through corporate mergers and scale management, quick access to more technology patents. Through the merger of another local company or form a joint venture with local companies to quickly explore the international market and local companies formed a joint venture can also be effective to bypass trade barriers of the host country. Foreign engineering contracting company should be sought through mergers, alliances and asset replacement, regional, cross the formation of large foreign project contracting group, improve the comprehensive competitiveness in the international market. Selectable China has a comparative advantage in the industry, its competitive enterprises as a leader, to form a comprehensive large-scale enterprise groups, foreign investment, consulting, design, project contracting, equipment and technology exports, the export of labor services integration. Through the effective operation of the capital reorganization, merger, listing etc. to accelerate the development of the enterprises themselves.

31.4.2.7 The Project Manager, Professional, Occupational, and Social Should Actively Promoted Implementation

The project manager responsibility system is an important result of the construction project management system, it is to improve project quality, to ensure safety in production, to raise the overall level of project management, orderly new management mechanisms and systems play an important role in the construction industry. Government should continue to increase the guidance in this regard; in particular the implementation of the Registered Architect of the new system should be taken to ensure the timeliness of the results of the reform and policy continuity. In conjunction with the implementation of the system of registered construction division, to build the brand of project contracting, project manager, neither as in the past project manager qualification attach too much weight, nor can the project manager simply limited to wash their hands within the enterprise, but rather to the project manager truly professional, professional, standardized management into the socio-professional, in order to facilitate the construction of the improvement of the level of project management and project managers widely and used by the owners.

31.5 Summary

With the further development of economic globalization, the international engineering contracting market competition is increasingly fierce, the Contractor is undergoing a profound change, and developed countries contractor by virtue of the advantages of capital, technology, information and management occupy the

high-end market and high-end business monopoly position. At present, China's total enterprise business, industry concentration is low, there is the phenomenon of vicious price competition, increased security risks, and other issues have become increasingly prominent. The following aspects of work should mainly be a good job. Level of technology to improve labor cooperation China's vast population, but only the potential advantages of China's foreign cooperation of labor service, put it into real competitive advantage lies in improving the quality of the labor force, increase the technological content of the labor service cooperation, not only to our country cost-effective level of that activity, but also to adapt to the international labor market changes. Therefore, we must develop the technical services, on the one hand, to strengthen the professional and technical training for staff of all walks of life and continuing education, reform, update the training curriculum to improve the knowledge structure of the labor personnel, on the other hand to develop labor service cooperation new areas to focus on expanding the labor market, the high efficiency of the high level of Southeast Asia.

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Chapter 32
Study on Publication and Distribution of Agricultural Science and Technology Journal

Jihua Sun

Abstract The focus of this paper is, through China's agricultural science and technology journal and the issuance of the analysis of the current situation in agriculture, and the periodical circulation of science and technology in the various factors, to put forward the stable and improve circulation, and create and expand the brand journal to promote the current issue of the journal of agricultural science and technology. Finally, strengthen the propaganda, perfect the mechanism, and improve the quality quantity, keep low price, and so on are the four aspects put forward in agricultural science and technology journal distribution work suggestions.

Keywords Agricultural science and technology journal · Distribution channels · Publication

32.1 Introduction

Issue is published in journal editing one of the important links, and agriculture. The important link of science and technology information transmission, in the current market economy condition, to join WTO and new rural construction to the development of agricultural science and technology journal has brought new opportunities and challenges, how to agricultural science and technology journal bigger and stronger, how to better and faster new agriculture science and

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technology knowledge and agriculture science and technology information transmitted to the farmers hand, to study and solve the current agricultural science and technology journal publication problems have each moment let the delay.

32.2 Status Quo of Agricultural Science and Technology Journal Issue

With the increasingly fierce market competition in journals, agricultural science and technology journal publication is not optimistic. In our country agricultural science and technology periodical circulation is dwindling, this already is the fact without dispute. Low agricultural science and technology journal circulation of both academic strong, similar journals such as more objective reasons also had with agricultural science and technology journal publication content relevant subjective factors.

32.2.1 Distribution Channels Relative Single, Still no Development and Form a Sound Stereo Distribution Channels

At present, our country agriculture science and technology journal mostly with the post office issued to give priority to still self-issue. The issue of either way, mostly heavy subscriptions, light retail, and propaganda way relatively single, not in good coverage due to read the group, increased the journal and readers in the market in the distance and the difficulty for each other, and to some extent restricted the journal circulation. Especially in the current digital and network published under the trend of backlash, if can not do fast development and form by newspapers board, agents, network distribution, retailers, etc., complementary stereo distribution channels, then to future agricultural science and technology journal development will be very harmful.

32.2.2 In the Issue the Channel Delivery, Science and Technology of Information Transfer and Accept not Effective Connection

Agricultural science and technology journal readers object the limits its demand and supply and the way effectiveness. China's current post status by the restriction, through the newspapers board subscribe to the post office of some agricultural science and technology journal mail, in actual post process, this should the door

had often only sent to the county, to township, farmers' subscription. It was difficult to ensure that the promptly sent to and sometimes even received can also cannot assure some agricultural science and technology journal is in the post office backlog of villages and towns, or in the office, to town the village committee, elementary school by mail, after long time backlog, it is difficult to reach farmers people hand. So, farmers need information not only cannot get timely and wasted a large amount of money to subscribe to. Agricultural science and technology journal only to their farmers, ability as far as possible to play their due role, and at present the post office issued by light is hard to do close to farmers. In addition, some agricultural science and technology journal is to reduce the cost issue, keep looking for transform issuance and mailing the cooperation unit, in fact some small issue and mailing male company in order to survive, often only pay attention to embrace business, and do not take the service, also lead to farmers industry science and technology journal publication and mail can not reach, and sometimes even cattle into the mud.

32.2.3 Emphasis on Professional and Academic, and Neglect of Rural Reader's Understandable Demand

At present, China's farmers are generally have high school the extent of culture, agricultural science and technology periodicals to get good effect, will let the farmers can read and learn will, use it [1]. Therefore, agricultural science and technology periodicals should with straightaway language, method and express the form. But at present, because of Chinese title appraisal system and other because of the influence of grain, in order to attract articles and improve layout fee income, a considerable number of farmers industry science and technology journal attaches great importance to the publication of the professional and academic, no good exam fear its most basic rural readers' reading needs and interests, neither in its in science that got ads like requirements with straightaway language to explain families learn phenomenon, also did not put forward to take care of the expression of paper to different readers' reading should be neglect of the most basic starting point—readability, are not able to attract more readers to subscribe to.

32.2.4 Similar Periodical Competition is Intense, Often on Earned Income for Cooperation; the Publication Quality Drop Caused Loss of Readers

Along with the journals competition intensifies, the same kind of agricultural science and technology between journals increasingly fierce competition, the same common phenomenon. The same industry in similar in the journal column setup, content reports, publicity positioning, and to subscribe to the issue, etc., is very similar, some might even say repeat settings, and some journals between the title

of the extremely easily confused [2], the publication does very good is rare. In the industry, often appear similar journals published draft between each other is "fight" like, make these publications not only lost its own distinct features of running the journal, and in the price and service competition lost peculiar readership. But the final result is inevitable the quality of the journal to decline, and the same circles readers to the pursuit of his fortune profit maximization and constantly job-hopping, thus make the agricultural science and technology periodicals in the issue potential crisis into existing issue landslide.

32.2.5 Heavy Editing and Advertising Work, Light Promotion Distribution Business

In recent years, China's most of the agricultural science and technology journal attaches great importance to the journal arranged standardization and printing quality and beautiful, the advertisement cooperation is very heavy depending on, some even put advertising business publications in the editorial department first position as top priority to grasp. This is because of the current our country journals are in change leather transformation, to pursue the economic efficiency, the magazine or the editorial department send a lot of human, material and financial resources on the quick effect of the advertising business, but ignores the journal the issuance of promotion. To do so, although short internal energy made a good economic charge good, but go down for a long time, atrophy will affect the circulation of the influence of the journal, then affect its brand image and sustainable development, and, in the end, the journal social benefit and economic benefits also does not have dependent, let alone the journal bigger and stronger. From the newsroom of the periodical success at home and abroad to see the structure of the organization, made up of the journal Series, distribution and advertising is affected by the same attention, some issue department even so alone in other departments, some magazines or the editorial department in the issue of job demands even more than the personnel quantity any department [3], pay great attention to the degree it can be imagined. Most of our current agricultural science and technology journal publication more work to edit or concurrently hire temporary workers along with the social affairs as a form of together make up operation. The fact is a very passive work mechanism; it is difficult to in market competition to occupy advantage.

32.2.6 Readers' Information Master Imprecise and Lack of Effective Management and Training Mechanism Issue

Most of the agricultural science and technology in China at the beginning of the first published in journal of business the peace in turn to management as the focus,

and even some journals kept planned economy the imprinting, there are few journals in the determination of the subject must be well targeted before the city field investigation, as far as possible, get the readers' positioning, and master the accurate information of the readers, and then design marketing means, and pay attention to the reader feedback information of the receiver collection and analysis, so, of course, there are few journals can establish precise readers data library, to the publication of the issuance and administration work to bring a lot of uncertainty. Another a journal in the market share not only how much you occupy the depends on quality, and on the issuance of the editorial department or magazine work and the management of the personnel issue also plays a very important role, especially of periodical circulation personnel management and training of machine the establishment of the system is the medium and long term in the market competition can be the key to success. At present, most of the agricultural science and technology periodicals are not set up a journal issue from personnel of the long-term management and the training mechanism, and not in the existing based on the operation of the market for coups distribution strategy, hard in the participating countries internal and external competition and expanded its brand influence in the race for the advantage status [4].

32.3 The Current Issue of the Journal of Agricultural Science and Technology Work Key Point

Agricultural science and technology journal of agricultural science and technology is not only the important spread knowledge carrier, and in science and education, prosperity the rural economy, promote the cultural and material Ming construction, to speed up the rural urbanization, the agricultural science and technology into agriculture productivity as Bridges and intermediary function [5]. Therefore, at present and in the future is long period in China to agricultural science and technology journal publication work to promote national. The new rural construction and agricultural sustainable development is of great significance. Expand the final purpose of the issue is to create a brand periodical, the journal of brand influence force and publicity to better promote journal publication, both supplement each other. Ahead to face the issue of the current situation of the agricultural science and technology journal analysis, we can see that stability and improve circulation in China's current agricultural science and technology periodicals in the fierce competition and complex, the volatile market for the sustainable development of the weapon, and it is also the current. Our country agriculture science and technology periodicals are the key points of the focus of the issue. In agricultural science and technology journal publication work, do keep pace with The Times, with the situation; grasp the market, farmers industry science and technology journal will be in the intense periodical competition.

32.4 Pushing Agriculture Science and Technology Journal Distribution Work Suggestions

The current journals in the fierce market competition, the agricultural science and technology periodicals the superior bad discard has become a reality, its survival and the development also come to a critical point, heavy depending on the agricultural science and technology journal publication work is of great significance. Market economy condition, period with the publication of the journal quality issue, the reader's approval is closely related to such as [5]. Therefore, to promote and strengthen agriculture science and technology journal publication work has to be comprehensive. A magazine or journal newsroom issue personnel and editors together, altogether with the efforts in comprehensive grasp market demand information based on the analysis and judgment and more, to the agricultural science and technology periodicals in accurate market positioning the outstanding features, strengthen the high quality service, can better manage now and in the future for a period of time periodical circulation in the pressure of competition, and promote the agricultural science and technology journal publication work more a layer of floor.

32.4.1 To Strengthen the Agricultural Science and Technology Journal Own Propaganda Work

At present, most of the agricultural science and technology journal is the traditional way; to own propaganda work not enough attention. Even if some publications recognized in the city competition for itself in the importance of publicity, often also because of several of subjective and objective the original and therefore had no make propaganda work into practice. "Good wine also fear that deep lane," in its journals in vigorously promoting his all, if can not let potential readers understand promptly and focus their publication, we would not be able to in the fierce market competition for the rapid deepening reader impression and expand the effective subscribe to demand. To increase of agricultural science and technology periodicals propaganda, expand the circulation, first of all, will be and the same kind of agricultural science and technology media (including journals, newspapers, books, TV, and nets Stand, etc.) establish mutual promotion and cooperative relations, timely information communication industry, add strong communication. Second, the active and distribution agent cooperation, and use them to professional issue canal word and propaganda way, improve visibility and reputation of publications. Agricultural science and technology promotion activities, agricultural science and technology training, and agricultural product exchange and exhibitions, in these activities to publicize their and mining potential customers and cooperation with the crowd company, gradually establish and perfect own distribution network. Finally, through the market research, to select

the suitable place set up their own proprietary, even in conditions are ripe for the club was founded, through a series of the quality service of strong and increase the number of periodical circulation.

32.4.2 Perfect Management System and Training of Personnel Issue Mechanism

Issue of the quality of the staff is the key issue periodical work [4]. Periodical circulation the editor is the creative work of into social value process, for the magazine club or the editorial department economic benefits can be realized, the editorial staff of labor can pay be social cognitive and recognition of the task. At present, most of our agriculture division technical journals in this field are not carry out, basically in a passive should be pay the state. Agricultural science and technology journal magazine or the editorial department should seize the favorable opportunity to build made of agricultural science and technology periodicals with the issuance of the distribution characteristics of incentive mechanism, through the close Richard and scientific interest distribution and rewarding performance, work to establish standard of periodical circulation and management system, build a good work atmosphere, maximum encourage distribution personnel. To develop their own potential, with the overall interests of the journal club is given priority to, a heart and soul the issuance of the publication of the ideas, in order to enlarge the journal largest circulation as the final purpose and hard work. At present, agricultural science and technology journal magazine or the editorial department should also be timely break "heavy editing and publishing, light promotion offering" practices, fully aware of the distribution work importance, efforts to build a political quality, familiar with editing and publishing business, with the business consciousness and the ability of market operation issued team, in a planned way, stratified exploration and the building. Set up the training of workers release mechanism. According to our editorial staff and the special point, situation and task, strengthen the training of personnel on the issuance and training, and, through the various way to broaden the view of the personnel issue size, growth their talents, comprehensively promote the issuer member and the issuance of the market development ability and competition ability.

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Chapter 33
E-Learning Training Based on Found Learning-Oriented Enterprise

Hui Wang and Dongsheng Zou

Abstract It is a tendency for the development of enterprises in years ahead to construct learning-oriented enterprises. E-learning can fully meet the times of our modern society and be in line with the connotations of learning-oriented enterprises. At the same time, learning-oriented enterprises provide support for the implementation of e-learning. This paper constructs the e-learning training system processes based on the design of learning-oriented enterprises, and gives some advice on the implementation of this system for building learning-oriented enterprises benefit.

Keywords Learning-oriented enterprise · E-learning · Training

33.1 Introduction

It is a tendency for the development of enterprises in years ahead to construct learning-oriented enterprises [1, 2]. E-learning has the characteristics of learner-orientation, strong interaction, realizable tracking management, etc., and has become the inevitable choice and trend of future enterprise training and development [3, 4].

Since 1998, e-learning has developed rapidly in most of the western countries [5, 6]. USA, as the cradle of E-learning, takes the leading position both in theory and practice. For example, Rosenberg summarized e-learning's successful experience in

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foreign enterprises. Sinclair, Joseph mainly researched on the relationship of web-based training and e-learning [7, 8]. Horton, William presented how to build website and increase navigation required software technology, etc., [9, 10]. Clark analyzed people's learning model and habits with empirical research [11, 12].

Late start of the domestic research focuses on two aspects: one aspect is the study of e-learning concept, characteristics, implementation significance, development trend, etc., [13, 14]; the other aspect is the study of actual operation of e-learning [15, 16]. Feng suggested the elements, procedure, model, and key points in the implementation of e-learning for enterprises [17, 18]. Dai Yong listed the six steps for resource integration of e-learning system and creation of learning organization [19]. Lian Ren, Liu Yi, Jiang Jianping, Wang Wei, etc., have also made influential studies [20, 21].

Combining the e-learning training method and construction of learning-oriented enterprise, with the analysis of correlations between learning-oriented enterprise and e-Learning, this paper constructs e-learning training system based on learning-oriented enterprise, thus to promote the construction of learning organization.

33.2 Correlations Between E-Learning and Learning Organization

33.2.1 E-Learning Promotes the Construction of Learning Organization

Five disciplines are personal mastery, improving mental models, building shared vision, team learning, and system thinking. The learner-oriented e-learning emphasizing knowledge sharing and team learning could be applied well in the construction of learning-oriented enterprise.

33.2.1.1 E-Learning Promotes the Realization of Personal Mastery

Personal mastery, as the spiritual basis of learning-oriented enterprises, provides rich learning resources and continual learning opportunities for employees.

33.2.1.2 E-Learning is Helpful in Improving Mental Models of Employees

"Mental models" refer to the psychological quality and mode of thinking. E-learning constructs platform for learning together of enterprises and employees, and encourages employees to continuously renew and sharpen their knowledge to promote the knowledge application.

33.2.1.3 E-Learning Helps Enterprise and Employees Build Shared Vision

Shared vision is common image or vision of people in the organization. With the building of shared vision, enterprise combines the development of enterprise and employee to promote the realization of personal mastery of employees with the setting of e-learning training courses.

33.2.1.4 E-Learning Enables Team Learning of Enterprise Employees

Team learning is the critical process in the construction of learning organization. E-learning enriches communication method in learning and deepens exchange degree.

33.2.1.5 E-Learning Helps Employees to Think Systematically

System thinking is the fifth discipline in the construction of learning organization. E-learning exerts system thinking potential by helping enterprise and employees to exercise the four disciplines "personal mastery", "improving mental models", "building shared vision", and "team learning".

33.2.2 Learning Organization Provides Support for the Implementation of E-Learning

33.2.2.1 Philosophy Support

Learning-oriented enterprise advocates philosophies of self-learning, life-long learning, whole learning, team learning, etc. These philosophies have directive function in the implementation of e-learning.

33.2.2.2 Environment Support

Learning-oriented enterprise has capability of continual study and good learning environment, which needs a training system that can provide learning chances at any time and any place. The presence of e-learning meets the requirements.

33.2.2.3 Decision Support

In the argumentation process, whether the implementation of e-learning needs scientific and detail demonstration, current environment and leadership attitude of enterprise plays a significant role.

33.3 Design of E-Learning Training System for Learning Organization

The construction of e-learning training system involves all aspects of enterprises and the rebuilding process of partial management flow as shown in Fig. 33.1.

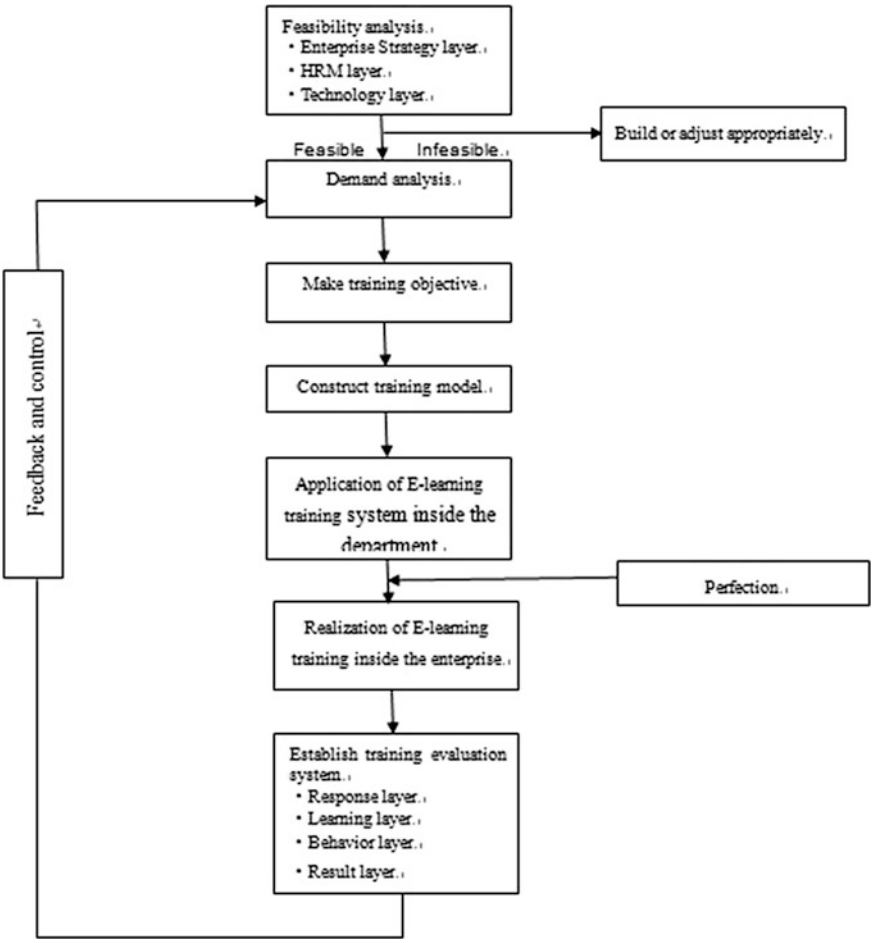

Fig. 33.1 Construction of e-learning training system flow chart

33.3.1 Feasibility Analysis

Enterprise should conduct feasibility analysis before the implementation of e-learning.

33.3.1.1 Analysis of Enterprise Strategy

To analyze if current e-learning implementation conforms to current enterprise development strategy, if the timing is mature, the supporting degree of enterprise high-level leaders, etc.

33.3.1.2 Human Resource Management

To analyze if enterprise had built up healthy performance assessment system, etc.

33.3.1.3 Enterprise Technology

Technology condition also determines the implementation effect of e-learning. Enterprise must have corresponding technology department or technicians to provide technology support for e-learning.

33.3.2 Training Demand Analysis

Training demand analysis is conducted from three aspects, which are organization analysis, person analysis, and task analysis.

33.3.2.1 Organization Analysis

Which is to analyze the availability of enterprise strategy orientation, organization structure, organization behavior information, and training resources?

33.3.2.2 Person Analysis

The overall quality of human resource directly determines the training requirements.

33.3.2.3 Task Analysis

Task analysis is conducted in specific operating post.

33.3.3 Making Training Objective

Enterprise should make training strategy objective according to enterprise development strategy and determine enterprises' and employee's personal objectives to be achieved from e-learning implementation combining training demand analysis, thus to confirm the position of e-learning in the whole process of informatization or enterprise development.

33.3.4 Construction of E-Learning Training Model

System framework of e-learning includes three sections, which are hardware, learning management system (LMS). and learning content (namely courseware) (Fig. 33.2).

33.3.4.1 Building Hardware Facility

Enterprises can choose to build their own websites or link to Internet, and establish internal training website through Internet.

33.3.4.2 Building LMS

Learning management system (LMS) is the basic platform for e-learning implementation. Enterprise LSM typically includes the functions below:

- System management;
- User management;

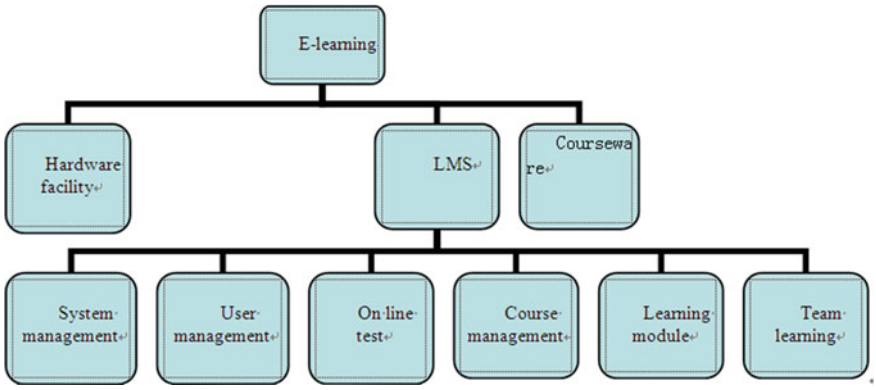

Fig. 33.2 E-learning system construction

- On-line test;
- Course management;
- Learning module;
- Team learning;
- Enterprise can bring in LSM method to build e-learning.

33.3.4.3 Making Learning Content

It is mainly about the making of courseware. Three modes could be adopted to make courseware: Bring in directly from e-learning courseware supplier, cooperation, and customization from special agency, self-development.

33.3.5 Application of E-Learning Training System Inside the Department

In actual implementation of e-learning training, enterprise should adopt methods step by step. They can perform trial training in a small range like core department and subcompany; then make evaluation and assessment of experimental training, collect feedbacks from employees and leadership; next, further improve learning method and platform; and at last, popularize gradually.

33.3.6 Implementation of E-Learning Training Inside the Enterprise

E-learning implementation is a training revolution for enterprise, and both enterprise and employees need to establish new training philosophy. In implementation, enterprise shall build good learning atmosphere, and introduce and promote e-learning method to employees via formal and informal channel.

33.3.7 Establish Training Evaluation System

Evaluation can be conducted from four levels: response level, learning level, behavior level, and result level.

Response evaluation: It is mainly to ask employees for their impressions in e-learning training, feelings on practicability of e-learning, etc.

Learning evaluation: Measure the improvements of employees in the master of knowledge and technology in e-learning by written examination, technical operation, work simulation, etc.

Behavior evaluation: Evaluate if employees have any changes in behavior after training and if they use the learned knowledge from e-learning training at work.

Result evaluation: Evaluate from higher level organization, which is if organization runs better because of the e-learning training. The main content to be evaluated is: production value, accident rate, employee turnover rate, employee morale, customer satisfaction, etc.

33.4 The Problems Needing Attention for the Application of E-Learning System in Learning-Oriented Enterprise

33.4.1 Change the Understanding of E-Learning Training

E-learning will become a useful tool of enterprise training and work support; Enterprise leaders should abandon the past concept of "training is a waste".

33.4.2 Combine E-Learning with Traditional Training

The implementation of e-learning does not mean to totally repudiate the traditional training method. Actually, both traditional training method and e-learning has advantages and disadvantages. Therefore, mixed teaching method is better to be adopted in on-line training.

33.4.3 Value Later Stage Software Development and Provide on Line Service

Some enterprises only pay prior attention to hardware construction period while building e-learning system, and neglects management in later stage. Considering this, enterprise not only should value hardware construction, but also pay more attention to software development.

33.4.4 Integrate Enterprise Culture

Enterprise culture is the sole of enterprise. Both the permeation of enterprise culture and philosophy, and the construction of impact of culture atmosphere need the help of training to realize.

33.4.5 Lay Stress on the Integration of Learning Resource

E-learning, as a new kind of training method, will take people to a fresh new learning level, but we should also see the existing problems in current e-learning implementation. And enterprise should adopt effective way to solve the problem and strengthen industry cooperation at the same time to realize the integration of learning resource and promote the healthy orderly development of e-learning.

All in all, the introduction of e-learning system has provided strong support for the improvement of employee comprehensive quality and effective sharing and transfer of knowledge, and helped enterprise to form the knowledge sharing and using among talents, and the virtuous circle of new knowledge creation by talents, thus to ensure and improve the core competitiveness of enterprise continuously.

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Chapter 34
Study on Municipal Facilities Development in Jilin Province

Guangjie Liu

Abstract Municipal facilities in Jilin Province include the urban road facilities, the city bridge and culvert facilities, urban drainage, urban flood control facilities, and five aspects of the city road lighting facilities. Jilin City municipal facilities play an important role in economic development, but there are following problems in the development: conservation base for small-scale urban maintenance funds, the layout of the distribution of nonplanning lags behind the above problems, the development of municipal facilities in Jilin Province, the city made the following responses: in-depth implement the scientific concept of development, and actively implement the party wind and Honest Administration, clear learning objectives, creating a high-quality management team to develop the scientific, rational, and economic construction program.

Keywords City · Municipal facilities · Management · Maintenance

34.1 Introduction

Municipal facilities are critical infrastructure in each city, protecting its functions of normal operation make a direct impact on urban social and economic development and public safety, to optimize the urban system as a whole, raise the city's comprehensive benefits, improve the investment environment, and to create a favorable image of the city. However, with the expanding size of cities, municipal facilities grew rapidly; the management of municipal facilities maintenance workload

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increases, has been unable to meet the evolving needs of the city, but the means and ability to have conservation, scientific and reasonable planning municipal facilities of custody system, has come to a critical state; otherwise, it will seriously affect and restrict sustainable development of the municipal facilities [1].

34.2 The Contents of the Municipal Facilities in Jilin Province

Construction and management of municipal facilities in Jilin Province to better serve the city's economic and social development services, municipal facilities, include: urban road facilities: the motor vehicle lanes, nonmotor vehicle lanes, sidewalks, squares, public parking, pipeline corridors and safe passage, hard shoulders, guard rails, street signs, street on both sides of retaining walls, street open space, and road greening control land and its ancillary facilities. Facilities of the city bridges and culverts: City bridges, tunnels, culverts, grade Separation Bridge, across the street footbridge, underpasses, the bridge open space and ancillary facilities. Urban drainage: rainwater pipes, sewers, sewer confluence of pipelines, roads, drainage and furrow, drainage ditches, inspection wells, water wells, pumping stations, and sewage treatment plant and its ancillary facilities. Urban flood control facilities: drainage pumping station and ancillary facilities. City road lighting facilities: City roads, bridges, public green space, attractions, etc. the lighting facilities [2].

Urban residential district, municipal engineering facilities within the development zone should be included in the residential district, the development plan of the development zone, supporting the building. Facilities construction plan of urban water supply, heating, gas, electricity, communications, fire a variety of pipes, poles, etc., should development plans and annual implementation plan with the city municipal engineering facilities coordination, adhere to the principle of the ground after the first underground carried out simultaneously with the construction of municipal engineering facilities. The construction of municipal projects and facilities, subject to municipal engineering facilities went through other approval procedures and approval by the authorities before they started. The unit engaged in the design, construction, and supervision of the municipal engineering installations, must have qualification certificates, and in accordance with the level of qualification to assume the design, construction, and supervision of the municipal engineering facilities [3]. Municipal engineering facilities' design and construction must comply with the technical standards developed by national and local norms and procedures, Municipal engineering facilities' construction and implementation of project quality supervision system and the construction supervision system. Without the acceptance of the competent department of municipal engineering facilities or unqualified acceptance of municipal engineering facilities management and maintenance shall not be delivered or received. Municipal engineering

facilities in accordance with the relevant provisions of the urban construction archives to establish the full completion of information and facilities file [4].

34.3 Municipal Facilities Take Effect on Economic Development in Jilin Province

Further increase of the urban construction fund-raising efforts to accelerate the pace of urban municipal public infrastructure construction, improve the urban comprehensive service functions, improve the investment environment, promote economic and social development, according to the national, provincial, and urban municipal public infrastructure supporting fees (hereinafter referred to supporting municipal fees) imposed regulations, where in the city urban planning area within New construction, renovation, and expansion of construction projects, must comply with the conditions supporting municipal fees paid in accordance with this approach. Supporting municipal fees levied to implement the system of notification, to impose a specific construction project municipal supporting time-consuming project situation should be publicized at the toll place, the policy basis for the charges levied amount and payment period and so on. Collection of municipal auxiliary fee use special financial bills. Levied by the municipal auxiliary fee in full into the financial account management, municipal construction administrative department of revenue and expenditure plans to include the year the department budget; the municipal finance department in a timely manner according to the revenue and expenditure plans approved by the municipal government to handle the storage and disbursement procedures. Supporting municipal fees for earmarked for urban municipal public infrastructure construction. Financial departments to the departments responsible for collecting municipal matching fee arrangements in accordance with a certain proportion of levy total operational funds earmarked for the collection, management, monitoring, and operations of the municipal auxiliary fee [5].

34.4 The Status of the Jilin Municipal Facilities and Problems

At present, various municipal facilities Custody mode is not the same, but most cities there is a serious shortage of municipal facilities Custody base, Jilin, for example, is mainly reflected in the following areas:

34.4.1 Conservation Base for Small-Scale

Existing at all levels, grassroots Custody base land size is generally small, some only a few hundred square meters, mechanical equipment, parking, storage of maintenance materials and tools there are great difficulties, and some areas there is no conservation of bases, machinery equipment parked everywhere or find temporary site parking both a security risk, but also affect the appearance of the city; due to size limitations of existing base, unable to procure new equipment, conservation of existing municipal facilities work overload state, but unable to meet Hefei modern lakeside city municipal infrastructure, conservation, and management needs.

34.4.2 The City Maintenance Problems Exist in the Use of Funds

Maintenance fund use over freshman, maintenance capital expenditures range includes the city roads, a forestation, and other nondirect benefits of the project, including water, gas, and other direct-yield projects. Although some cities on the profitability of the municipal utilities market operation, maintaining the use of funds to be reduced, but some cities still follow the old system, the government arranged the construction and maintenance of municipal facilities and utilities nonpolicy subsidies for losses, and even a few cities also maintain the new funds for facilities. With the increase in the number of municipal facilities, maintenance funding gap is growing. The survey shows that the uncoordinated growth of the proportion of funds received and expenditures with the increase in the number of municipal facilities, maintenance, maintenance funding gap is growing, and continuing funding gap will allow a number of municipal facilities are not normal maintenance, resulting in some of the facilities, In particular, as a full-scale public utilities cannot operate normally, shorten the service life of the facilities.

34.4.3 The Layout of the Distribution of Unreasonable, Low Construction Standards

Increase the cost of maintenance and repair of existing conservation base irrational distribution, service radius is too large, reduce municipal facilities inspections, supervision of work efficiency, timeliness, impact of the maintenance and repair is not conducive to the emergency response. Base of small-scale, mostly simple bungalows and a plant shelf, cannot guarantee that the office logistics and materials, tools, stacked, seriously affecting the work to enhance the level of custody.

34.4.4 Sense of Service in Municipal Facilities Management Industry Show

Sense of service from the meaning of the concept, which is something of an ideological level, invisible, to grasp, just gave birth, breeding, reproduction in the minds of individual people. From a practical meaning, the sense of service will be materialized through the thoughts and actions of individuals or groups, materialized sense of service is something concrete, visible, grasp is maintained, the concrete reflection of the sense of service dominated by people or groups doing.

Sense of service in the management of municipal facilities is regarded as a whole show. In the implementation of the management of municipal facilities, its sense of service as a whole show the carrier is a department of the municipal facilities management or a unit, left the impression or evaluation of the public or government in fulfilling its functions of a department or a unit. It should be said that each of the elements of the municipal facilities management are closely related with the interests of the people, such as the management of urban infrastructure and environmental construction, If you have a sense of service for the people and the government is responsible for municipal facilities management department will be in practical work to get rid of the shackles of personal interests, sectoral interests, the satisfaction of the people dissatisfied with the Government are satisfied as the starting point and final goal. In fact, the work efficiency and quality of municipal facilities management department to complete what people can be seen to be realized. Municipal facilities management departments carry out their functions, that is, in fulfilling the Government's work in this area functions, therefore, the satisfaction of the people both directly related to municipal facilities management department, even with the local government. Analyzed together, the manifestation of the sense of service of municipal facilities management department as a whole both contain the public's evaluation of the department, even with the evaluation of where the regional government.

34.4.5 Planning Lag

Various cities have long attached great importance to the overall planning of the city, closely related to the city running special plan is easily overlooked. According to a preliminary understanding of the various cities of the country, Custody base special plan for the preparation of municipal facilities, but also did not set aside the custody logistical space for urban development, the protection of municipal facilities in good condition and running, attention to the construction of municipal facilities, planning, neglect municipal facilities in custody and custody planning.

34.4.6 Urban Infrastructure Construction and Management Issues in Jilin Province

Urban infrastructure is the most basic provision of public services for the operation and the public life of the urban economy, physical facilities, protection of urban production and life to the normal operation of the premise and foundation. The urban infrastructure, the basis of urban economic operation, is a prerequisite for maintaining the normal functioning of the city. Urban infrastructure is the areas of quasi-public goods. Responsible for the provision of urban infrastructure, typically composed of government entrusted to private sector or government authorization and supervision of the premise, the provision and operation of urban infrastructure. A narrow urban infrastructure refers to the urban water supply, electricity, heating, gas, public transport, drainage, sewage treatment, roads and bridges, tunnels, stations, appearance and environmental sanitation, waste disposal, landscaping, disaster relief disaster prevention, emergency hedging, etc. related to the physical facilities of the daily life of urban residents. Broad urban infrastructure also matters of public interest, including hospitals, education, aviation, telecommunications, railways, and other public service sectors.

34.5 Transition and Across the Development Zone, Perfect Management Mode Opportunities in Jilin Province

An Economic Development Zone, for example, after 10 years of development and construction of the development zone of the infrastructure construction as developers gradually settled and progressive sound, Development Zone, production and operation of municipal facilities have designed and constructed to meet the needs of the moment. Development zones reach a certain size, the infrastructure is clearly overloaded situation. Also, because the future planning of public goods, the measures are far from being implemented, and finance for the maintenance costs of municipal facilities development costs are not included in the daily expenditure plan, the development zone of municipal facilities input and output of the capital chain rupture; past management model and management system with Zone Economic development of contradictions, urgent need to create a new model to the implementation of effective management and construction of development zones investment environment construction. At the same time, the transition and beyond Development Zone to improve the management mode opportunities.

34.6 Municipal Facilities' Development Strategy in Jilin Province

34.6.1 Thoroughly Implement the Scientific Concept of Development

Arrangement of construction in batches participates in the study the scientific concept of development activities. After setting activities of the party branch research implementation of the program, the focus on two major aspects of the study and discussion activities: closely linked to "strengthen the functions and efficient management" theme; adhere to grasp with both hands, the two promotion. Namely the one hand and the study and practice with one hand and the development of municipal roads. This activity has been carried out, the party branch attaches great importance to the careful arrangements, extensive mobilization, the study and practice has received remarkable results, preliminary showing "studies with studies for academic change" a good atmosphere.

34.6.2 Actively Implement the Clean and Honest Administration

The institute honest government as an important agenda, so that honest government and operational work of the same deployment, with the implementation of the same check, with the assessment. In accordance with the principle of "who is in charge that is responsible for the down tube on a chase a combination of collective leadership with individual, and promote greater development Jilin province Municipal Engineering Administration municipal career".

34.6.3 Optimizing the Energy Structure, the Use of Clean Energy

Solar, hydro, wind energy, hydrogen energy, ocean energy, biomass energy, geothermal energy, nuclear energy and other renewable clean energy eco-city of energy, fossil energy will just add to the energy. Especially solar energy, because of its efficiency, will become the major source of energy in the form of eco-city, and will gradually replace fossil fuels.

34.6.4 Clear Learning Objectives, Creating a High-Quality Management Team

The open door at the same time of rapid economic development for our country, it also brings some "by-product"-Western decadent capitalist ideas and values. Make the cadres and workers always maintain a strong political beliefs and morality, we must strengthen the political theory and ethics learning. The first is to further clarify the learning objectives and learning systems, improve the long-term learning plan, recent learning program, and establish the education system to adapt to the job, and gradually formed a multilevel education system. Second, followed by further broadening the learning content of the ideological and political education, attention to grasp the operational capabilities, aiming to the weak links for all categories of personnel to increase management capacity-building and organize multilevel training courses to improve the professional quality and management level of the team. Third, to further clarify the learning incentive and restraint mechanisms. Learning system to ensure that learning a regular, standardized, and learning outcomes combined with rewards and punishments, and management salaries, bonuses, promotion be tied to "learn" to "I want to learn", and constantly improve study of consciousness, to ensure the effectiveness of learning, and the creation of the quality of learning institutions.

34.6.5 To Develop a Scientific, Rational, and Economic Construction Program

Construction work is based on the design drawings into a certain amount of manpower, raw materials, semi-finished products, machinery and equipment, and turnover materials to make it into the process of engineering entities. Before construction, advanced technology, process, and organization capable of construction are produced according to engineering characteristics and the actual situation in the preparation balanced arrangements for the progress of each subproject. Flat water, interchange operating principles guide the construction, to ensure that the face is not idle, uninterrupted process operation, the operating team coordination and orderly. Arrangements should not only consider reasonable scheduling use of mechanical equipment and the flow of materials, but also consider being the amount of raw materials and inventory, eliminating the backlog, idle, waste, scientific, rational, economic construction program, to shorten the construction period, to improve the quality purpose of reducing costs.

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Chapter 35
Study on Private Express Enterprises in Yunnan Province

Yuanchun Xia

Abstract With the rapid development of economy and export-oriented economical pattern adopted in Yunnan province, the express industry grinds to a halt after a fast-growing stage in the past one decade. This paper tries to find approaches to this general issue through identifying critical attributions from analyzing the current situations. The author of this paper indicates that this plight stems from the inferior capability to make profits in private enterprises and then study how world four express giants do acquire higher profits from targets customers and endure the fiercer competition for sustainable earnings based on supply chain management (SCM). Lastly, suggestions for private express enterprises in Yunnan are proposed in terms of how to position themselves in conformity with the local market and how to improve their service for customers' satisfaction by taking the change of real idea about market as the first priority.

Keywords Private express enterprises · SCM · Approaches

35.1 Introduction

Express or courier is one of the most significant logistics activities offering door-to-door delivery services of tangible goods to customers by any mode or modes of transport by express enterprises. The development of express industry at home and abroad has certified the fact that express industry poses an impetus for improving

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of service industry, offering employment opportunities and optimizing the upgrade of economical structural transformation. That is also true with Yunnan's express industry. The express enterprises in Yunnan center on couriers in Kunming, which account for about 80 % of total volume. So far as the end of 2011, the licensed express enterprises reaches to 180 in total number, which contribute to the annual increase of approximately 20 % in volume since 2006 [1].

35.2 Current Development

The express industry in Yunnan, thanks to the unique access to south-east Asia and south Asia along with the infrastructures, the stable national economical advance and regional cooperation acceleration in ASEAN, has gone through the initial stage of development in the past 10 year, resembling the following characteristics.

35.2.1 Sound Development Momentum

Since 2008, the increase of express in both volume and turnover remains at least 15 % and keeps growing in normal circumstances. The Table 35.1 below can help better understand the general trend [2].

35.2.2 Diversification of Competitiveness

At the end of 2011, about 3,800 employees work in state-owned enterprises (8.60 %), private companies (77.10 %), and foreign corporations (14.30 %). We can witness that the development of express industry presents a wide range of competitive pattern. Although the private companies hold the majority in staffs hired, its business volume does not parallel with its scale of personnel, which can be illustrated in the following column of business classification in 2008 and 2009 in Kunming [3].

As indicated in the above chart, the majority volume (88 %) is occupied by EMS, a service offered by a state-owned enterprise China Post, while the minority

Table 35.1 2008–2011 Yunnan express volume and turnover

Indicators	2008	2009	2010	2011
Volume (in 10,000 pieces)	1,757	1,909.90	2,259.04	3,000.00
Turnover (in RMB 10,000)	41,238.20	47,693.38	59,440.33	71,000.00
Annual increase in volume		8.65 %	15.50 %	32.80 %
Annual increase in turnover		15.70 %	24.63 %	19.45 %

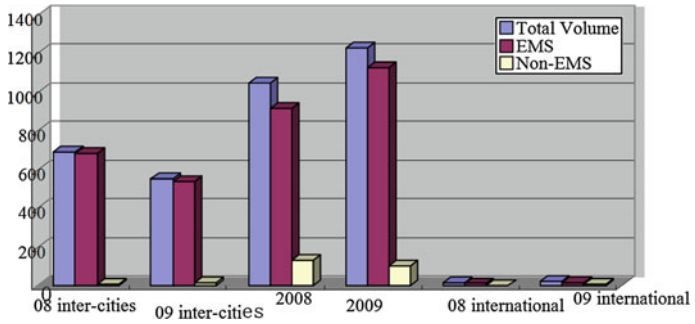

Fig. 35.1 Column 1 business classification in 2008–2009 (in 1,000 pieces)

part (12 %) is shared by private and foreign express providers. Besides, only a tiny business (less than 0.1 %) operates for international purposes. We can witness that the diversified competition pattern does not change the fact the state-owned enterprises in the express industry remains dominant, although the staffs in non-state-owned are prevailing (Fig. 35.1).

35.2.3 Service Upgrade

Rather than providing the sole delivery service to customers, express enterprises tend to render more extensive services in terms of normal transport, warehousing, distribution, inbound and outbound agencies, and logistics consultant as well as collection on delivery. Further, delivery services have been ameliorated with regards to door-to-door delivery, specified arrival and information tracking by adopting computers and portable terminals.

35.3 Problems Analysis

Mentioned above, although the development of express industry in Yunnan has been enhanced significantly in business volume and turnover, but some critical problems underlying are impossible to ignore.

35.3.1 Lower Margins

The most serious problem that those private express enterprises encounter centers on the fact that the increased business volume and turnover, instead, make their profits lower. Under the current earning model in the express industry, more than

half of profit derives from the outbound parcels, which can account for about 50–60 % of profit share. The inbound parcels, however, after the freight is deducted (20–30 %), can take 8–10 % while require much more costs and labors to consume for picking-up, distribution, and delivery to customers' terminals. That is the situation private express enterprises in Kunming face. In 2011, the total volume and the turnover witnesses both increase by 32.80 and 19.45 % separately (See Table 35.1), with the profit added remains at less than 10 %. The volume growth, nevertheless, attributes to the inbound express delivery with the outbound delivery unchanged. This indicates that private express companies must input more to respond to the market but gains far less than what they invests, which will eventually lead their development outlook to deteriorate supposed this trend remains unchanged.

35.3.2 Lack of Necessary Supports

Door-to-door swift service is the reason customers prefer to courier in most cases and should be facilitated by conveyances like mini cars, minivans, and light trucks for distribution, which are subject to restrictions in driving and parking in Kunming in working hours. So the pick-up and delivery of parcels have to be substituted by electrical vehicles, which cannot assure the transferring rapidness and safety and consequently lead to complaints. The government entity cannot provide the convenience and security to private express companies in this concern.

Besides, a more general issue related to the necessary supports relies on the difficulty in financing for private companies. Therefore, these private companies cannot get stronger over years with regard to capital investment. Some of them have to pursue for quick rich through irrational competitions by undercutting with the surrender of service quality, which will drag the whole industry into the downward spiral and eventually leave the market to competitors.

35.4 Lack of Qualified Professionals

Based on the two critical problems, private express companies, due to their weak profit-making and growing-up capability in a long term, cannot implement a systematical recruitment or human resource management to cultivate qualified professionals required. Obviously, the survivals of themselves easily defeat other cost-consuming programs in training and loyalty-keeping of qualified staffs and customers.

Mentioned above, the core of problems that impedes the development of private express companies is the inferior ability to make profits sustainable for the present and future. How to boost the earnings thereby represents the key to this quandary.

35.5 Approaches

In this part, we study how to tackle with the problems mentions above by global express giants from the perspectives of how to make access to target customers to realize higher profits and how to guarantee qualified services.

35.5.1 SCM Solutions

Obviously, none of the four express giants restricts himself as the sole delivery provider, but evolve to take part in the supply chain in the global market, which is integrated to a greater extend than ever before. Supply Chain Management (SCM) facilitates each aspect of transaction to the pinpoint, or just-in-time, which constitutes one of the core needs of what most transnational enterprises ask for, especially with the formation of world factory in China, where derives 80 % of international express demand. Who satisfy the potential customers indicates who could win the market, although it is not an easy case to tailor an efficient SCM solution to guarantee customers' requirements in the accuracy of delivery time and the security of parcels in transit.

In March 2004, timely delivery service in Shanghai was rendered by DHL, under which parcels would be distributed to the main cities in Asia before 9:00 a.m. or 12:00 at the next day since hand-over from customers. In April, express insurance against loss of or damage to goods in transit was presented by DHL accordingly, the sole provider of such value-added service in China. In the following May, DHL set foot in domestic parcels express, which implied that an integrated express solutions could access to transnational enterprises through DHL individual account, one bill and a hot-line, a simplified but an efficient and desired service, which tends to be the source of high profits in express industry.

35.5.2 Enhancement of Quality of Staffs

It is widely acknowledged that competition today in essence relies on competitions for talents in any business. Based on the essential cognition, all four express giants, without exception, take the personnel training as their regular and significant work to conduct, for they do believe it is the employees, those in express terminals in particular, contact customers new or established, in a face-to-face way, an approach to their target clients. So when facing with customers, personnel handles either parcels or delivers the image of companies at the same time, the latter, however, attracts greater concern for customers. The personnel training involves from the moral, manners of behavior and tone to even the walking rhythm, which constitutes a full

regular and decent set of conduct guide for staffs and represents good image to customers and leads to higher customers' loyalty and satisfaction.

Said above, in terms of how to generate higher profits and how to keep with the existing clients, four express giants choose the way that virtually conceives differently from the traditional logistics servicers. They accord their business with the market need in no time. Nevertheless, it must be admitted that the above idea cannot be accomplished to the desire until it would be supported by other facilities like advanced information system and business outlets, which are necessities to the whole operation. But all the differences attribute to the awareness of market.

35.6 Suggestions

In order to answer the most pressing issue the private express enterprises encounter with, we discuss the possible suggestions for their reference based on the above analysis.

35.6.1 Differentiated Market Positioning

Mentioned above, the international four express giants led by SCM look for their target customers across the world in conformity with the global market needs, which is testified as an efficient way to hold their clients for higher profits. The way they reveal for private express enterprises in Yunnan is how to discover customers valuable and then satisfy them from the perspective of SCM, or how to set a suitable position individually, instead of being an affiliate to others. The market share international express corporations hold till 2011, however, is approximately 80 % for international purposes and 30 % for domestic ones, remaining 20 and 70 % separately. Thus the majority market share (70 %) is occupied by domestic express enterprises, among which private express companies play out the utmost advantages over years. So the private express enterprises, to a great extent, should hold the domestic market well for better development, and those in Yunnan take no exception.

In Yunnan express market, for this concern, there are increasingly more potential customers to be explored. Since 2006, attraction investment was set as one of the governmental tasks for Kunming municipal government with the manufacturing projects as the priority and achieved fruitfully. And the investment projects operated have ranged from motor production to photoelectron industry, from daily essentials to high-tech products, covering all fundamentals for living and manufacturing. A great demand for express service derives from these newly established firms since the first day they operate, which requires tailored service for manufacturing connecting with their upstream and downstream clients successively, or virtually for some certain point in their supply chain. Private express

enterprises here should take the advantages of the policy of investment attraction to win over the domestic express market share by involving in the supply chains and putting forward SCM solutions individually.

35.6.2 Intensifying the Awareness of Serving

For engaging in the supply chains in each enterprise, service of good quality plays vital important role to achieve the success in SCM. Many approaches could contribute to it but the awareness of serving takes the first priority. Thus how to occupy and expand the market through winning loyal clients and how to enhance the efficiency attribute to how to implement the customers' satisfaction to the utmost manner. This is particularly important for private express enterprises since they are commonly either financial-weak and technological-backward, compared with foreign express companies or policy-supported as EMS. The only way out for them is to enhance the cognition of personnel's qualification and transferring customers in value-added services, which lead to internal training essential to this concern.

35.6.3 Joint Capital Accumulation

The private express enterprises in Yunnan are almost branches or subsidiaries of private couriers in eastern regions in China. Local private companies act as the affiliates to them, rendering marginal services over years. One of the reasons resulting in this fact ascribes to lack of financing, a critical prerequisite for growing-up. Under such circumstance, local private express companies could take the amalgamation as an alternative to service this purpose. In addition, to build up Yunnan-label brand in express industry also constitutes another concern to this general issue.

35.7 Summary

In short, busy but lower profit could only drag down a company in a long run, which is precisely the fact that private express enterprises in Yunnan suffer from now. From the study of how to make profit and how to retain sustainable earnings in global express giants, we could witness they turn to another direction by rendering SCM solutions to individual client, instead of delivery of parcels and improving the service qualities through training their employees rather than cutting down training budget. Although their success could not be realized from only above two conducts, they do take two of the key points to win the market. From

this perspective, private express enterprises in Yunnan can take for reference now to consider the way ahead. The most critical they need contemplate is the concept of real change, the transforming of idea for the changing market.

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Chapter 36
Study on China's Import and Export Growth Rate Based on VAR Model

Kai Fan and Guanghai Nie

Abstract This paper takes the total amount of imports and exports in the period of 1979–2007 as sample, and the annual import and export volume increment as growth rate, and conducts an empirical study of the linkage relations between China's import and export growth rate by using the VAR model and the dynamic variance decomposition method. The results show that: the import growth rate is the cause of export growth rate of the Granger Causality. In the short term, the main reason of the fluctuations of the total import and export growth rates are from their own changes. In the long-term, the impact of imports on the export growth rate improved and kept in a later period. The related relationships of growth rate have obvious increasing trend in the recent 30 years, and the two growth rates have a certain convergence.

Keywords Import and export increment · Import and export growth rate · VAR model · Granger causality test

36.1 Introduction

Since the reform and opening up policy in China from 1979, the import trade (IM) and exports (EX) have developed rapidly. The imports increased from 24.29 billion yuan in 1979 to 7.32846 trillion yuan in 2007; the exports increased to 9.34556 trillion yuan in 2007 from 21.17 billion yuan in 1979. Since the U.S. subprime mortgage crisis broke out in 2007, as the foreign import demand the reduction of China's total imports and exports began to decline, to avoid the

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fluctuations of the financial crisis to import and export, this paper only collects the data of 1979–2007 for research [1].

The increment of the total imports and exports is the accumulation of imported per year increment (DIM) and the total export volume increment (DEX) [2]. At the same time, DIM and DEX stands for the growth rate of total imports and total exports growth rate, respectively. The rapid growth of them two prompted the paper to conduct the research from the following two aspects: the linkage relationship between DIM and DEX; preliminary judgment DIM and DEX may exist the following four types of relationships: (1) DIM cause the growth of DEX, (2) DEX led to the growth of DIM, (3) mutual promotion between the two, and (4) there is no obvious correlation between the two [3].

36.2 Literature Review

The literature review found that the scholars have studied the relationship between the domestic and international import and export volume, the results show that:

By the research framework of VAR model, it analyzed the causal relationship between exports and imports empirically, the findings show that: First of all, there is a cointegration relationship between total imports and total exports; it means that there is a long-running steady state between them. Second, they proved the existence of a two-way causal relationship between the import and promotion of growth. Finally, Japan's economy obeys the exports and promotes the growth of GDP, while it has a negative impact on export growth in Korea.

Many scholars in our country also have studied the relationship between import and export trade, most of them have researched the other economic variables related to the import and export:

The impulse response function analysis showed that FDI has long-term role in promoting China's exports and imports, and the impact of FDI on China's export trade has long-term stable positive effect on China's export trade; on the other hand, the impact of the export trade has a positive effect on FDI, the imports have a negative effect on FDI. The variance decomposition results showed that FDI have some contribution to the forecast variance of the import and export trade, showing that China's trade and investment integration has been gradually formed.

To sum up, Chinese scholars did the research largely based on the correlation between imports, exports, and other economic variables, but for the long-term relationship between the growth rate of imports and exports growth rate, as well as Granger causality, there has no one studied. Since 2012, the impact

of the subprime crisis has faded, the basic situation of China's foreign trade has begun to improve, so it is necessary to do the quantitative study about the relationship between the imports and exports growth rate. The paper will focus on this point.

36.3 Analysis Methods and Data Processing

In this paper, it is studied about the relationship between Chinese imports annually total incremental (i.e., the growth rate of imports) and total annual export increment (i.e., export growth) in the period of 1979–2010, by the time series analysis method which is based on the VAR model.

1. handling smoothly about the total import and export data, its visual map shows that IM and EX changes in the same direction, and there is a strong trend between them (Fig. 36.1).
2. import and export growth rate and its unit root examination

To process the annual total imports IM and total exports EX to get the results of DIM and DEX, and to use ADF test the stationarity of DIM and DEX. As the line chart of them shows that they have the constant term, so a constant term and trend unit root test is necessary, the test results are as follows: (Fig. 36.2), (Table 36.1).

The ADF value of DIM is −3.789162, which is less than the critical value −3.587587, 5 % significant level. The ADF value of DEX is −4.938804, which is

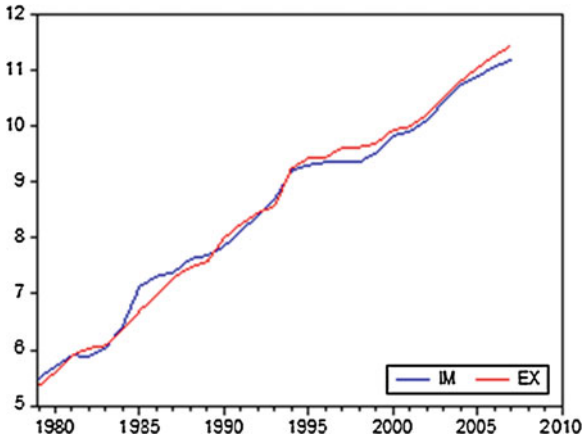

Fig. 36.1 The visual map of total imports (IM) and exports (EX)

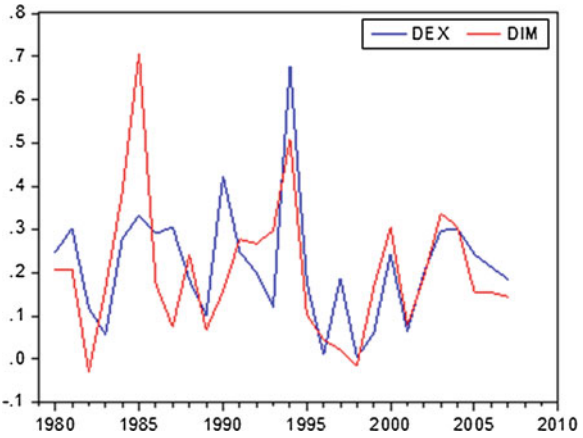

Fig. 36.2 The visual map of DIM, DEX

Table 36.1 Test results of unit root of DIM, DEX

Stationarity test of ADF	
Variable	Level of value
DIM	−3.789162
DEX	−4.938804
Significant level (%)	Critical value
1	−4.33933
5	−3.587527
10	−3.22923

less than 1 % significant level under the threshold −3.22923. In summary, it is stable of DIM and DEX when they are at the 5 % significance level.

36.4 The Establishment of the VAR Model

36.4.1 Determine of Lag Order

The maximum lag K should be determined before the establishment of VAR model. If K is too small, the error term autocorrelation will be very serious sometimes, and will lead to the nonconsistency of the estimated parameters. As a result, we need to eliminate the errors of the autocorrelation by increasing K. However, K cannot be too large, because that will lead to reduce the degrees of

Table 36.2 The value of the information criterion of the different lag order

Value of different criteria for judging						
Lag order	LogL	LR	FPE	AIC	SC	HQ
0	30.30393	——	0.000356	−2.264314	−2.166804	−2.237269
1	32.79672	4.387309	0.000403	−2.143737	−1.851207	−2.062602
2	36.86933	6.516186	0.000404	−2.149547	−1.661996	−2.014321
3	39.00260	3.071902	0.000478	−2.000208	−1.317637	−1.810892

freedom, and may directly affect the validity of the estimated parameters. This paper selects the optimal lag order based on the principle of minimum information guidelines. The information guidelines include two elements of AIC and SC: residual sum of squares, and add additional parameters for the loss of freedom. The object of it is to select certain parameters to make the value of information criterion is the minimum (Table 36.2).

Although AIC shows that $k = 2$ is the optimal lag order, which means when $k = 2$, AIC is the minimum, but the FPE, BC and HQ all show that $k = 1$ is the optimal lag order, so it selects $k = 1$ as the optimal the lag order.

36.4.2 Estimation of VAR Model

The following table shows that when the lag order is 1, the estimation results of the VAR model are: (Table 36.3).

Table 36.3 Estimation results of VAR (1)

	DEX	DIM
DEX(−1)	−0.307859	−0.390088
Standard error	(0.23724)	(0.27591)
T statistic	[−1.29766]	[−1.41380]
DIM(−1)	0.439770	0.468945
Standard error	(0.20686)	(0.24059)
T statistic	[2.12588]	[1.94918]
C	0.193076	0.192449
Standard error	(0.04954)	(0.05761)
T statistic	[3.89756]	[3.34041]
R-squared	0.158469	0.139013
Adj. R-squared	0.088341	0.067264
F-statistic	2.259725	1.937488
Akaike AIC	−1.083888	−0.781867
Schwarz SC	−0.939906	−0.637885

It is not difficult to see that some of the estimated coefficients are significant, some are not significant, but because of the VAR model does not concern the coefficient is significant or not, so these coefficients will be retained. The AIC and SC guidelines are mainly considered. Known by the figure, the lag order VAR equations are in line with the AIC and SC guidelines. The following equations are significant:

$$\mathrm{DEX} = -0.307859\,\mathrm{DEX}(-1) +^{\circ} 0.439770\mathrm{DIM}(-1) + 0.193076 \qquad (36.1)$$

$$\mathrm{DIM} = -0.390088\mathrm{DEX}(-1) +^{\circ} 0.468945d\,\mathrm{lim}(-1) +^{\circ} 0.192449 \qquad (36.2)$$

36.4.3 Test of VAR Model

Inspection of the VAR model includes two aspects: firstly, to verify the stability of the VAR model; secondly, to verify the independence of the residuals:

To test the stability of the VAR Model by whether Characteristic roots in the unit hospital.

The test results show that all the characteristic roots are in the unit circle, the VAR model satisfies the stationary assumption (Fig. 36.3).

Test the independence of the model residuals by the autocorrelogram of the residuals. We can see from the two diagrams in the left and lower right, the residuals does not have an obvious correlation, which can be considered as independent of each other (Fig. 36.4).

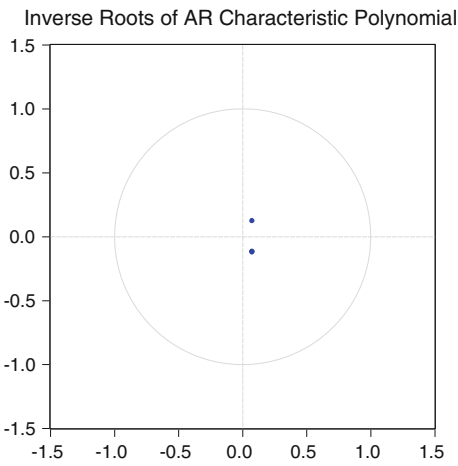

Fig. 36.3 Stability test of VAR (1)

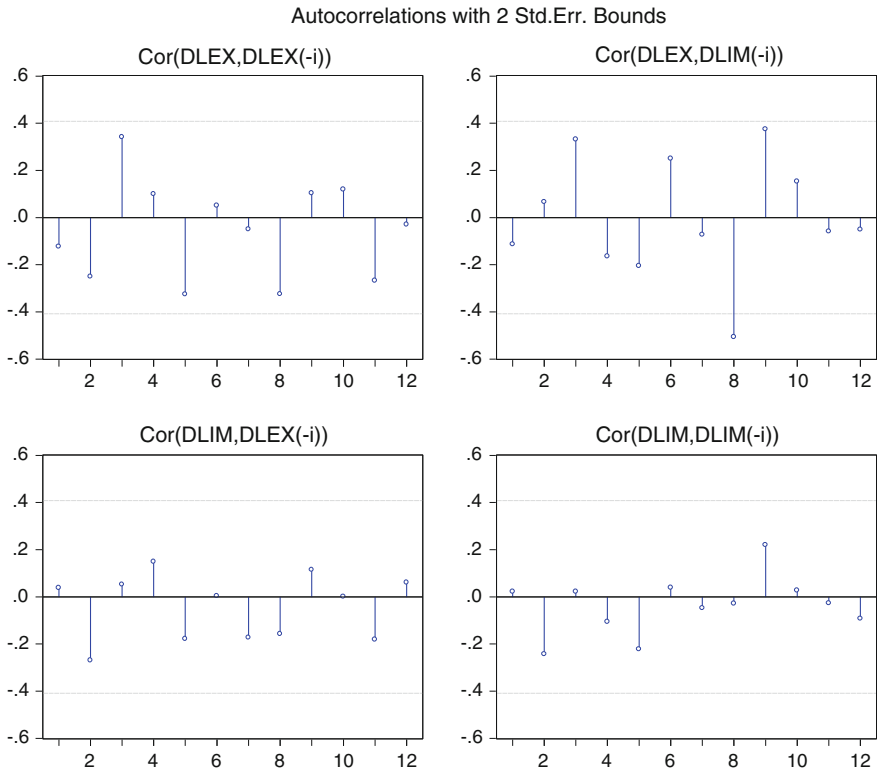

Fig. 36.4 Residuals from the correlation diagram of VAR (1)

36.5 Granger Causality Test

36.5.1 Theoretical Model

Granger causality method (Granger, Causal Relation Test) is put forward by a famous econometrician of University of California named Granger in 1969, and in the later, Hendry, Richard and some others well-developed the test method. What Granger causality says is that when the two economic variables X, Y, contain the past information, conditions are better than separate forecast Y by the past information of Y only. In other words, if variable X contribute to the variable Y and the improvement of prediction accuracy, then we say X and Y has a Grand causal relationship.

Table 36.4 Granger causality test results

Null hypothesis:	Obs	F-statistic	Prob
DIM does not granger cause DEX	27	4.51936	0.0440
DEX does not granger cause DIM		1.99883	0.1703

36.5.2 Granger Causality Test Results Under the Eviews Software

The results of the Granger causality test are very sensitive to the choice of lag order, and thus 1 is determined as the lag order for a VAR model (Table 36.4).

The test results show that the in the confidence level of 5 %, to reject DIM is not the original assumptions DEX Granger causality reasons, and to accept DEX is not the original assumptions of DIM reasons either. Therefore, the import growth rate is the Granger reason of export growth, and export growth rate is not the Granger causes of imports growth rate.

36.6 Variance Decomposition

The variance decomposition is broken down into each of the volatility of endogenous variables according to their causes (random error) of the new interest rate of each equation associated components, in order to understand the importance of the new interest rate endogenous variables.

It can be seen in Fig. 36.5, the variance decomposition results of DEX begin to stabilize from the second period. The influence comes from itself is accounted for more than 80 % of export growth forecast error. The same is DIM by more than 70 %. It can be seen from the analysis of this period, the contribution to the prediction error of variables itself is high.

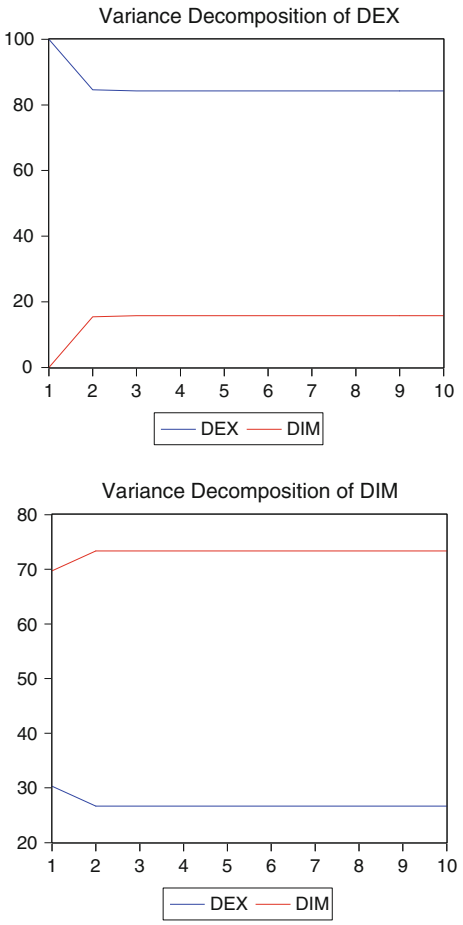

Fig. 36.5 Variance decomposition

36.7 Conclusion

1. The import growth rate of export growth Granger causes changes in export growth from changes in the growth rate of imports.
2. In the short term, the main reason of the fluctuations of the total import and export growth came from its own changes. In the long-term, the impact of imports on the export growth rate increased and remained unchanged at a later stage, and moreover, the growth rate relationship in recent 30 years is significantly higher in the direction of the total growth rate with a certain convergence.

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Chapter 37
A Cross-Level Framework of Relational Governance Between Chinese Agricultural Firm and Farmers

Can Chen and Shiyan Huang

Abstract Relational governance between Chinese big agricultural firm and farmers is an issue which has not been studied in the existing research. This paper establishes a framework of the relational governance between firms and their cooperative farmers.

Keywords Relational governance · Trust · Reciprocity · Interaction intensity · Satisfaction

37.1 Introduction

The alliance between Chinese big agricultural firm and farmers can be seen as a very special economic organization, which is an intermediary mode between market and hierarchy, but different from the organizations of traditional pattern such as strategic alliances, corporate networks, and so on. In this kind of organization, the two parties are not all organizations, but one is corporate, and the other is many natural persons. Therefore, to study the relational governance between Chinese big agricultural firms and farmers have significance both theoretically and practically.

Foreign study of relational governance has been focused on the relationship between more equal enterprises, the rules of relational governance of which followed are generally consistent. But in the situation among Chinese big agricultural firm and farmers, the dominant positions of both sides are unequal. Usually firms

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are implementers of relational governance, and farmers are often passive recipients. Therefore, the paper will execute cross-level research.

37.2 Literature Review

37.2.1 Relational Governance Review

A large number of researches have examined the relational governance's significance for cooperation performance. Zaheer and Venkatraman [1] studied the relational governance of the strategic alliance between insurance companies and insurance agents in insurance industry, and hold that relational governance can improve the performance of the alliance. Zhang et al. [2] found that firms can increase its export turnover by using relational rules to govern the relationship with their foreign distributors. Claro et al. [3] found that trust, corporate network activity, and other relational rules will affect trade performance (including sales growth and trading satisfaction). These studies are all from the respect of one party in the exchange.

Relational governance means bilateral governance practices, but there is little empirical research to examine both sides of the transaction because of the difficulty to obtain data, the limitation of statistical methods, and other reasons. Existing bilateral studies have reflected that relational governance has differences between parties in the transaction from different perspectives. For example, Ferguson et al. [4] examined the commercial banking transaction management model by using bank account managers' and business clients' interview data, and found significant difference in the structure of both models. All of these show the importance of research using the data of both parties in the same time. However, existing research is clearly insufficient in the statistical methods of study. Ganesan's [5] research also examined the data of 124 retail buyers and 52 suppliers to these retailers, but the empirical analysis of both aspects is fragmented. He made structural equation analysis to the retailers' data, and conducted multiple regression analysis to the suppliers' data. Ferguson et al. [4] used multi-group analysis of the EQS software, which only can examine that relational governance has difference between different perspectives of both parties in the transaction, and cannot analyze the interaction of relational governance between them. Although Siguaw et al. [6] study of 179 suppliers and distributors analyzes the interaction of relational governance between both parties in the transaction, it doesn't distinguish them from the level. Instead, it directly corresponds the data of both aspects to the same model, and then verifies the goodness of fit though path analysis. This paper attempts to make up the shortfall in the content and methods in the existing research, using the particular situation of cooperation between Chinese big agricultural firm and farmers, applying hierarchical linear analysis which is a more cutting-edge tool, and executes cross-level research to relational governance of both parties in the transaction.

37.2.2 Review of Agricultural Firm Research

The emergence of the concept of "Chinese big agricultural firm" is closely related with the Chinese unique agricultural environment. Because of China's large population, scarce land resource, and fragmented distribution of land, our basic land policy cannot make up this limitation through sale of land. The existent agricultural firm reconfigures the land resource in the Chinese particular social and institutional condition, and achieves concentration of land resource directly or indirectly while maintaining the farmers' right to contract land, and then achieve mass production.

Study found that only applying formal agreement to govern the cooperation between firm and farmers has many deficiencies. Thus, in the situation of lack of public trust in China, informal relational governance is more important for the cooperation between firm and farmer [7, 8].

37.3 Proposition and Model

37.3.1 Relational Governance Between Big Agricultural Chinese Firms and Farmers

This paper argues that in the relational governance between agricultural firm and farmers, the firm is on the active side of relational governance. Therefore, the constituent elements of relational governance that this paper chooses must conform to the following two conditions: (1) to abide by firms and farmers, or (2) firms are initiative to offer and farmers can directly recognize it. So this paper selects the following three relational norms:

"Trust" is the relational rule first to be posed. A large number of empirical studies have shown that relational governance was associated with trust [1]. Trust is the important factor constituting relational governance between agricultural firm and farmers.

This paper examines basically the same variables within "reciprocity", "mutuality [9]," mutuality of interest, combined with the concept of reciprocity in Chinese traditional culture and research interviews to Chinese big agricultural firms and farmers, and then extract the variable of "reciprocity" as another constitute factor of relational governance.

There is a kind of variable that stands for the frequency of the informal contacts in the transaction to measure the interaction between parties. There are a lot of informal interactions directly affecting cooperation performance in the alliance formed by agricultural firms and farmers. For example, there are no rules or contract terms to qualify the help that firms offer for the farmers in the production. All of these are spontaneous behaviors. Even some enterprises give farmers help in life, such as housing, supporting learner, etc. [8]. Combining the literature of

relational governance with the actual research to agricultural firms and farmers, this paper will name the variable of the frequency of interaction that agricultural firms implement for farmers as "interaction intensity".

In summary, this paper chooses three factors of trust, reciprocity, and interaction intensity. The principles of trust and reciprocity are the rules that firms and farmers should abide by, while interaction intensity is the rule mainly implemented by firms and farmers can directly realize.

37.3.2 Relational Governance and Satisfaction

Examining the performance level of economic organizations is the ultimate goal of the general management research, so the improvement in performance of the alliance formed by agricultural firm and farmers is also the goal of relational governance. Many strategic alliance literature defined the performance of the alliance as the level of satisfaction that the parties in the transaction felt with the alliance relationship (e.g., Poppo and Zenger [10], Claro et al. [3]), which is a compound way of defining and measuring. Satisfaction is the main result of working partnership, which can not only measure the efficiency, but also predict alliance partners' future actions. At the same time, this definition has avoided the measurement of the governance cost, and focus on the evaluation of the optimal governance level, which can examine these potential variables such as relational governance more easily. A number of literature have demonstrated that the relational governance has a positive effect on satisfaction. For example, Poppo's and Zenger's [10] empirical analysis found that relational governance and formal governance have a positive impact on satisfaction complementally. Now the paper builds hypothesis about the relationship of the three relational governance variables of trust, reciprocity, and interaction intensity with satisfaction below.

37.4 Trust and Satisfaction

Claro et al. [3] found that trust, corporate network activity, and other relational rules will affect trade performance (including sales growth and trading satisfaction). Ganesan [5] points out that trust has a positive correlation with the satisfaction of both buyers and sellers. During actual research, Chinese agricultural firms and farmers all agreed that trust has a major impact on cooperative performance. Wan [7] pointed out that trust can reduce the transaction cost of companies and farmers, improve the compliance rate of both sides, and then make them feel more satisfied with the cooperation. So we propose the hypothesis as follows:

Proposition 1 *The higher the degree of trust of firm layer is, the higher the firms' satisfaction will be.*

Proposition 2 *The higher the degree of trust of farmer layer is, the higher the farmers' satisfaction will be.*

37.5 Reciprocity and Satisfaction

Empirical studies of Finket al. [9] have found that reciprocity can improve the performance level of relational transaction. Some researchers hold that reciprocity helps form a common vision, and a common vision will help create long-term value, thus affect the satisfaction of both partners. Wan [7] pointed out that as long as each transaction achieves reciprocity, it can satisfy both parties and then enhance their willingness to cooperate again. So we propose the hypothesis as following:

Proposition 3 *The higher the degree of reciprocity of firm layer is, the higher the firms' satisfaction will be.*

Proposition 4 *The higher the degree of reciprocity of farmer layer is, the higher the farmers' satisfaction will be.*

37.6 Interaction Intensity and Satisfaction

Claro et al. hold that network intensity can be defined as the amount of valuable information obtained from the corporate network, so the network activity can reduce information asymmetry, and reduce the risk brought by the uncertainty of business environment, through increasing the exchange of information with certain firms. Uzzi [11] pointed out that social interaction, particularly face-to-face interaction, can promote good exchange of information. Therefore, interaction intensity will reduce information asymmetry, concerns both parties about the uncertainty brought by the environment and transaction, and then enable them make rational decisions, create a more harmonious atmosphere of cooperation, so the relationship of both parties is more harmonious. Above we have mentioned that firm's Initiative and farmers' interaction will improve the level of farmers' commitment, and enable farmers more willing to cooperate with firm, thus increase the firm's satisfaction accordingly. So we propose the hypothesis as following:

Proposition 5 *The higher the interaction intensity of firm layer is, the higher the firms' satisfaction will be.*

Proposition 6 *The higher the interaction intensity that farmers feel is, the higher the farmers' satisfaction will be.*

3 Interaction of Two Layers

Because of the initiative status in relational governance that firm as an organization and legal person, the difference in the level of firm layer's relational governance will lead to the difference in relational governance the farmers feel,

then cause the difference in farmers' satisfaction. So we propose the hypothesis as follows:

Proposition 7 *The satisfaction of farmers that cooperate with different firms are significantly different.*

Siguaw et al. [6] analyzed the interaction of relational governance between both parties, and found that suppliers would influence distributors. The relational governance variable of Chinese big agricultural firm will also affect the corresponding relational governance variable of farmers. The characteristics of Chinese rural society will also reinforce this effect. For example, Chinese people advocate "courtesy demands reciprocity", "Cast with papaya, react with fine jade". These features are called the Chinese "face view", "human game" by sociologists, and these concepts have deeply influenced the activities of Chinese economic organization. Thus, we propose the following hypothesis:

Proposition 8 *In cooperation, the higher the level of firm's general trust on farmers is, the higher the level of Individual farmers' trust on firm will be, then the higher the farmers' satisfaction will be.*

Proposition 9 *In cooperation, the stronger the firm's sense of reciprocity is, the stronger the individual farmers' sense of reciprocity will be correspondingly, then the higher the farmers' satisfaction will be.*

Proposition 10 *In cooperation, the higher the firm's interaction intensity to the overall farmers is, the higher the interaction intensity that farmers feel will be, then the higher the farmers' satisfaction will be.*

Based on the theoretical framework and propositions above, this paper proposes the overall research as following (Fig. 37.1):

37.7 Conclusion and Discussion

In summary, this study illustrates the importance of relational governance in the cooperation between agricultural firms and farmers through empirical analysis: not only the relational governance consisted with trust, reciprocity, and interaction intensity can improve the satisfaction of the firm layer and farmer layer, but also

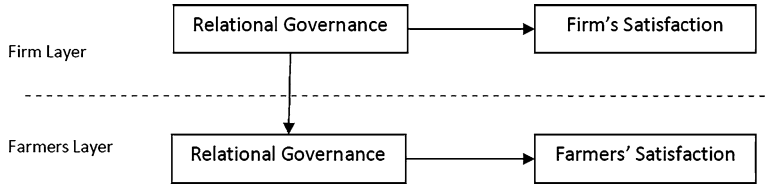

Fig. 37.1 Overall research model

the initiative of the relational governance of the firm layer can promote the farmers' perception of relational governance, and then improve the farmers' satisfaction. This study makes up the blank in the previous research field in relational governance and agricultural firm research, and provides a new direction for future research.

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Chapter 38
Study of Public Works Based on Asset Replacement

Lijun Fan

Abstract "Asset replacement" is a general successful practice of listed companies. To graft this practice onto public utilities and use it to start those local public works which are poorly financed now, the key is to understand the connotation, scope of application, ways of operating, and management system of asset replacement in-depth. College A in Henan Province succeeded in using asset replacement to start the construction of new campus, from which we can get some inspirations.

Keywords Asset replacement · Operating and management system · Economic benefits and social benefits

38.1 Introduction

Since the outbreak and spread of the 2008 financial turmoil in the whole world, affected by tight money policies, some local public works projects which have enclosed land and been planned to start have halted. How to strive for policy support, widen financing channels, start the project as soon as possible, and make the best of the current land resources have become the top priority of the units to which those problematic projects belong [1]. As an effective proper financing channel, asset replacement will surely play a big role in exerting government's and administrative institutions' subjective positivity, raising initial capital, and redeveloping public works. This chapter takes the construction of the new campus of

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College A in Henan Province as an example, and focuses to detail the connotation, appropriate projects, ways of operating, management system, and policy suggestions of asset replacement from the perspective of public works [2].

38.2 Asset Exchange Concept

"Asset exchange" comes from economics. It is a means for the restructuring of enterprise's assets, namely the two parties of listed company's transaction exchange evaluated assets based on equivalent value, separate away assets that do not aid in the company's development and at the same time infuse into quality assets. Simply speaking, asset exchange is to exchange a company's assets with other companies' assets in order for a company's assets to be at the best disposition, to obtain the maximum income or for other sakes such as getting listed [3].

This concept in economics is also applicable in the running of a university under market economy conditions, the asset exchange of two parties under the principle of equivalent value exchange under the support and leading of the government. For schools, the counterpart's high amount of money is acquired and invested into capital construction through high-valued asset (unimportant for itself) exchange [4, 5].

38.3 Applicable Projects

Asset exchange of universities in principle applies to public projects (e.g. land expropriating and prophase fees, water, electronic, and central heating pipeline networks and auxiliary facilities, library, teaching building etc.). This realm of projects cannot be realized through the way of union development (the union of university's and social money) due to the fact that they cannot produce economic benefit immediately after the completion of construction as the principle and core projects of universities [6]. The narrow-margin projects and for-profit projects cannot catch up unless these projects are started up. The star-up of public projects cannot merely rely on universities and the government must exert more effect of support. Under the condition that government cannot increase direct investment, asset exchange can yet be regarded as a good resolution method [7].

38.4 Ways of Operating and Management System

38.4.1 Ways of Operating

Asset replacement in colleges is to raise funds needed by capital construction by means of managing their own assets, it includes the reselling of old campuses, the

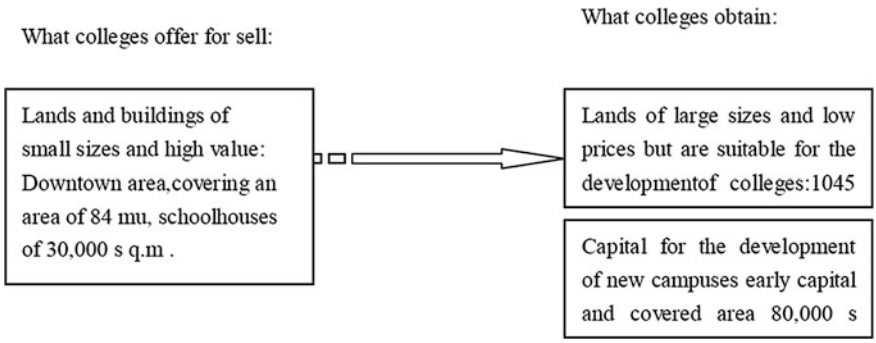

Fig. 38.1 Sketch of ways of operating of asset replacement

transfer of tangible and intangible assets, and the renting of facilities. Asset replacement is the exchange of assets between buyers and sellers under the principle of equivalent exchange. For colleges, they can use high-value assets that are not so important to attract social investment to build campuses and to obtain large amounts of land assets and funds. In the case that the direct economic input of government finance are not increasing, through asset replacement colleges can obtain both the required large areas of land and the start-up capital for the development of new campuses as well as the foundation fund to help their survival and further development. Take College A for example, its ways of operating can be shown in Fig. 38.1.

It is a total innovation of education investing system and education management system to obtain capital by means of asset replacement and use the capital in developing colleges' new campuses. It has been found that asset replacement will become an effective method of simple operation to solve the current problem of financing gap in the development of colleges' new campuses.

38.4.2 Management System

38.4.2.1 Implementation Procedure

Estimate the colleges' real estate first, then determine the reference standards of the market values of assets, and then confirm partner such as real estate agency or other investors, with which colleges carry out asset replacement. Both parties will sign an agreement of asset replacement: defining what both parties of asset replacement offer for sell and their value, together with the specific time and relevant issues of delivery. The specific sketch is given below.

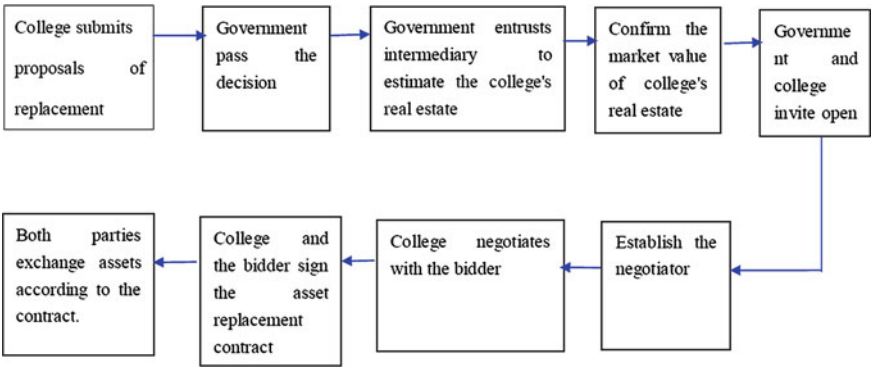

Fig. 38.2 Procedure chart of college's asset replacement

38.4.2.2 Method of Management

The preparations before the asset replacement between colleges and enterprises should be finished under the domination and control of the local government and rely on the social intermediary. After signing the contract, both parties should carry out the finishing of asset replacement under the supervision of the government (Fig. 38.2).

38.4.2.3 Forms of Exchange

According to the contract of asset replacement, generally, there are three types of final exchange forms between both parties: (1) Object–object delivery, which means the exchange between the college's real estates and the real estates in the new campus that of equal value and funded by the cooperative enterprise; (2) object–money delivery, which means the exchange between the college's real estates and the capital offered by the enterprise; (3) object–money + object, which means the exchange between the college's real estates and a part of the real estates built by the enterprise together with a part of their capital.

38.4.2.4 Delimitation of Property Rights

Before the asset replacement, the property right of the college's real estates which are waiting to be exchanged belongs to the college; however, after the asset replacement, it belongs to the sponsored enterprise.

38.4.2.5 Ways of Construction

With regard to the exchange form in which the built estates are the objects of replacement, before the exchange of assets, as the future vendor, the college should manage the overall process of newly built projects from various tache like planning, designing, construction, completion of works, and acceptance, and control the project quality, time limit for the project, and investment together with the sponsored enterprise according to the contract.

38.5 The Asset Replacement of the A University

38.5.1 The Background Conditions

The A universities cover an area of 84 acres. While the main school hardware conditions cannot be achieved and eager to expand outside, the plan that the old campus which is located in the heart of the city intends to preserve the old campus on the basis is difficult to achieve; therefore, the development of the A university can be done only in the new campus without other choice.

The A university original campus area is small, noisy, and not suitable for Higher Learning, but the school is located in the city center which is the high cost of land and has a high commercial value. Small parcels of land located in the center far from being able to meet the school's teaching effectiveness of favorable conditions of the campus in the heart of the city in prime locations, but it can be used in accordance with the principle of land rent, good location, and land a high gold content of the original campus of asset replacement acres of land on the outskirts. You can exchange for part of the funds for new campus construction in order to maximize the effectiveness of education and teaching of the land.

38.5.2 The Specific Implementation and Achievement

With the strong support of the local government, in March 1997, the A university and XX real estate development company sign an agreement in the real estate replacement: A university will return the existing campus of 84 acres of land (including ground attached 30,000 m^2 of real estate) to the XX company in the 2 years later, in July 1999. The XX company will pay 160 million yuan to the total value of A university including land acquisition costs of the new campus and 1,045 acres of land containing one of the pre-matching fee of 75 million yuan, while the rest is built premises. This contract which is a final area of 84 acres of campus and the old premises of 30,000 m^2 in exchange for 1,045 acres of campus land and 80,000 m^2 of new school has been able to reach the main advantage of

the city downtown and suburban land rent. The A university old campus is the total value of $1.6 billion with a land area of 84 acres, per acre of the prevailing market price of $1.4 million yuan coupled with the ground attached to the property of 30,000 m^2. The A university uses the asset replacement fund to enable the funds to the 1,045 acres of land in the suburbs. The new campus far from urban areas and land acquisition costs only 66,000 yuan/acre (including related taxes and fees), so only 75 million yuan is enough upfront infrastructure fee to pay for land acquisition costs and a project. The remaining more than 8,500 yuan will completed the equivalent of nearly three times the size of the original school premises.

The A university completed an expansion project to break through the "bottleneck" of their own development with asset replacement mode of financing the construction of new campus, which is greatly improving the hardware level and passed the compliance requirements of the Ministry of Education school conditions. And this has laid a solid foundation for the overall relocation of the university A to create a good space for future development for the two the start of the phase of the expansion project. Therefore, A university was development at the same time learning in the building school.

In addition, the A university also use the principle of asset replacement communications market to open exclusively to the telecommunications operating company. Selling the campus communications market intangible assets in order to finance the construction of capital of 8 million yuan. A new campus communication system works according to the investment budget for the required 800 million. In order to ease the tensions of school funding, schools will be on campus wired telephone market exclusive to sell to China Netcom and the wireless communications market exclusivity to sell to China Unicom. As the premise of the school, the two communications companies signed a treaty, which the two companies will fund the construction of the communication system of the A university. This initiative makes school construction in the case of direct funding to improve the communication system, but also laid the foundation for future sustainable development of the school communications, network, and generate huge economic benefits and far-reaching social benefits.

38.6 The Issues to be Focussed on

According to the experience of the colleges and universities around the implementation of asset replacement, the support given by the local government in terms of policy is determinate condition and the collaboration and cooperation of government departments at all levels is a basic condition to complete the replacement work. Replacement way selection, scientific and reasonable arrangement of the replacement program is the basis of the premise that replacement work. It is important to government departments to attach great importance to the introduction of the corresponding support policies. Therefore, in particular, to propose the following:

38.6.1 To Establish the Governing Bodies of Colleges and Universities of the Old Campus of Asset Replacement

By the competent governor (mayor) responsible for the Department of Education, National Development and Reform Commission, Ministry of Finance, Personnel Department, the Office of Land and Resources, Department of Construction, Civil Air Defense Office, Price Bureau, Local Taxation Bureau, and other departments involved in the study the introduction of relevant policies and coordination of university assets replacement work.

38.6.2 Full Investigation

Full investigation on the basis of the relevant departments to devise a "Higher asset replacement management approach" and explicitly universities applications for replacement of the old campus, the approval process to determine the acceptance, examination, besides, approval department of the government can also select a few representatives of the school in the first step, replacement of part of the assets of the old campus of experimental work. Suggested that the government on everything and try to simplify the approval procedures.

38.6.3 To Minimize the Replacement Cost

The core of "Asset replacement management approach" is the old campus educational sites you want to change to the comprehensive development of land to price higher, which to make this part of the increase in value realized through the auction listing. This part of the full amount will investigate into the school by the Government the new campus construction. The key of "Replacement of assets management" is the reduction of various taxes, fees, minimizing replacement costs, and solve the problem of the necessary construction funds for the local higher education to find a new way, in order to reflect the government and relevant departments to support the development of higher the determination of education.

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Part V
Innovative Education and Applications

Chapter 39
Study on Coupling Model Between Anaerobic Exercise and Fitness Weight Loss Based on Bioelectrical Impedance Method

Yushu Li, Bo Zhang and Qiang Guo

Abstract Anaerobic exercise refers to the load of high strength, transient strong high-speed strenuous movement. After strenuous exercise, lactate metabolism and injury of muscles during the repair process will consume a large amount of fat, increase the ratio of muscle and fat as well as increase the rate of muscle metabolism, so as to achieve fitness and weight loss. Through the contrast experiment method, young students' body fat is analyzed by the bioelectrical impedance method in a period of time after anaerobic exercise in order to understand anaerobic exercise on fitness loss weight direct influence. The results show that body fat content has a certain reduction in a period of time after anaerobic exercise, because anaerobic exercise and fitness weight loss have a direct relationship.

Keywords Anaerobic exercise · Fitness · Weight loss · Monitoring analysis · Fat ratio · Bioelectrical impedance

39.1 Introduction

With the development of society, people pursue nutrition and health; at the same time also gradually pursue fitness, such as women's weight loss. In recent years, fitness weight loss was more and more welcomed by people, anaerobic exercise

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fitness diet has also been a rapid development, anaerobic exercises in the application field of fitness weight loss is more and more widely, and however, the scientific research of anaerobic exercise weight loss fields has not achieved fruitful results [1]. Anaerobic exercise training and body fat changes have great relevance; there are many rapid weight loss samples in life, and it is difficult to find in the anaerobic exercise to take necessary and effective measures, so that body fat may decrease rapidly, the weight will also be dropped significantly, this is due to the process of anaerobic exercise, the body's interior oxygen lacks, the sugar of body have not had time to get the oxidation, motion has produced lactic acid that has piled up and not to be consumed. After exercise, lactic acid decomposition and the muscles recovery of body will consume large amounts of fat [2]. For a long time, the idea of people has a misunderstanding that anaerobic exercise is the movement of the intermittent, and has little help for the weight loss, because anaerobic exercise is difficult to use the stored fat in the body [3, 4].

39.2 Research on Object Analysis

39.2.1 The Selection Principle of Research Object

In order to better study, selecting ordinary students who belong to sprint elective of anaerobic exercise type are centralized through the assessment of the degree of obesity grading technique namely body mass index (BMI). BMI is equal to the weight of the body weight (kg), and the quotient of its height squared (m), overweight or obesity students are choose to be numbered [5].

Assume the weight is said by W, the height is said by h. According to the assessment, the degree of obesity classification methods recognized worldwide can be drawn from the BMI formula as follows:

$$\text{BMI} = \frac{W}{H^2}(\text{kg/m}) \tag{39.1}$$

According to the standards set by the World Health Organization, the Asian BMI is above 22.9 that will be too heavy. Asia and Europe and the United States belong to different races, the World Health Organization standard is not very suitable for Chinese people, and Chinese people have formulated Chinese reference standards as shown in Table 39.1 [6, 7].

In Table 39.1, according to the reference standard of World Health Organization as the principle for selected object, then BMI values carry on classification.

Table 39.1 BMI standards under the provisions of world health organization

BMI Category	WHO standard	Asia standard	Chinese reference standard	Relative disease risk
Lean	<18.5	<18.5	<18.5	Low
Normal	18.5–24.9	18.5–22.9	18.5–23.9	Average level
Overweight	≥25	≥23	≥24	
Fat	25.0–29.9	23–24.9	24–26.9	Increase
Obesity	30.0–34.9	25–29.9	27–29.9	Moderate increase
Severe obesity	35.0 ~ 39.9	≥30	≥30	Severe increases
Extremely severe obesity	≥40.0	≥40.0	≥40.0	Very severe

39.2.2 The Selection Method of Research Object

Sprint elective course belongs to the anaerobic exercise types, selecting 60 students carry on uniform numbers from 1 to 120, all students will be measured height and weight, through the calculation of BMI, at the same time reference to China standard, to select BMI qualified students as the research object. Then, through statistical calculation, the BMI qualified students are a total of 20; The 20 students are divided into two groups, each group of 10; the first group of numbered is from 1 to 10, the second group number is from 11 to 20.

39.3 Research Method

39.3.1 Reasonable Choice of Research Methods

The proportion of body fat weight in the total weight of the human body is called the body fat rate, it is also known as the percentage of body fat, which reflects the number of the person's body fat content. Through the determination the body fat rate to detect the directly affect of anaerobic exercise and fitness weight loss, the instrument of using underwater weighing method is relatively large, it need to be higher requirements for the tester, so it is generally not used. In order to more accurately obtain the directly coupling relations of anaerobic exercise and fitness weight loss, adopt the bioelectrical impedance method before and after anaerobic exercise to conduct the experimental data acquisition. The bioelectrical impedance method measures the human body impedance, fat in the human body acts as the role of resistance. Through applying a small AC current, the body will have potential difference in the relevant part of the body, eventually the phase difference between voltage and current obtains the module information and the corresponding phase information [8].

39.3.1.1 The Working Principle of the Bioelectrical Impedance Method

Body fat content and capacitance effects are closely related, body fat content can be well reflected through the human body impedance, measuring the equivalent resistance to determine human impedance modulus and phase angle, finally to get the body fat content percentage.

Using amplitude demodulator, through a low-pass filter, a DC level can be converted to ripple level; DC output corresponding to the sinusoidal signal is calculated as follows:

$$\begin{aligned}\int_0^T |\sin(\omega t)|\mathrm{d}t &= \int_0^{\pi/T} \sin\left(\frac{2\times\pi}{T}\times t\right)\mathrm{d}t - \int_{\pi/T}^{2\pi/T} \sin\left(\frac{2\times\pi}{T}\times t\right)\mathrm{d}t = -\frac{2\times T}{\pi} \\ &= V_{\text{out}}\times T\end{aligned} \tag{39.2}$$

$$V_{\text{out}} = -\frac{2}{\pi} \tag{39.3}$$

The demodulation amplitude information can reflect the value mode of electrical impedance.

The reference input signal is $V1 = A\cos(50Kt)$ through the body, the human equivalent resistance model has capacitance, so the sine wave will have a phase shift. In addition, the current through the body will produce the delay, it also lead to phase change, which is phase error. This error cannot be avoided, so the measured capacitance is the relative value.

After current flows through the body, the instrumentation amplifies band-pass filter to process.

$$V_2 = B\cos(50Kt + \theta + \theta_1) \tag{39.4}$$

Where θ the phase shift is produced by the body and due to the delay produced phase shift, θ_1 is the phase shift generated by the instrumentation amplifier and band-pass filters.

$$\begin{aligned}V =& V_1 \times V_2 = A\cos(50Kt)\times B\cos(50Kt+\theta+\theta_1) \\ =& \frac{AB}{2}[\cos(\theta+\theta_1)+\cos(100Kt+\theta+\theta_1)]\end{aligned} \tag{39.5}$$

After low-pass filter

$$V_{\text{out}} = \frac{AB}{2}\cos(\theta+\theta_1) \tag{39.6}$$

Among them, the A, B is known, the constant θ_1 is determined by the frequency, they can be measured in the circuit testing. From this, we can calculate the θ value.

39.3.2 The Calculation Method of Body Fat Analyzer Tanta BF-639

Selecting the measurement tool is the body fat analyzer Tanta BF-639, its formula is as follows

Human density formula is

$$\rho_{\mathrm{DB}}(\mathrm{kg}\cdot\mathrm{L}^{-1}) = 1.1000696 - 0.107903\left[\mathrm{mZ/H^2}/\mathrm{kg}\cdot\Omega\cdot\mathrm{cm}^{-2}\right] + 0.00017\,\mathrm{Z}/\Omega \tag{39.7}$$

Male body mass fraction is calculated as

$$\omega_{\mathrm{BF}} = 100\left[4.57\cdot\left(\rho_{\mathrm{DB}}/\mathrm{kg}\cdot\mathrm{L}^{-1}\right)^{-1} - 4.142\right]\times 2 \tag{39.8}$$

Female body mass fraction is calculated as

$$\omega_{\mathrm{BF}} = 100\left[4.57\cdot\left(\rho_{\mathrm{DB}}/\mathrm{kg}\cdot\mathrm{L}^{-1}\right)^{-1} - 4.142\right]\times 2.5 \tag{39.9}$$

In (39.7)–(39.9), ρ_{DB} is said body density; m is said body mass; Z is said electrical impedance modulus values; H is Height; ω_{BF} is human body mass fraction.

39.4 Analysis of Test Results

39.4.1 Impact of Anaerobic Exercise to Test Students' Body Fat Rate

In the 20 students of screening BMI index standard, to use bioelectrical impedance method to measure the experimenter's body fat percentage, then to carry on anaerobic exercise experiment, the experimenter's main content is the sprint. At the end of the 3,000 m sprint, randomly select five students. After 30 min, respectively, the experimenter body fat rate will be measured again. The statistical results are shown in Table 39.2.

Table 39.2 Change of body fat rate before and after anaerobic exercise

Serial	Sex	Height (m)	Wight (kg)	BMI index	Fat rate (before anaerobic exercise)	Fat rate (after anaerobic exercise)
1	Female	165	53	19.5	18	16
2	Female	153	62	24.2	27	22
3	Female	162	55	21	19	17
4	Male	172	61	21	19	16
5	Male	173	71	24	20	18.5

Through the experimental statistics, we can easily find that both men and women after anaerobic exercise, the body fat percentage will appear apparent fall. Before anaerobic exercise, the fat rate of 2 female subjects is 27 %, through the three high-strength 1,000 m sprint, after 0.5 h, the fat rate appears substantially drop, just 22 %; According to Chinese standard of BMI, the girl already by obesity standards fell to normal range, the girls have been obese standard fell to normal range. Similarly, the fat rate of five boys before the anaerobic exercise has decreased significantly that is 25 %; he is from overweight to normal of the Chinese standard. Trend of body fat rate before and after anaerobic exercise is shown in Fig. 39.2.

From the Table 39.3 and Fig. 39.1, they can be shown that anaerobic exercise can effectively consume excess body fat, the body fat rate can be significantly reduced, the fat content is also significantly decreased, the subjects' fat rate of participating in anaerobic exercise will decrease significantly, it drops close to 20 % fat, that is to say, for weight loss, to increase anaerobic exercise training can't only increase the proportion of muscle in the body, after exercise, muscle is static condition, it can consume 20 % fat. So, every 1 kg's fat is converted to muscle, the body will naturally consume 100,000 more calories a day. If insisting, each 1 month can lose 2 kg fats. Through the fat rate changes of observation students, we can obviously feel the anaerobic exercise that causes the change of fat percentage.

39.4.2 Impact of Long-Term Anaerobic Exercise to Test Students Physical Shape

In order to better study the anaerobic exercise on fitness weight loss effect, select 20 students to participate in test; these students adhere to every 3 km sprint of 3 months to carry on monitor statistics. The statistical average results are shown in Table 39.3.

In Table 39.3, it can be found that after 3 months anaerobic exercise, to participate in testing body fat ratio tends to decline. In the first test, general average impedance is 400; in the sixth test, the average impedance drops for 380, drop

Table 39.3 Change of body fat rate after long-term anaerobic exercise

Measuring site and project	First	Second	Third	Fourth	Fifth	Sixth
Upper limb impedance	255	253	249	244	240	235
Upper limb angle	17.0	17.1	16.9	16.9	16.8	16.5
Lower limb impedance	126	127	125	123	121	123
Lower limb angle	24	24.2	24.2	24.3	24.3	24.1
Whole body impedance	400	396	391	390	387	380
Generalized phase	15.4	15.4	15.3	15.4	15.4	15.3
Fat rate (%)	19.3	19.1	18.7	18.4	18.2	17.9

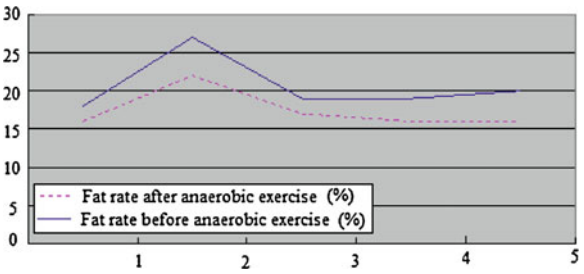

Fig. 39.1 Trend of body fat rate before and after anaerobic exercise

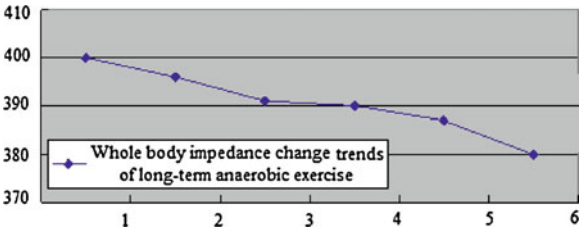

Fig. 39.2 Test students' whole body impedance change trends of long-term anaerobic exercise

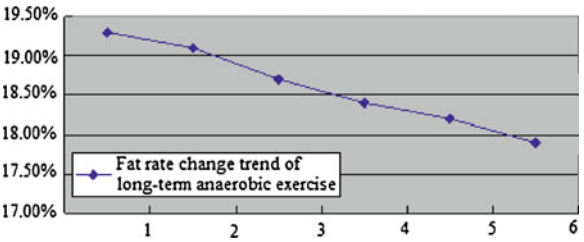

Fig. 39.3 Test students' whole body fat rate change trend of long-term anaerobic exercise

5 %, the average fat rate drops 1.4 %; wherein the upper limb, lower limb, systemic angle doesn't happen very obvious changes, however, resistance produces continuing decline, it illustrates that the long-term adherence to anaerobic exercise, which will have some influence for the body shape and is conducive to the body fat rate of decline, also have certain effect reducing weight. Testing students' whole body impedance and fat rate trend of long-term anaerobic exercise is shown in Figs. 39.2, 39.3.

From the Table 39.3, Figs. 39.2 and 39.3, those can be indicated that the individual parts of resistance and fat percentage of students body after anaerobic exercise can be observed to have decreased trend, the body fat is effective decomposed to increase the fat as an energy approach, to reduce fat purposes, and through anaerobic exercise course, the body shape of young students will be gradually to the development of a fit body orientation.

39.5 Conclusion

Anaerobic exercise is a mostly intense, strength, speed and high-intensity exercise. In the fitness weight loss process, people cannot be blind and have no scientific basis to carry on anaerobic exercise according to own actual, balancing their nutrition; to avoid the physical discomfort in the process of anaerobic exercise, and even accident. After anaerobic exerciser, the body will produce the lactic acid accumulation that will cause physical discomfort, such as pain. So people should increase the frequency of movement in the aerobic loses weight, gradually adapting to the anaerobic process, to improve their body resistance to oxygen capacity. In the Medicine School of United States MIT University, Director Mr. Rip has concluded that only using anaerobic exercise loses weight; however, the muscle will be reduced, to not fill the skin by muscle tissue will appear relaxation, and thus reducing the effect of body fat is not obvious. So only the combination of anaerobic exercise and aerobic exercise is the best way of losing weight.

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Chapter 40
Treadmill's Adjustment Mechanism Based on User Exercise Experience

Lili Yang and Nan Xiang

Abstract In this paper we introduced treadmill equipment which can be controlled by users' exercise experience. First, we captured users' facial expression and physiological signals such as heart rate (HR) from the camera and HR monitor settled on the treadmill in front of user. Then, we used Hidden Markov Model and Kalman filter to extract user experience from his expression and HR by computer analysis. After this, we measured user's performance according to the exercise guidelines of American College of Sports Medicine (ACSM) and control the parameter of treadmill dynamically. In addition, our treadmill can be connected through Internet and provide the same virtual exercise environment for multiplayer.

Keywords Experience controlled treadmill · Dynamically difficulty adjustment · Facial expressions · User experience

40.1 Introduction

In common fitness game equipment, the level of difficulty cannot be changed within each stage of process. Although there may be a training model for player to learn the equipment mechanics, however, once the player set the game difficulty, it is easy for him to feel frustrated as the mission is too difficult to accomplished or too tedious without any challenges. In addition, players must set the parameters of equipment manually. For example, user has to decrease the speed of treadmill

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manually if he or she hardly can proceed. To increase players' convenience and experience, fitness game equipment must be balanced well. For instance, it must provide meaningful choices, the players' situation should be considered then reacted, and players must perceive the reaction mechanism to be fair [1], otherwise the player should lose their interesting. This is so-called dynamic difficulty adjustment (DDA) and dynamic game balancing (DGB).

In nowadays, user's emotion plays an important role in their experience. The designers have recently recognized the importance of emotion in the development of more engaging equipment, and the area of affective facilities is receiving increasing attention [2]. Many psychophysiological studies have been made to investigate different traits of user experience and several kinds of equipment have been developed in laboratories exploring the possibility of adapting the performance to the user's state [3]. This provides us a practicable method to avoid undesired user emotions such as frustration by dynamically adjusting game parameters especially game difficulty level. Physiological signals such as blood volume pulse (BVP), heat rate (HR), and electro dermal activity (EDA) are used to detect the arousal of emotion. In addition, the facial expressions could present the user emotions well. In this paper, we utilized the facial expressions and physiological signals to adjust the parameters of treadmill which had projection screen to simulate the outside environment and could be contact with Internet. The treadmills have various sensors embedded to collect user's body performance data. Furthermore, we created avatar in the virtual scene and then the player's avatar in a virtual game environment could be synchronously control by connecting treadmills with computers or set-top-boxes (STBs).

40.2 Research Background

To enhance users' experience is one of the most important targets in equipment exploring. In Erma's study, immersion is composed by sensory immersion challenge-based immersion and imaginative immersion [4]. Wijnand considered flow, an optimal state of enjoyment where people are completely absorbed in the activity. Especially in the gaming domain, immersion is mostly used to refer to the degree of involvement or engagement one experiences with a game [5]. Lennart explored well-accepted common meanings of certain user experiences such as flow and immersion instead of a more thorough understanding of loosely defined subjective experiences [6].

The relations between physiological signals and users' emotional activities have been studied in many works. These researches showed that high EDA values correlate with high arousal and that a high level of arousal can be indicative of a high level of challenge, frustration, and/or excitement. Users are engaged in low speed of HR and frustrated in high speed of HR. Although these signals could be used to detect the arousal of emotional activates, yet it is hard to distinguish some

distinct experiences which have the same physiological reactions, for example, being frustrated and being immersed.

The other methods are to utilize game AI to dynamically adjust the difficulty level. Gaussian mixture module and multivariate pattern mining were used to model the player's reaction pattern [7, 8]. By conducting a cheap, abstract simulation of the player's progression through state space, Hunicke [9] used Hamlet system to predict when the player is repeatedly entering an undesirable loop, and helps them get out of it. Joost [10] proposed an adaptation approach that uses expert knowledge for the adaptation. They used a game adaption model and organized agents to choose the most optimal task for the trainee, given the user model, the game flow, and the capabilities of the agents. Hom [11] used AI techniques to design balanced board games like checkers and Go by modifying the rules of the game, not just the rule parameters.

40.3 System Framework

The system architecture is shown in Fig. 40.1. The equipment is composed of client end and service end. The client is used to collect user data and displays virtual scene. The service end is utilized to manage the user data and control the game logic. Most large equipment updated the parameters in their new versions which often take a long time to be released.

System adopts the active shape model (ASM) animation algorithm to facial feature point detection. Model totally includes 77 feature points, five of them are eyes and eyebrows related, nose, mouth and cheek have 12, 11, and 34 related feature points, respectively. Where 77 feature points coordinates, as shown in Fig. 40.2 output as vector.

40.3.1 Hidden Markov Model

HMM can be represented as $\lambda = (N, M, \pi, A, B)$, where N denotes the number of states S, let q_t the state in time t, then $q_t \in (S_1, \ldots, S_N)$, v represents the number of observation V, set Q_t the observation in time t. π is initial state vector and $\pi = (\pi_1, \ldots, \pi_N)$. A denotes the state transformation matrix and $A - (a_{ij})_{N\times N}$. B is the observation probability matrix and $(B_{jk})_{N\times M}$. To construct HMM, it firstly needs to generate the observation sequence $O = O_1, \ldots, O_n$ and $\lambda = (\pi, A, B)$, then estimate the probability of this observation sequence $P(O|\lambda)$. Secondly, utilize the Viterbi algorithm to select the state sequence $S = q_1, \ldots q_n$ which is the optimism state sequence. Thirdly, it is to exploit Baum-Welch algorithm to modify the parameters of $\lambda = (\pi, A, B)$ which can maximize $P(O|\lambda)$.

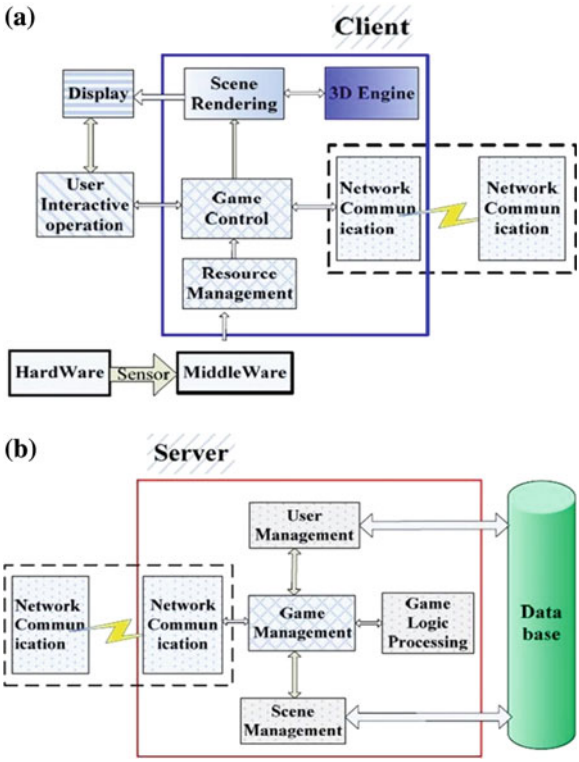

Fig. 40.1 System architecture

Fig. 40.2 The facial feature points

The image of a face may be modeled using HMM by assigning each of these regions to a state as shown in Fig. 40.3. The typically running mood represented by facial expressions when playing treadmill is shown in Fig. 40.4. They are frustrated, engaged, relax, and bored.

40.3.2 Experience Filter

The game system established metrics for assessing the player's in-game performance within the game world. The numbers of lines that had been eliminated and had not been eliminated by player over time were utilized to represent the in-game performance which could use to predict the player's game experience. Ground on the theory of Kalman filter, the expressions of player as an observational variable were used to adapt the prediction of experience.

Assuming $S_n = \{\text{bore}, \text{relax}, \text{engaged}, \text{frustrated}\}$ represents the player's state in time n, $P_n = (le_n, lr_n)$ is a vector denoted the in-game performance, le_n and lr_n denotes the number of kilometers that have been finished and have not been finished, then

$$S'_n = AP_{n-1} + U \tag{40.1}$$

where S'_n is the predicted player state, and A is translation matrix, U is covariance.

$$S_n = S'_n + (BE_n - AP_{n-1})\text{kg} \tag{40.2}$$

B is control matrix, E_n represents the expression of player's face, kg denotes the Kalman gain.

$$\text{kg} = BQ'_nB'/(BQ'_nB' + V) \tag{40.3}$$

$$Q'_n = AQ_{n-1}A' + U \tag{40.4}$$

Q_n represents the optimal covariance. All these parameters are set according to experiments.

The adjustment strategy can be found in Table 40.1, when player is frustrated, the treadmill speed should slow down. Flow means a good game experiences and

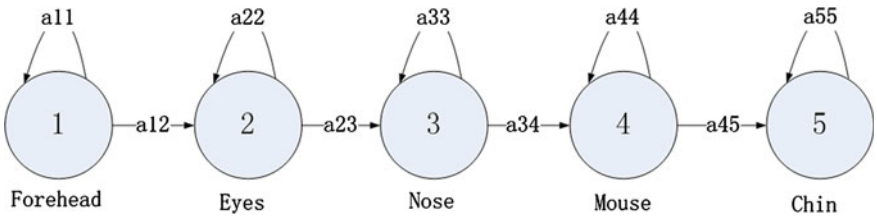

Fig. 40.3 HMM for face recognition

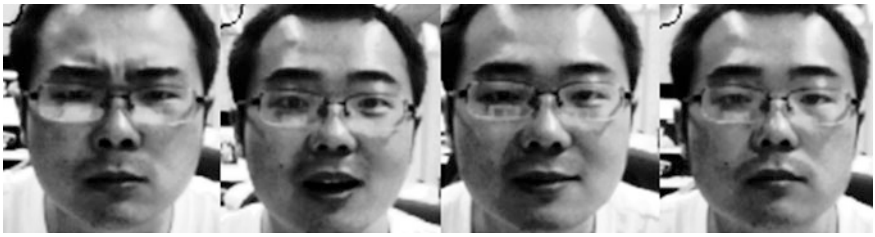

Fig. 40.4 The sample facial expressions in four kinds of running mood

Table 40.1 Adjustment strategy

	Frustrated	Flow and excited	Flow and relax	Bored
Good performances	Slow down	Keep on	Speed up/keep on	Speed up
Bad performances	Slow down	Keep on	Keep on	Need a rest

the speed should be kept on. When players are bored they may need to change the speed or a rest. Good in-game performances do not mean speed up and bad in-game performances do not mean slow down, they are related to the player's game mood.

Beside facial expressions, the physiological signals such as HR can be used to measure user's performance and according to the exercise guidelines of ACSM [12], it can be used to measure the effect of aerobic exercises. As a result we adopted HR in our treadmill. This is a useful method to keep the treadmills giving reasonable reactions to uses had different fitness level. Treadmill system collects the user's HR in real-time during the running exercise. If the rate is higher than the recommended upper boundary of the guidelines, the system will alert the user to slow down the pace by voice and text and dynamically decrease the velocity of the surrounding competitive nonplayers; if the rate is lower than the recommended lower boundary, the system will alert the user to accelerate and play cheering sounds to encourage the user and accelerate the running speed of the surrounding nonplayers.

Integrated with the emotional reactions mentioned before, the level-up strategy is also employed to encourage players to persist in running. The higher level the player is at, the more privileges they will have in the virtual world. To ensure that all players at different fitness levels have the opportunities to upgrade their level, the traditional level-up strategy is implemented as the finished tasks (FT) strategy, by which the player may upgrade their level either winning in a competition or finishing appropriate exercise tasks.

In both the training and the competition modes, the exercise time and intensity conform strictly to the ACSM's physical exercise guidelines [12]. To guarantee that the user enjoys a safe, effective, aerobic exercise, according to the guidelines, the running exercise time is limited between 30 and 60 min. By monitoring the

player's HR and employing our adaptive HR-FT method (Sect. 4.4), the exercise intensity is divided into three phases as follows:

1. Warm-up at least 5–10 min of low-intensity, large-muscle activity at approximately 50 % of the intensity of the exercise in the stimulus stage.
2. Main exercise at least 20 min of activity at 77–90 % of the maximal HR.
3. Cool down at least 5 min of low-intensity exercise to return the HR to pre-exercise levels. A virtual coach in the system will make a custom-made exercise plan for each player according to his or her exercise history and guide the user in finishing the plan. If the exercise time and intensity are satisfactory, the coach will advise the player to take a rest and switch into tour mode to avoid overexercise.

40.4 Summary

In this paper, a network treadmill was provided to show how user experiences were used to controlled machines. According to the physiological signals such as facial expressions and HR, our machine dynamically adjusted operation parameters and gave advance to the user.

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Chapter 41
Rationality Evaluation Model of Volleyball Tournament Ranking

Ping Sun

Abstract The three regular kinds of rules used in volleyball match, which often questioned. In this paper, by using quantitative analysis, such as, the hierarchical analysis and regression analysis methods to calculate the match results of comprehensive strength index calculation for one season, we obtain a sort of absolute sequence. According to the three kinds of commonly used numerical integral methods, we calculate various integrals under the rank sequence of absolute sequence inverse number. Here, the inverse number sequence is the team ranking, teams with the comprehensive strength rank the agreement coefficient, which size reflects the integral rule rationality. Finally, combined with a specific data on the season and make the simulation evaluation.

Keywords Analytical hierarchy · Absolute sequence · Relative sequence · Reverses number

41.1 Introduction

Currently, there are three methods to calculate the international volleyball competitions, and they each have the corresponding advantages and disadvantages.

The first method is giving 2 points to winning team, and the losing team 1 point. This integration method is simple and clear, and implemented in international volleyball forum for many years, but the shortcomings are also very obvious. First, at the later league, the integration points between the strong and weak teams are

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often easier to pull, causing the weak teams early to lose the hope to catch up, and affecting the positive and the ornamental. Second, the different points between weak teams or strong teams but not easy to pull, which also caused the situation of many teams had the same points when statistic the league ranking.

The second method is when each participating team 3 to 1 or 3 to 0 is winning 3 points, 0 to 3 or 1 to 3 is losing 0, 3 to 2 is winning 2 points, and 2 to 3 is losing 1 point. This integral formula could encourage the weak teams to fight for victory in each game, so that to improve the game's ornamental. But it is too early to widening gap between the team's points, but affects the positive of game.

The third method is to calculate the point based on the number of the winning innings of each team. Relative to the first two methods, it is more apparent on the role of incentives in the game. And it can stimulate the team members to do their best in each game. Of course, there is no formulation is perfect. Because the outcomes of each game are related to the increase and decrease of points, so that there is a big problem of understanding ball. For example, in the critical moment of the league, some teams that have advantage on points will put a few understanding balls to some teams that whose points are far behind.

The integral calculating method is directly related to the team rankings, so it has practical significance to study the fairness of the integral method.

41.2 Evaluation on the Fairness of Integral Method

After the determining of integral method and the finishing of the season game, each team's total score is the only basis for the team ranking, the fairness of the integral should be reflected on the degree of coincide on the team rankings, and the overall strength of the team rankings. Combined with the characteristics of volleyball game, there are three major elements to determine the overall strength of team [1, 2]: the impact of winning rate to the team ranking is X, the produce tendency of the understanding ball is Y, and the affect of the different points per game to the ornamental is Z.

We can do some quantification on the three factors X, Y, Z, and then normalized the quantification, set the value of each team after normalized as W_i, D_i, S_i, the weighted value of these three factors that affect team's overall strength is varied different, we can use AHP to determine the weight of X, Y, Z are α, β, γ, integrated three normalized value, after weighted respectively and sum up them , then we can get the index of the overall strength of the team:

$$f_i = \alpha W_i - \beta D_i + \gamma S_i \tag{41.1}$$

We can obtain an absolute sequence according to the size of composite index based on ranking each team, and calculated respectively under a variety of teams ranked in the reverse sequence of absolute sequence number τ, the smaller the τ, then the more reasonable of the pointing method.

41.3 Numerical Calculation

41.3.1 Weighting of Each Factor

It has certain interactions of each factors' impact on the overall strength, such as α and β are both related to absolute power, of which the larger the α, the stronger the absolute strength, the larger the β, and the less reflect the absolute strength, that is, the lower the absolute strength. In addition, it was a positive correlation of γ and the ornamental of game, the greater the β, the lack of the ornamental. To sum up, we can think it is in line common sense that adds a level of absolute strength and ornamental among the three factors and composite index [3]. Their hierarchy as shown below: (Fig. 41.1).

According to Saaty comparison scale tables of AHP [4], we can list the following judgment matrix:

$$\begin{array}{ccc} A & B_1 & B_2 \\ B_1 & 1 & 2 \\ B_2 & 0.5 & 1 \end{array} \qquad \begin{array}{ccc} B_1 & C_1 & C_2 \\ C_1 & 1 & 2 \\ C_2 & 0.5 & 1 \end{array} \tag{41.2}$$

Judgment matrix A–B Judgment matrix B_1–C

$$\begin{array}{ccc} B_2 & C_2 & C_3 \\ C_2 & 1 & 2 \\ C_3 & 0.5 & 1 \end{array} \tag{41.3}$$

Judgment matrix B_2–C

After normalized the above matrix, we can calculate the weight vector of the first level $w1 = (0.666667,\ 0.333333)$, the second level of weight vector $w21 = (0.666667,\ 0.333333)$, $w22 = (0.2,\ 0.8)$. It follows that:$\alpha = 0.444444$, $\beta = 0.288889$, $\gamma = 0.266667$.

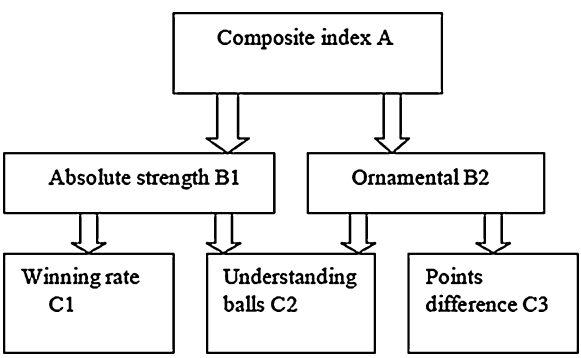

Fig. 41.1 Hierarchy structure

41.3.2 The Establishment of Each Factor's Indicators

1. Indicator W_i of X's winning factor.

It has always been based on the thinking that, the higher winning percentage, the composite index should be higher. We can get each team's winning percentage p_i by the total number of wins for each team divided by the total number of game field N, that is $p_i = {}^{n_i}/_{N}$. So it can be directly used p_i to represent the Numerical value W_i of X.

2. Index D_i of understanding ball's factor Y.

We believe that the higher of A team's winning percentage than B team, and their points difference should be greater, that is a positive correlation between $\sum_{j=1}^{N} p_i/p_j$ and $\sum_{j=1}^{N} |i-j|$, which p_i is the i team's winning percentage, $|i-j|$ is the points difference of each game. We can use the regress function by MATLAB to calculate regression coefficients Matrix [5] $D = (D_1, D_2, \cdots, D_m)$.

3. Index S_i of ornamental factors Z.

It is generally believed that in a game, the smaller the gap, the more intense of game and that is more ornamental. We add up each team's winning and losing game, namely $S_i = \sum_{j=1}^{m-1} 3 - |i-j|$, so we can calculate each team's index S_i of ornamental factor.

4. The normalized data.

Normalized indicators of these factors by MATLAB function $y = \text{atan}(x) * 2/p_i$, then

$$W = (W_1, W_2, \cdots, W_m), D = (D_1, D_2, \cdots, D_m), S = (S_1, S_2, \cdots, S_m) \quad (41.4)$$

41.4 Simulation

According to the data of ranking game in 2008–2009 ANTA National Volleyball League Men's Group A, we can calculate a composite index and ranking of each team from the above formula W_i, D_i, S_i, and f_i:

So we can get the absolute sequence of ranking, then get the relatively sequence by the points under the three programs (with C value), then separately calculated negative sequence τ of relatively sequence to absolute sequence.

Option One $\tau_1 = \tau(1, 2, 5, 3, 4, 7, 6, 8, 9, 10) = 3$
Option Two $\tau_2 = \tau(1, 2, 5, 3, 4, 7, 6, 8, 9, 10) = 3$
Option Three $\tau_3 = \tau(1, 2, 5, 3, 4, 7, 6, 8, 9, 10) = 2$

To sum up, $\tau 3 < \tau 1 = \tau 2$, it indicates that the third program can general present the fairness of team rankings.

1	Eight One Men's Volleyball Club in Zhuzhou	0.323548819
2	Denglupu Men's Volleyball Club in Shanghai	0.302246599
3	Zhongsheng Electrical Men's Volleyball Club in Jiangsu	0.298931067
4	Tianguan Men's Volleyball Club in Henan	0.291644391
5	Shandong Men's Volleyball Club	0.266551023
6	Liqun Men's Volleyball Club in Zhejiang	0.25806671
7	Saying Air-conditioning Men's Volleyball Club in Liaoning	0.245024436
8	Beijing Men's Volleyball Club	0.233715597
9	Sichuan Men's Volleyball Club	0.224155631
10	Aerospace Men's Volleyball Club in Hubei	0.088253362

41.5 Conclusion

There is no kind of pointing method of volleyball is perfect, the event organizer only can directed toward the purpose of the competition, and strive to design a pointing method that possibly fair and reasonable. When calculating the index of each team's overall strength, I considered of factors which may be incomplete, it has a bit rough on each factor's calculating methods of weight and index, and needs to be improved.

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Chapter 42
Study on Colleges Outdoor Sports Development in China

Hongwei Wan, Lajiao Wang, Ying Jiang, Yongna Xin and Huibing Sun

Abstract The development of science and technology, human survival conditions, physical conditions, and spirit conditions are greatly improved, labor time gradually shortened, leisure time increases, and people began to open using leisure time hair health of outdoor activities. The current, outing, mountain climbing, drifting, hiking, travel, camping, skiing outdoor sports in our country have developed regions and cities of gradually carry out. And increasingly become fashion leisure entertainment. In recent years, the outdoor sports in our country increase the outdoors to show great charm and development potential. Colleges are giving training and creating comfortable to society development, promote social progress of high quality and the cradle of talent, and for young people, college students are the future development and progress of China's reform, the backbone of the outdoor sports is a melting divorces idle, entertainment, and fitness in one of the projects at the same time. Outdoor sport and fashionable sport also be more and more college students put it into his life. College students to participate in outdoor sports main expert four kinds of forms: school of outdoor sports courses, the school organization of outdoor practice activities, take part in outdoor club, and spontaneous organization form.

Keywords Outdoor sports · College · China

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42.1 Introduction

Party and state leaders have great concern on teenager's quality education. Hu General secretary examines out people's University of China put forward to adhere to reform and innovation in advance element quality education [1, 2]. Premier Wen Jiabao on the national education work conference speech to the mentioned face to promote the quality education, among them to promote the quality education is key to deepen reform curriculum [3, 4]. The ministry of education and the common school physical education curriculum teaching guidelines put forward in fully the use of air and sunlight, water, river, lake, sea, beach, field, forests, mountains, grasslands, Xue yuan, wasteland and conditions for survival, the life of the teaching and training, open Hair natural environment resources as a new Physical education curriculum, the momentum of development, and quality education in the role of very outstanding [5]. To carry out the quality education curriculum innovation is the carrier. Outdoor sports courses to sports training study and education, psychology, management and organizational behavior as the theory basis, broke traditional physical education curriculum mode, the teaching in the space school, the society, the natural look be in harmony close, theory with practice, the classroom teaching and outdoor practice guidance integration, fully embodies from the practice, practice, and practice on the education service connotation [6, 7]. Theory and reality practice show that the outdoor sports training, on one hand, can effectively develop people's potential and ascension and the strengthening of personal psychological quality, on the other hand, can help build team consciousness, make richer team cohesion, and more rich of honor [8]. Develop outdoor sports courses conform to the international hair exhibition trend, accords with modern sports teaching development concept, and teaching theory system.

42.2 Research Methods

42.2.1 The Literature Material Method

According to the purpose of subject research and content, through the visit China journal net, China sports information nets, looking up a 2010 national each sports university, about outdoor sports course and quality education, teaching management and the related literature, from which access to relevant information analysis, this study lays solid foundation for theoretical basis.

42.2.2 Interviews with Experts

According to the need, experts visited the east China Normal University, Shanghai Normal University, the sea traffic university, Shanghai institute of physical education and sports of higher learning, the main access the pedagogy, psychology, sociology, etc., of experts, interview and record the content, collect on the curriculum opinion and the suggestion, and experts are discussed, take to the real experience first-hand valuable information, and makes the theoretical study more targeted.

42.2.3 Teaching Practice Method

For students in explaining after sufficient theoretical knowledge, to lead the students to go to school outside of the quality of the field survival training, accumulated the massive teaching case, will theory and practice with the better.

42.3 Outdoor Sports Concept Definition

Outdoor sports and other sports leisure activities compared. Showing the process involved in human and nature. The fusion of participating is in process influenced by the environment and controlling, activities, and exploratory pick war for the features. This paper mainly refers to the outdoor sports in spare time. People for the body relaxing exercise is since meet nervousness or emotional, interpersonal and stimulation, and risk. The various needs of the insurance, the sports way (walking, skiing, mountain climbing, riding a bicycle, etc.) in the hill country, desert, plateau, waters, and specific natural environment outdoor. Outdoor sports in our country to develop main project are: bungee jumping, climbing, climbing, and climbing ice, skiing, cross, orientation, hiking, drifting, surfing, gliding, water skiing, diving, slippery grass, mountain speed drop bicycle, cross-country mountain bikes, hot air balloon, tracing the creek, the development, and the flight.

42.4 The Characteristics of the Outdoor Sports

42.4.1 The Integration of Man and Nature

The rise of outdoor sports is people gradually left the traditional sports venues. It is with natural the environment for the special field of the *f* with exploration of the nature or experience exploration of sports. Generally are in the wild mountains,

rivers, lakes, wasteland jungle, desert and Gobi and other natural environment in, so participants and nature completely be in harmony and organic whole, make it have a return to nirvana, return to the sense of nature.

42.4.2 Controlled by the Influence of the Environment

Outdoor sports activities by way of activity place (natural environment), which for outdoor movement of the projects have been in specific natural places, so, activity places, place environment directly determines the characteristics of the form of outdoor sports. For example, it is in the mountains of the rich resources area. Do take part in mountaineering more region in the winter skiing sports more.

42.4.3 Activities and Challenging Experience

The people of modern society live mainly in the city and town, the noise of the urban environment, gray color forest (city construction), work and life of mechanization, and heavy feeling let people choking and thirsty hope to flee. Therefore, the modern people are to contact and experience of the natural environment and the desire to get rid of high pressure life state is outdoor exploration and challenge the main motivation of activities.

42.5 The Influence of Outdoor Sports

42.5.1 For College Students' Physical Health Effects

Outdoor activities are for college students' physical health the role that is the comprehensive. The outdoors exercise environment chooses commonly in the fresh air, vegetation is rich, and less pollution in the natural environment. For exercise the effect is very good for outdoor sports exercise, often the long distance walking, mountain climbing, skiing, mountain bike are aerobic endurance sports. In the field of environment, students to overcome geographical difficulties: plateau, mountains, and lakes, pounding on the very tall to the requirement of students' physical fitness. The special geographical environment will make learning. Each system to obtain the very good exercise, such as sports system strength, speed, endurance, flexibility, coordination, skeletal system, nervous system, circulation system, and so on. In the cold, heat, wind and rain are the environment. And under conditions of outdoor sports, student's ability to respond to the environment will continuously improve. Immunity also suggests the wills of corresponding enhancement study.

42.5.2 Influence on Psychological Health of College Students

Outdoor activities in the sunshine, blue waves, the wind and the fresh air in sports, and more make the person loosen body and mind. Enjoy pure and fresh and open interest can temporarily out of big industrial production damage the body deformity development and civilization public nuisance. And urbanization way of life and tense is rhythm and the environment. The movement of the regulating is psychological. Have a positive attitude of learning pressure of today's college students. And the employment, etc. The psychological pressure is bigger, through the outdoor activities can get more in nature good relaxation.

42.5.3 The Influence on College Students' Knowledge Construction

College students' physical life is in the "golden age", energetic, an eager, enthusiasm bold and unrestrained, positive enterprising, like pursuing emerging, fashionable, and challenging sports. A close to understand natural outdoor sports. Through the approach and blend in nature. Understand some mountain forest, rock stone or land forming process and the geography of the natural form of knowledge and natural intimate contact can make the student to obtain for animals and plants, trees and many natural phenomena intuitive feel. Such as directional luck move needs for different landscape environment of participants and sense of direction of discrimination have higher requirements. Outdoor sports process can help students contact, understand and even love nature, and gradually true are aware of the importance of environmental protection.

42.6 College Students Develop Outdoor Sports Countermeasures

42.6.1 Teachers' Training

University outdoor sports professional teacher shortage is the fact that does not dispute. In order to solve the real asked question. Increase the outdoor sports teaching skills training work efforts to encourage teachers to learn, to ensure that the development of outdoor sports course professional knowledge lecture, and popular outdoor sports knowledge. Outdoor sports is a professional knowledge, equipment and technology of the shipment still, will outdoor sports activities in the scientific, safety limits of tourism scope. Therefore, they carry out professional

knowledge lecture. Popular outdoor sports knowledge is very necessary in school to often carry out professional knowledge for outdoor sports lecture.

42.6.2 Integrate the Outdoor Sports Resources

Through to the university sports resources fully tap. Improve college outdoor sports resources with benefits. Take all kinds of effective ways to strengthen college physical self hematopoietic machine system. For the college physical education curriculum implementation of emerging provides material support to the equipment the factors. Nearby is then the launch of the outdoor sports. Campus directional made full use of the campus all kinds of natural and people work environment. Organize the student to carry on the practice. So that students in a changing environment are new stimulation. Courageously perform fully mobilize the enthusiasm of the students' practice. Students build a lively, light loose learning environment. Fully arouse the students' interest in practice, thus to achieve the training to learn the purpose of the interested.

42.7 Our Country Outdoor Sports Development Present Situation and Restriction Factor

42.7.1 Our Country Outdoor Sports Development Present Situation

The development of outdoor sports in our country had experienced three stages, namely exploration stage (twentieth century 1950–1990s), content to a mountain climbing expedition Lord; Rise stage (twentieth century 90s–2003 years), part of the university of mountain sports spread to the society, become a fashionable urban movement; Standardized development stage (2004 years). The movement outside formal establishment project, by the state general administration of sports of mountain sports management center negative Principal management. In recent years, China's rapid development of outdoor sports, 2,000 output values only 6,000, 10,000 yuan, in 2002 to 300 million yuan in 2005 and was increased to nearly 10 one hundred million yuan.

42.7.2 Traditional Sports Culture Background Restricts

Chinese traditional sports to health as the core, exquisite combining static, harmony between man and nature, and god shape both, god first, emphasize the

movement of the sexual abstinence, think a competitive match "invite a shot the internal injuries bone marrow, the muscles away." Exercise content to martial arts, such as chess for nuclear project heart, exercise to mimic animal movements of reactive power exercise is given priority to, main is self practice. The United States is the new immigration country, the war of independence, the development of the western region, and make hard course. American adventure character and struggle consciousness, reflected in the sports culture, is the limit of the pursuit of people development, show perfect and "faster, higher, stronger" value idea, fully respect the free will, make public individual character is its basic principle, hunting, fishing, sailing, camping, hiking movement gradually popular, outdoor sports let advocate since the Americans found the return to nature, return to the way.

42.8 The Influence of Outdoor Sports

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Chapter 43
Study on Item-Group Competition Olympic Gold Athlete's Success Factor in China

Daling Shi, Xuehong Wang, Yiliang Sun, Jie Zhang and Bo Sun

Abstract Skills leading class project including the backlash against the nets of combat. To compete against, three groups are against the crowd at the Asian games and the Olympic Games. The gold medal is a significant portion of the distribution, fighting against sex and the nets to resistance is the advantage of China's competitive sports items. With modern training development, in today's big games are confrontational project on athletes. Fitness put forward higher request, our country adversarial program in athletes. Physically, foreign athletes, there are still some difference, need to roll out. For this, this paper, from the perspective of comparative study, tries to combat fight, the nets against physical stamina training to compete against the comparative study. The characteristics of the dialysis physical stamina training, in order to arrange different scientific methods against body training, promote training methods and means to provide optimization.

Keywords Item-group competition · Olympic · Success factor

43.1 The Research Object and Methods

43.1.1 The Research Object

Skills against project of wrestling, taekwondo, feet, boxing, ping Pong, badminton, volleyball, and basketball are the project of physical training, a total of 15 a

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shipmen dynamic team, one of which is a national team, and the other is the province, city team [1, 2].

43.1.2 Research Methods

We use the literature material law, on-the-spot observation statistics, factor comparison method, and investigation.

43.2 Physical Training Factors Comparison

43.2.1 Physical Stamina Training in Combat, the Nets, and the Status of Training to Compete Against

Combat athletes in the competition of tactics use hair swing and psychological quality of the game stability and physical training level close phase shut, from the survey of the 15 h on the distribution of annual training, physical stamina training in boxing, wrestling, judo, and accounting for 40 % of the training 50 % or even 60 % ratio [3, 4]. The nets against of physical training are in the relatively low proportion of some, and change to a larger extent. Table tennis project of physical stamina training low proportion, in overall training accounted for only 10–15 % of the ratio. Badminton, Volleyball project of physical training is in about 20–25 %. The nets of fitness requirements did for skills that high, but our athletes and foreign wonderful players than, fitness, are still in existence in certain disparity. Improve the nets against athlete's fitness level to promote the development of the important way. Athletes to compete in the game against the offense and defense in the fight against frequent and intense melee, athletes, only to have a good body level of training to adapt to the high speed, the fast pace of conversion, and in the whole game time from beginning to end play at a high level of techniques and tactics ability. The proportion of physical stamina training accounts for 25–30 % of the overall training.

43.2.2 Leading the Sports Quality and the Body's Ability to Function Comparison

Combat class project requirements of athletes have a comprehensive physical quality, force quantity, speed, and sensitive; endurance is the dominant sport of combat quality [5]. Wrestling with the maximum power and explosive, dexterity, movement speed, and stamina row sequence; Boxing, kickboxing, with a response

speed and movement speed, flexibility, and durability sort. Feet to the reaction rate and movement speed, flexibility, durability, and strength sort. Combat kind of project for athletes and the body functions. Requirements have in common; the body of the main physical training is to improve the call suction and cardiovascular system function, which improves the body fight play ability and inside. Dirty organ seismic capacity; improve the function of the organ and vestibular muscle acid ability. The nets against the dominant sport quality are project movement speed, flick arm speed, flexibility, and fast moving durability. Speed is the core quality, speed, and endurance is the foundation. Its body function strengthen training in order to improve the flexibility of central nervous, cardiovascular, and respiratory system. All functions and muscle fatigue resistance ability give priority to. To compete against the project game running positive athletes, many times heavy after rapid starts and sprinting, the body in the reasonable frequent contact rush bumps, and game time is long. So, suddenly started speed, movement speed. Degrees, linear and change to displacement speed, strength, sensitivity, and explosive resistance. Force is the dominant sport to compete against quality. Its body function training. The main practice can improve heart function, the lactic acid can offer ability, around aerobic for ability,space balance and space directional sense.

43.3 Physical Training Method Features Comparison

The usual kind of project combat training methods had distinct properties to refer. A week of fighting against the project of the game for the time of 2–3 rain, training practice, usually the maximum intensity and time biggest strong degree of short-term repeat method, improve the lactic acid can be the biggest energy force, development speed, and explosive action ability; the strong intermittent and strengthen sex intermittent method, improvement of lactic acid and respectively of the lactic acid meta obligation can mix for lactic acid metabolism ability, the speed of development and speed endurance, strength endurance, improve muscle acid ability; combined training and follow ring training method is required on the development speed of fight quality, force quantity and physical stamina; the training intensity, density, transform the way of teaching methods, make the body function and structure in the production and the actual kiss game close to the training.

The nets against athlete physical stamina training is more than the reinforced sex and developmental intermittent method and short, where last method, improve oxygen generation thanks mainly the lactic acid with anaerobic alternate energy ability. In short, again the development speed of response training methods and short of the moving velocity and the explosive force; to strengthen the sex and developmental intermittent method development anaerobic endurance, mix oxygen endurance, quick take, and rapid displacement durability; to load transform, content transformation, and form transform method development flexibility. To

compete against of physical training in intermittent method widely used, and heavy the complex method, transform method and circulation method, its characteristic is often tactics combined, hardening approximate to compete against competition activities of the way physical exercise ability.

43.3.1 The Training Load Characteristics Compared

Combat class athletes in training and competition fierce sport heart rate of 180–200/rain, training high average heart rate is exercise density. The nets against project of the game for a long time, a game about 30 min or even more than 2 h, but the relative movement heart rate is high. According to project characteristic, the strength of the training for above the average intensity, see below but for larger. Athletes to compete against the project in the game are no energy supply oxygen and aerobic alternating metabolism, large, medium, and small strength alternate activities. The average load rate is higher, in anaerobic threshold heart rate and anaerobic threshold heart rate above range, the density of the practice, measuring is higher.

43.3.2 The Athletes' Mental Factors Analysis Characteristics of the Winner

43.3.2.1 Emotional Stability

One-to-one combat game was a man of item-group directly adversarial program, in game on the athletes' mood of thinking sex, attention degree, perceptions, accurate performance, and the reaction that all have certain effect. High spirits, inspiring spirit, and height sense of responsibility, sense of honor, etc., can cause the force of positive emotions, the athletes thinking agility, attention focused, and perceptions clear, accurate, fast reaction; instead, excessive shock still, cold, anxiety, fear, and blind confidence negative emotions such as reducing force, can make the player thinking slow rigid, attention and lax, perceptions fuzzy, and slow response. On the other hand, feeling Arizona is aroused level which also affects the athlete's training effect and the full play of the game. Emotional awakening level, not only affects the degree of athletes physiological mobilization, also influence on athletes psychological mobilization energy. So one-on-one item-group athletes is than in combat before the game should be fully activating mental energy, in order to be able to match or exceed constant play normal water ping. Because in the course of a game, the athletes games against combat are between a process; therefore, the mood of the athletes is easy to be his opponent's play, the audience or drink the color, the referee gave effect etc. During the race it will be in advantage, athletes

and stalemate disadvantages three games state, and in the open competition for between the variables so many factors, the athletes are in advantage when trying to be a defense if the opponent strike score or errors by the referee era, will have a big impact to the mood, coke fear, tension and even fear are likely to emerge, direct influence on athletes mood stability and morale. According to the theory can explain for: when the cerebral cortex and the cortex central some part of the body by a strong need to dominate and highly excited, the cerebral cortex. Other parts produced negative induction due to restrain, thus in the emotional state, can make the person's reason degree and self control drop, increase the aggression, easy to cause the in strong or intense competitive game come bad behavior, also influence tactical thinking, decision and other reason activities, and for consciousness and action has certain influence on the accuracy makes the power to finalize the design cannot automatically representation of the smooth, so that the movement under the operation level drop. So the group of athletes should have stable emotional control, in the face of various situations should be easily face, as far as possible will own mood stability in a certain appropriate level, and right various negative effects using positive measures, which will be the negative influence will be to emotions. The minimum in the emotional force of the boycott reduction effect also should pay attention to the emotional force effect increased when Athletes in the competition show superb the level of skill and tactics, beautiful defensive back, from athletes itself to the coaches and the audience will have emotional fluctuations, generally produce is the force effect, when facing the situation at this time, the athlete must strike while the iron is hot, and more mobilize the positive emotions, boost morale to continue to pressure opponents at the same time, the more heavy. To live is to be able to stable mood in a certain range, if awaken to a high levels now blind, space, and too much exposure to attack by his opponents the opportunity to seize counterattack.

43.3.2.2 The Superior Specialization Motion Perception

Specialization motion perception, also called special perceptions, is through the movement of the formation of training highly differentiated motion perception, in special practice process, the brain into which to various analysis of various stimuli are fine is analyzed, and the formation of the brain cortex solid complex. The results of the neural connections are miscellaneous. On a one-to-one combat item-group, taekwondo luck mobilization of seeing, hearing, motion perception, and taekwondo techniques in training and competition plays an important role. The taekwondo spatial perception including an opponent with since the distance, the position has sense perception, rivals the body form characteristics and preliminary pose knowledge sleep. In taekwondo competition, the athlete often according to the information to determine their own. Similarly, in the group of several other items of specialization motion perception similar characteristics and taekwondo project, a player's vision, hearing, and motion perception in the group of technical training and competition plays an important role. Distance is and the central

nervous system of the flexibility, visual sense, and sharp. Technical skill and tactics are the use of related. In the course of a game and must be right keep your hands effective distance, this distance is beneficial not only to his offensive, and there are defense and counterattacks. Correctly measure the distance, to strike force small, attack the use of technology, and have a decisive role. The distance is too close, cannot make against the hit of the forces into full play, also easy to make opponents in flight; the distance is too far, is nothing or attack struck weakened. The correct distance, need long term. The training, in actual combat gradually improve. Light and flexible footwork are in optimal control when the distance of the external performance. Actual combat is always a constant movement process, and all kinds of feeling in the twinkling of an eye, only rely on the flexible footwork continued to move to adjust and opponents of the distance, make the footwork movement transform truly light, flexible, stable, and accurate it. During a game, both sides' players in the process of looking for attacking opportunities, the general situation next, maintained in action can hit directly outside the scope of the distance, two people at any time with to keep through footwork or false action, manufacturing or the opportunity to attack back. No matter into attack or fight back, premise condition is must close to each other, into action can attack in distance range. In distance range, most of the situation could be the basic technology training as usual thug's target, equipment maintenance, sandbags, and in the best position. Therefore, the group of luck mobilization should have good distance feeling, can according to various needs to adjust and tactics opponents of the distance, keep freely, over all function completed, to make tactical played dripping wet try to. One-to-one combat sports including the time feeling of technology of movement speed degrees, rhythm, and time interval between action and action order between rival, between attacks the time of the poor clearance correctly estimated. In the game, when the referee tip the athletes. To attack began; players must in some time to attack action, at this time on the athletes' mental pressure is very big. Especially, for the attack the dominant athletes, how to use a few seconds to rival hair up effective and do not let their offense caught counter attacking opportunity, this to the attack and defense mobilization is a sense of time grasp test. Opponents of the move, attack action speed and the order for the time needed for finishing and a correct judgment is the counter attack premise, athletes, can grasp the opportunity right back, it is the right opportunity found broken based. Defensive is the best time of each other attack action just to achieve maximum distance, also did not take back. The athlete completes a single attack technique of the action time is very short, and body moving time relatively long. Outstanding athletes often according to the body can often move, center of gravity of the position, and various signs and information prediction of action and other offensive make corresponding counter action, to ensure that holds the best counterattack time. In a complete game process, athletes cannot be in the whole game beginning always maintain a single form and psychology, the level of skill and tactics of the play, for example in the foot. The ball game, through to the opponent in the past lost the ball game time and the way the statistics learn analysis, can be concluded some regular such as lost the ball was asked section, losing the ball way and so on,

from with the time period when opponent in the special for they lost the ball and set millions of tactics. On a one-to-one combat item-group game, more is needed athletes play and watch face, when opponents of momentum, athletes should be enough have selectively used conservative formation, and the advantages of the opponent in resist and opportunists looking for opponents of the flaw, ready to counterattack. Therefore, time and time not only have the time is the composition of consciousness, and including the motor imagery and intuitive thinking composition, and in the game plays a very important role, athletes have to deal with time have certain master, is able to discern the situation in the game, a pointed in different by the time of the different tactics play style.

43.4 Conclusions

In physical stamina training item-group, training system plays a very important role, and in the development of the sport playing more and more important role. Fighting against the dominant sports quality is similar field, fight the required on speed, strength, and physical endurance; the nets against leading the sports quality are short displacement rate, take speed, flexibility, and fast take and fast moving durability; suddenly start, the actual action speed, various forms of displacement rate, the explosive force, the sensitivity, and endurance athletes to compete against is the dominant sport diathesis. Adversarial program of physical training method has the same, but in practice, according to combat, the nets, the characteristics of the compete against and load characteristics and the body function capacity characteristics, and show the specificity of the implementation of the training, for the development of specific against different needed for athletes' fitness level.

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Chapter 44
Study on Sport Industry of Traditional Chinese Sport Based on National Intangible Cultural Heritage

Jianjun Wang

Abstract Traditional Chinese sport conveys China's millenniums' culture, which can be taken as symbol of China's culture. Therefore, the application for the status of national intangible cultural heritage becomes unavoidable. No matter it will be successful or not, the process will boost its industry. This paper argued its push to traditional Chinese sport industry from the point of traveling, sporting goods, culture industry, and entertainment and relaxation.

Keywords Traditional Chinese sport · Application for the status of national intangible cultural heritage · Sport industry

44.1 Introduction

National traditional sport, which has survived more than 2,000 years, is the crystallization of both culture and wisdom of the whole Chinese nation. The successful application of the "dragon boat sacrifice" of South Korea for the status of world intangible cultural heritage has aroused the awareness of Chinese people in the protection of traditional culture [1]. As one of the forms of Chinese traditional culture, it is necessary to pay enough attention to the application of the traditional Chinese sport for the status of national intangible cultural heritage.

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44.2 Intangible Cultural Characteristics of the Application of Traditional Chinese Sport for the Status of National Intangible Cultural Heritage

As part of the traditional Chinese culture, national traditional sport is rich in Confucianism, carries on the traditional Chinese ideological and moral philosophies such as "the theory that man is an integral part of nature", "top priority is given to ethics", "moderate energy first" and "the benevolent loves others", and simultaneously integrates philosophical thoughts of "Yang cannot grow without Yin" and "a combination of inflexibility and yielding".

In 2003, "Convention for the Safeguarding of the Intangible Cultural Heritage" was drafted by the United Nations Educational Scientific and Cultural Organization (UNESCO). According to the definition in the convention, intangible cultural heritage refers to all kinds of practice, performance, expression form, knowledge and skills as well as relevant tools, material objects, handicrafts, and cultural sites that are regarded by all groups or sometimes individuals as cultural heritages. All kinds of groups and individuals, in accordance with their living environment, relationship with the nature, and changes of historical conditions, promote intangible cultural heritages that are passed down from generation to generation to be innovative, and also make themselves generate the senses of both recognition and history. Therefore, the diversity of culture and the creativity of human are promoted.

From the definition of intangible heritage, four elements of intangible heritage can be concluded as follows: (1) inheritance from generation to generation; (2) a close tie with the life of mass people; (3) the expression forms of culture; (4) providing a space for the survival of culture. In general, traditional Chinese sport was inherited through the way of oral imparting with physical instruction, so as to make its intangible cultural form passed down from generation to generation. However, the inheritance forms of traditional Chinese sport comprised inheritance through groups of people, inheritance through families or clans, and inheritance through society.

44.3 Contents and Process of the Application of Traditional Chinese Sport for the Status of National Intangible Cultural Heritage

As high importance is continuously attached by the state to the application of traditional Chinese culture for the status of national intangible cultural heritage day by day, traditional Chinese sport is also stepping into the period of a rapid development. In recent years [2], the highest attention has been paid by the

Government of China to the protection of intangible cultural heritages as well as related construction works. In 2006, the first list of national intangible cultural heritages was formally announced by the state, including 518 projects in total. In 2008, the second list of national intangible cultural heritages was announced by the state, including 510 projects, and the third list included 706 projects and also had been announced in public. In these three lists, more than 50 projects related to sport were re involved, such as the Mongolian wrestling and Korean springboard and swing in the first list and the Scrambling for a Sheep and Manchu pearl ball in the second list. All these sport items possessed the most distinctive Chinese ethnic characteristics. Also, it can be seen that the awareness of Chinese people in the protection of intangible cultural heritages is continuously improved, the enthusiasm of governments at all places on applying for the status of national intangible cultural heritage rises day by day, and traditional Chinese sport as part of intangible cultural heritages has been fully recognized since the protection of intangible cultural heritages has been actively and positively promoted by Chinese government.

44.4 Current Situation of Traditional Chinese Sport Industry

The progress of social civilization, the development of economy, and the continuous improvement of the quality of people's material and cultural life have promoted people to be liberated from the traditional life way of the past time and begin to seek a more fashionable and healthy life. Without any doubt, such a function is definitely available in traditional Chinese sport for modern Chinese people. In China, there are rich national traditional sport resources with diversified forms. In recent years, the influence of traditional Chinese sport has been expanded by relying on the application for the status of national intangible cultural heritage and great supports have been provided by Chinese government to it, and some excellent achievements have been achieved in its excavation, arrangement, and protection. However, it is still necessary to carry out further researches on the development and utilization of traditional Chinese sport in socialization and market. For this reason, traditional Chinese sport possesses a more advantageous position than the modern sport items in development [3]. At present, paying more attention to the industrial development of traditional Chinese sport will promote China's sport industry to attain rapid development and expansion, and also will change into a new growth point of the national economy.

44.5 Promotion Role of Application for the Status of National Intangible Cultural Heritage in the Development of Traditional Chinese Sport Industry

The application of traditional Chinese sport for the status of national intangible cultural heritage plays a positive promotion role in the inheritance of traditional Chinese culture; through the application for the status of national intangible cultural heritage, supports, and national legal protections have been provided by Chinese governments to traditional Chinese sport, and simultaneously the interest of people has been inspired [4]. The reasonable development and utilization of traditional Chinese sport resources, by taking application for the status of national intangible cultural heritage as an opportunity, can play an active and positive role not only in the development and inheritance of traditional Chinese sport, but also in the promotion of the development the traditional Chinese sport industry.

44.5.1 Promoting Sport Tourism

The application for the status of national intangible cultural heritage has not only aroused the awareness of Chinese people in the protection of the traditional Chinese sport culture, but also promotes the traditional sport culture with a long history and a variety of forms to the whole world. In the mean time, the combination of traditional Chinese sport and rich tourism resources will attract increasingly more domestic and foreign tourists to go to the areas where Chinese ethnic groups live with no doubts.

The unique cultural characteristics, profound cultural intensions, and multivariate functional values of traditional Chinese sport have become the important cultural resources for developing the sport tourism of different areas. For example, on the Third China's International Dragon Boat Rally in Three Gorges of Yichang, tourists of 492,200 person-times were received in total, and also the signed total amount of investment reached 1.8 billion RMB; on the international Shaolin Martial Art Festival of Henan, a considerable economic benefit had been achieved.

Areas where Chinese ethnic groups live own a great advantage in the development of sport tourism. In these areas, traditional Chinese sport and sport tourism can be combined together, and also natural environments enjoy exceptional advantages. Therefore, special tourism is relatively developed. If the hot tourism season comes [5], relevant traditional sport items will be provided at all scenic spots, so as to attract increasingly more tourists. Ultimately, economic income can be increased. Therefore, in the areas where Chinese ethnic groups live, combining traditional Chinese sport items with tourism and cultural industries and making them promoted and developed mutually will be an effective way for developing the economies.

Chinese people's great attention that is aroused by the application for the status of national intangible cultural heritage to their own traditional sport has changed into a main driving force to increase the economic revenue of sport tourism. Also, the interest of foreign visitors in traditional Chinese sport culture is greatly aroused by the application for the status of national intangible cultural heritage. In addition, the application for the status of national intangible cultural heritage has promoted government to provide more policy supports and economic investments to traditional Chinese sport. All these advantages will undoubtedly bring about the development and prosperity of the traditional Chinese sport industry.

44.5.2 Promoting the Development and Sales Development of Traditional Chinese Sport Products

In South Korea, the commercialized operation for the protection of intangible cultural heritage is energetically advocated by government; under the active and positive leadership and encouragement of its central government and local governments, businessmen actively participate in the development of the commodities of intangible cultural heritage, and therefore relevant advertisements can be seen everywhere.

The market of China's national sport products industry comprised equipment market, souvenir market, clothing market, and health products market, and so on. At present, the market of China's national sport products has reached a certain scale. However, there remains an unreasonable development of products as well as a single products structure. Therefore, through the application for the status of national intangible cultural heritage, the promotion of all traditional Chinese sport items as well as the popularization of cultures contained in them can be strengthened, and simultaneously the scope of consumer groups and the market demand on these products can be expanded. As a result, a market can be opened for the production and sales of these products.

44.5.3 Promoting the Traditional Chinese Sport Cultural Industry

The cultural factor of the traditional Chinese sport industry is one of the most important factors of the sports industry of Chinese ethnic groups, and its contribution rate can reach 36.9 % and is much far higher than other factors. This suggests that the culture of the traditional Chinese sport industry plays a crucial role in the entire traditional Chinese ethnic groups sport industry. Culture companies can become the effective examples for the industrialization of the culture of the traditional Chinese sport industry; a position is always given to the cultural

performances of traditional Chinese sport in each CCTV Spring Festival Gala of China; Chinese dragon dance and lion dance have been highly popular among people all over the world. Performance is the most direct and the most effective method for people to know well a thing. At the present stage, Chinese people have gotten a new understanding of traditional Chinese sport. Along with the continuous development of science and technology, time and space of knowing things can be reduced for people. Besides, modern science and technology can be applied by Chinese people, such as changing a traditional Chinese sport item into animation or online game in the new media age. This will be more helpful for the development and communication of traditional Chinese sport. Projects such as TV production, cartoon design, and software development can be provided for traditional Chinese sport. Further, it can be developed actually for the development of industrialization, so as to allow intangible cultural heritage to win the utilization to the maximum.

44.5.4 Promoting the Traditional Chinese Sport Leisure Industry

Along with the continuous improvement of people's living standard, more and more attention has been paid by people to their own physical and mental health, and therefore leisure and entertainment change into their primary choices in spare life. Traditional Chinese sport, along with the rising of such a demand, plays its role in culture and body building. Traditional Chinese shadow boxing is taken as an example here: it is a sport helping people building physical and mental qualities at the same time, and provides natural and smooth actions and movements that are live, coherent, ceaseless, and fascinating. Therefore, an effect of anti-aging and prolonging life can be achieved if it can be practiced by a person at a regular time. Up to now, traditional Chinese shadow boxing has already been accepted by people all over the world.

The road of the market development of traditional Chinese sport, oriented at leisure and entertainment, is not only in conformity with the consumption concept of consumer groups currently, but also in line with its own characteristics. Therefore, the shadows of traditional Chinese sport items have also appeared in the sport and fitness industry of modern cities. For example, traditional Chinese shadow boxing, health Qigong, rope skipping, and other traditional Chinese sport items have been introduced into the fitness clubs in the modern times. Among them, flying a kite and swinging have also attracted increasingly more leisure consumptions with a gradual step.

The application for the status of national intangible cultural heritage is a great opportunity for developing the leisure and fitness markets of traditional Chinese sport. Moreover, the application for the status of national intangible cultural heritage can promote salesmen to research and develop more products that can

combine traditional Chinese sport and fitness market together. Through the process of application for the status of national intangible cultural heritage, leisure and fitness products of traditional Chinese sport can be greatly popularized. Then, through the sales of products, the inheritance and communication of traditional Chinese sport can be enhanced.

44.6 Conclusion

From the above analysis, the application for the status of national intangible cultural heritage plays a positive role in the development and sales of the traditional Chinese sport products of sport tourism, the development of the traditional Chinese sport cultural industry, and the expansion of the leisure and fitness products, and also brings about many opportunities for the development of traditional Chinese sport and promotes the adjustment to the structure and management system of the traditional Chinese sport industry. Meanwhile, in the development of the traditional Chinese sport industry, the traditional Chinese sport culture attains a promotion, and its influence at home and abroad is enlarged, and therefore the progress of the application of traditional Chinese sport for the status of national intangible cultural heritage is boosted.

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Chapter 45
Study on College Basketball Teaching Based on Cooperative Learning Mode

Jian Yu and Wentong Liu

Abstract Cooperative learning teaching model is based on social interdependence theory, cognitive theory, and choice theory. Cooperative learning teaching mode is the relationship between the research and use of the students in the class, let the teachers and students and student–student cooperation as the basic strength, make a group activities as the main teaching form. According to our country's university basketball teaching research, the emphasis is on theoretical and experimental teaching of cooperative learning teaching mode; the teaching method further inquires that how to influence students' physical health and personal communication. This paper provides the theoretical basis and a new perspective into basketball teaching reform.

Keywords Cooperative learning · Teaching mode · Physical health · Basketball lessons

45.1 Introduction

International education committee of the twenty-first century (1996) in its report "education-Wealth contains" says that the UNESCO education should focus on the cultivation of four basic learning skills; namely learning, learning, learning know life together, learn, and they think that our education should be based on learning to live together. For expounded in this report, the cultivation of the students' ability to learn to live together [1] is very necessary to teach them study

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and life, this highly advocates cooperation status and can achieve the cooperative learning concept [6]. Obviously, the training of the students' co-operative ability has attracted widespread attention from both the public and the government.

It is a creative and effective teaching pattern, to form the good psychological quality and social skills. It is known as "one of the most important and the successful teaching reform"; cooperative learning is a kind of necessary reform to the traditional teaching method. Having a second view of the present situation of college students in China, it is to press the cooperative learning and improve their ability to cooperate.

45.2 Object and Methods

45.2.1 Object

The research object is second grade students in our university who have basketball class. Among them, the experimental class have 30 people, and control the class totally have 30 people.

45.2.2 Methods

45.2.2.1 Documental Data Method

According to the research content, seeking a large collection of related material, reading education, psychology and education psychology, sports psychology, statistics, and so on.

45.2.2.2 Survey Method

Adopting expert interview to prove subject's feasibility.

45.2.2.3 Teaching Experimental Method

Use of cooperative learning of experiment teaching mode; Use the traditional teaching mode control class.

According to the requirement of cooperative learning concept, the students are in the pupils into four groups. That is a base, each group members keep stable during the experiment, which provides students long term, committed relationship, let members support each other, help, encourage, and help. When the group of students, their psychological health, physical quality, and special technology into

consideration, so that they can learn from each other. Each group is by six or eight students. It is very important, for each member of a special function in the group: the tape recorder, the reporter, monitoring, the observer, the facilitator, and so on. Each member is assigned with different duties monthly and must perform their duties. At the same time, their role changed often, so that all the members have the opportunity to practice new role. Ensure that each member in doing his or her job, a list distributed to each group to be filled [2]. The students must bear their own responsibility. In addition, obviously, each team member will share the same score group inside, that is, team members have to help each other, because they "swim and sank in together". The anxiety scale is given at the beginning of the first semester of every student in two in the control group and the experimental group for a placement test, including three parts: physical quality, special technology, and personal communication. Test results are accurate, objective, so the researchers involved in the standard of two classes of the judge. No significant differences in the control of the classes.

The body quality testing, in the middle of the term referring to a basketball skills and collecting the data in class questionnaire survey in the last class, at the end of the semester. Overall 30 students attended the experiment class meeting in control class. Therefore, 60 students participated in the final assessment.

45.2.2.4 Psychological Measurement

Adopting "Texas Social Behavior Inventory (TSBI)" by Helmreich et al. to test personal communication and adopting "Teacher-Student Relationship Inventory" by Zhen Richang.

45.2.2.5 Statistical Method

All the data processed in SPSS13.0 software.

45.3 Results and Discussion

The Statistical Package for the Social Sciences (SPSS) 13.0 was run to work out the descriptive statistics of the physical quality, special technology, and the questionnaire on personal communication and teacher–student relationship involvement, including means [3] and standard deviations. Also, T-tests were conducted to find whether significant difference of classroom involvement existed between two classes.

45.3.1 The Comparison of Physical Quality, Special Technology Between Experimental Class and Control Class

After the experiment, there are no significant differences of the classes in the 50 m control, standing long jump and 1,000 m; but there are significant differences, the control class nod class's free throws (Table 45.1).

Exercise is the effects of the exercise intensity, the movement by time and frequency, gender, age, congenital genetic differences, and biological rhythms. In our university, there are 90 min weekly basketball class 18 weeks per semester, so students exercise frequency is obviously deficiency. Exercise load is limited 90 min per week in teaching unit, because of the diversity of teaching resources, teaching content, and the task and the student's actual sports ability. The students' physical 50 m [4], standing long jump, 1,000 m, and three quality developments need longer unremitting training, so there is no obvious difference and the test group control in the 50 m, standing long jump and 1,000 m 18 week basketball after class.

Cooperative learning theory improves the learning interest of the students, strengthening the learn basketball practice class. So there are significant differences, the control class nods class's free throws. It is worth noting that let students understand basketball theory and all kinds of practice ability, especially for general research process.

45.3.2 The Comparison of Personal Communication Between Experimental Class and Control Class

After the experiment, there is a significant difference between the control and test group in social contacts.

Cooperative learning teaching mode is the training of the students' personal communications technology. Its advantages are constructing the harmonious classroom learning environment. Basketball is a team game. It takes five people cooperation with each other. So personal communication is developed

Table 45.1 The comparison of physical quality, special technology between experimental class and control class after the experiment

	Experimental class ($N = 30$)	Control class ($N = 30$)	T
50 m (s)	$7'45 = 0 \pm 0.35$	$7'52 \pm 0.33$	0.055
Standing long jump (m)	2.45 ± 0.14	2.44 ± 0.26	0.282
1,000 m (min/s)	$3'\ 56'' \pm 16''$	$3'\ 54'' \pm 16''$	0.842
Fixed-point free throw	5.91 ± 2.57	5.01 ± 2.55	2.518*

*Significant different from control, $P < 0.05$
**Significant different from control, $P < 0.01$

environment. Students' autonomous learning experience and the interaction between team members, it is easy to learn and improve the teaching effect. The students to become close cooperation partners, learning and the enthusiasm of students' study fully aroused [5]. It is suitable for the development of classroom teaching. Cooperative learning teaching mode is different from the traditional teaching method and personal teaching class mode; it can train and develop most student's having quality of social, cooperation, altruism, realizing the social community, and so on. To work together to make the students in the process of mutual benefit in pursuit of activities. At the same time, self-control is in the breeding process improvement (Table 45.2).

45.3.3 The Comparison of the Teacher–Student Relationship Between Experimental Class and Control Class

From the Table 45.3, we can know the extent of the total mess up the relationship between teachers and students in the medium of all classes and control both in class. There was no significant difference between classes and control class Z inspection.

Inventory consists of the relationship between teachers and students in three aspects: trouble degree between the teachers and students in the process of teaching, disaster degree between teachers and students emotional distance, the trouble degree between the teachers and students relations, and the identity of the higher scores in serious trouble degree. These three aspects to the test were shown in (Table 45.4).

From the statistics, we can know that no significant differences in trouble degree between the teachers and students in the process of teaching control between the experimental classes after class, but there are significant differences between the teachers and students trouble degree of emotional distance, suffering degree between the teachers, and students relations in the position.

In cooperation activities, students can be defined as all the members in student community, those in a teacher and student group. In such a relationship, the teacher must put you as a separate group [6]. And students utilize the opportunity to appreciate to share time with teachers to become "partners" in their learning and not only guide it. They think that they are to be specific attention to their achievements, need to be recognized and attention, respectively. Teachers shall undertake joint liability peers. Shared responsibility to promote students' concept, the purpose of assessment is to inform the learning process, and not distinguish

Table 45.2 The comparison of social contacts between experimental and control class after the experiment

	Experimental class ($N = 30$)	Control class($N = 30$)	T
Social contacts	41.5 ± 8.65	37.5 ± 4.69	2.58*

Table 45.3 The comparison of the teacher–student relationship between experimental class and control class after the experiment

	Experimental class			Control class			Z
	N	$\bar{X}$	s	N	$\bar{X}$	s	
Total score	28	−0.43	3.49	25	0.53	3.91	0.97
Troubled degree of teacher–student relationship	Medium	Medium					

Table 45.4 The three comparisons of the teacher–student relationship between experimental class and control class after the experiment

	Experimental class $\bar{x}$	Control class $\bar{x}$	U
Trouble degree between teachers and students in the process of teaching	0.45	−0.33	0.21
Trouble degree between teachers and students in emotional distance	1.7	2.95	2.07*
Trouble degree between teachers and students in status relationship	−1.46	3.01	2.93*

U: Two samples of rank and inspection comparison

between those who can and those who have no opportunity. The teacher is a warm and enthusiastic student, close to as many of the students and have no pressure.

In cooperation activities, the teacher is a teacher and organizer, consultant, help, and prompter prompt. In cooperation activities, teachers will no longer dominant class, control, and guide the student to every minute. And the teacher's behavior by the behavior of the students, in turn affected the behavior of students.

45.4 Conclusion

First, There is no significant differences between the physical quality of cooperative learning teaching mode and "traditional" teaching mode. Second, cooperative learning teaching model can help improve interest in learning basketball techniques . Third, cooperative learning teaching mode, give full play to students' personal communications technology, helps the relationship between teachers and students.

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Chapter 46
Study on Badminton Smash for Training Based on Sensor

Jian Yu and Guojin Zhao

Abstract In this paper, the local sensory system has been developed in a badminton racquet. Data were collected from independent accelerometer and earthquake sensor, installed in badminton racquet. And the accelerometer and acoustic sensor, and the combination of value-added information costs can be crushing analysis, by providing the important material of shattered performance. The ANFIS is used in the fusion of acoustic emission and acceleration information to calculate the shuttle produce the ball speed, the main performance can get a fairly accurate results. However, if the training data quantity is limited, data cannot cover the scope with the sample input data, it will lead to wrong estimated output. Therefore, it is the need to get enough large amounts of data for training system, prevents data range of problems, and has obtained the good accuracy.

Keywords Badminton smash · Training · Sensor

46.1 Introduction

In a badminton match, the most common stroke is the victory over smash, it is also the most powerful attack shooting. Its effective use is the most important, a player is competitive. However, compared with other sports, such as tennis [1, 2], golf [3, 4] and baseball, [5, 6] badminton stroke received a relatively small scientific attention [7]. An understandable badminton, significant value will help break the badminton coaches trained badminton players. In addition, the application has

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several similar applications and the method of the development is expected to this work will be directly apply to other applications.

In the published literature, most of the relevant investigation is computer imaging technology through the use of high speed camera [5, 6]. However, there are some shortcomings of these techniques, such as lack of quantitative information 2 d measuring the racket speed, significant effort required to manual for each screen frame, difficult to obtain the speed of the racket of graphic information.

46.2 Similar Works

In the literature, there are many related work analysis in all kinds of strokes and hit a ball and bat racket games foundation. Jaitner and Gawin [8] analysis in the badminton crushing use accelerometer. Three 2D micro accelerometer (Biovision) used in the investigation accelerometric and kinematics of data for badminton impact is collecting. Spearman rank correlation analysis method of the calculation speed and racket correlation ball acceleration. According to the report, about 80 % of the variance of the ball speed can be explained by the racket of acceleration. However, in the work, the accelerometer is only used to predict the shuttle's ball speed.

Ahmadi et al. [9] research and the movement of the rotating speed of the swing with acceleration plan for the athlete skill evaluation. The work of CAI [10] analysis methods of muscle table electric chart (EMG) activities provide quantitative information model of master and use swinging badminton racquet. This as evidence of how much power the player needs to perform powerful shattered. Arm movements of biomechanics analysis work and Ahmadi a-ming et al. [9] analysis of knee, foot and wrist movements provide good information, the expectations of the legs, knee, arm, and wrist movement necessary to perform a strong wave racket of shattered [11].

46.3 Project Motivations

Works [3, 9, 10] present in the previous section to contribute and analyze the different parts of the body of a player for the badminton hit. These used to help athletes and other similar player's sports of monitoring and improve their skills. However, these studies are only emphasizing physical activity in people performing a variety of different sports. Little attention has been focused on remote sensing movement of the racket. This is time consuming and expensive occupation racket games using camera [1–6], and is difficult to measure the actual speed of the racket involved complex algorithms and analysis method [8]. Works of the racquet speed analysis provide good information needed a powerful racket for the shuttle

ball speed. However, they only use accelerometer serve velocity and the onboard the ball, lack of information, do not know the shuttle was hit the ball, this time the racket hit the shuttlecock.

The purpose of the current work is to fill the "information gap" with acceleration sensor related alone. The fusion of accelerometer, acoustic shock sensor data also has several industrial applications which would benefit from the development of the method.

46.4 Design of Local Sensor System

In choosing different acceleration, different ranges of accelerometer 6, 18, 30, and 50 g are tested. The installation of the accelerometer is on the string of the part of the racket. A maximum of g (gravity acceleration) won about 15 g. In order to get the best search performance, puts forward two-axis accelerometer (18 g acceleration, ADXL321) installed in base take head, with sports adjacent to the racquet head. An acoustic sensors (BRT1615P-06) installed in the racket head feels hit the shuttle's voice ball, adjacent to the racquet head. Figure 46.1 shows the accelerometer and acoustic sensors racket installed at the base of the racquet head.

46.5 Experimental Methodologies

The data from the sensor system were collected using a National Instruments NI 9201 and NI 9233 data acquisition modules. The frequency requirements for the ADXL321 accelerometer and the BRT1615P-06 acoustic sensor are both 5 kHz. NI 9201 and NI 9233 met the requirements. The signals were acquired at 10 kHz. The following experiments designed to test the signals from the accelerometer and

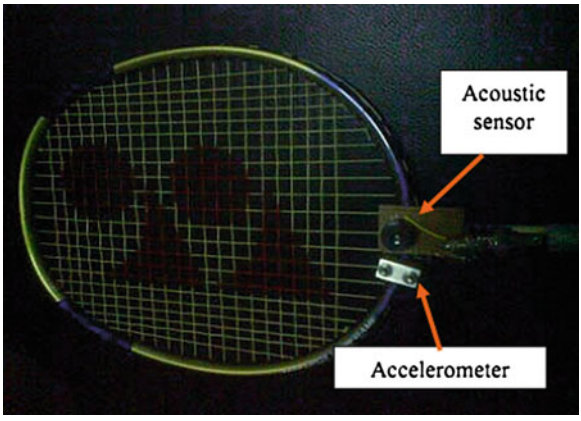

Fig. 46.1 Accelerometer and acoustic sensor mounted at base of racket head

acoustic shock sensor when swinging the racket, as well as when smashing the shuttlecock. The individual experiments are outlined below:

Exp. 1 Overhead swing movement of the racket was simulated to test the accelerometer and acoustic sensor response to the swinging action.

Exp. 2 Characterize the acoustic shock sensor when subject to surrounding sound, not produced from the racket. Done by striking two metal forks together 1 cm to the acoustic sensor to produce a loud noise.

Exp. 3 Characterize the acoustic shock sensor by striking a shuttle ball at various points on the racket strings. The racket was mounted horizontally; with shuttle ball allowed to fall freely onto the racket strings.

Exp. 4 Characterize the response of the acoustic shock sensor by striking a shuttle ball on the racket frame.

46.6 Results

To facilitate the study of each experiment, acceleration, root mean square (RMS) [12], and crest factor CF [12] was calculated as defined by the following equations:

$$\text{Acceleration} = \text{gx} \times 9.81\left(\text{m/s}^2\right) \tag{46.1}$$

$$\text{RMS} = \sqrt{\frac{\sum_{i=1}^{N} X_i^2}{N}} \tag{46.2}$$

$$\text{CF} = \text{Peak AE}/\text{RMS} \tag{46.3}$$

Where, g is the gravitational acceleration from accelerometer. X is the time series vector of the acoustic emission (AE) from the acoustic shock sensor, and $i = 1, \cdots, N$. N is the number of sample. Peak AE is the peak AE amplitude.

Exp. 1 Simulated swing movement of the racket.

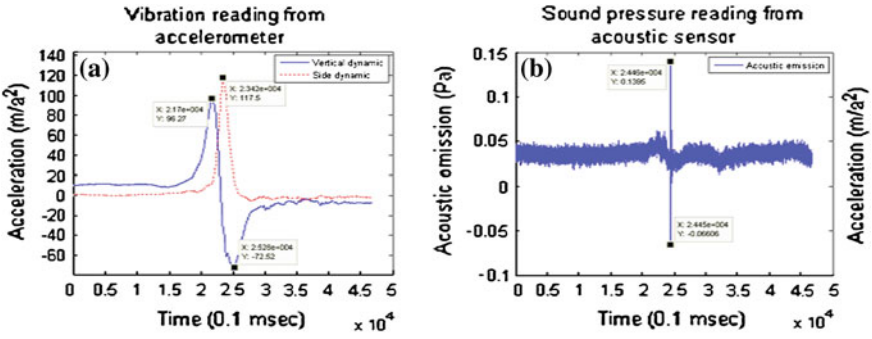

Fig. 46.2 Acceleration and AE responses during overhead swing. **a** Acceleration (forward and sideward dynamics), and **b** AE signal

Figure 46.2a shows the acceleration during the overhead swing of the racket, and Fig. 46.2b shows the AE signal obtained during the same stroke. The forward movement has peak acceleration of 96.34 m/s^2. The sideward acceleration is 117.5 m/s^2, which means the racket swinging sideway. There is a peak AE burst 0.14 Pa at the end of the swing. This was due to surrounding sound. RMS of the waveform was 0.04, and crest factor is 3.5.

Exp. 2 Metal fork striking noise acoustic shock sensor.

Figure 46.3 shows the acoustic waveform representing the noise created near the acoustic sensor. The waveform has peak AE amplitude of 1.1 Pa. RMS was 0.028, and crest factor was 4.64.

Exp. 3 Shuttle ball striking strings from a fix height.

Figure 46.4 shows the AE waveform for shuttle ball hitting string at the center of the racket head from a fix height of 1.65 m. It can be seen that the waveform diminished smoothly from peak value. The peak amplitude of AE burst was 0.93 Pa. RMS was 0.167, and crest factor was 5.58.

Exp. 4 Shuttle ball striking frame from a fix height.

Figure 46.5 shows the AE waveform for shuttle ball hitting the frame from the fix height of 1.65 m. The waveform diminished rapidly from the peak, and then a second rise of waveform which diminished slowly. The peak amplitude of AE burst was 10 Pa. RMS was 1.2, and crest factor was 8.4.

Exp. 5 Smashing a shuttlecock.

These final tests were to capture the racket's acceleration and AE signal, when smashing a shuttle ball. Figure 46.6 shows the acceleration and AE signal for the shuttle ball hitting the string of the racket. The racket hit the shuttle ball when the acceleration signal was −56.2 m/s^2 (deceleration), with the sideward acceleration at the peak.

The AE burst happened, at the same time, the shuttle ball was hit, with the peak amplitude of 85.2 Pa. RMS was 22, and the crest factor was 3.6. Figure 46.6c shows the closed up view of the waveform, which shows that the waveform diminished smoothly from peak, but forming five small waveforms. This could be because of the strong hit which caused the residue vibration to built further AE waveforms.

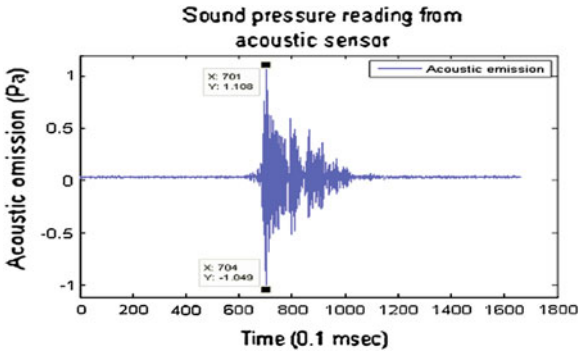

Fig. 46.3 AE waveform in response to shuttle ball hitting the ground

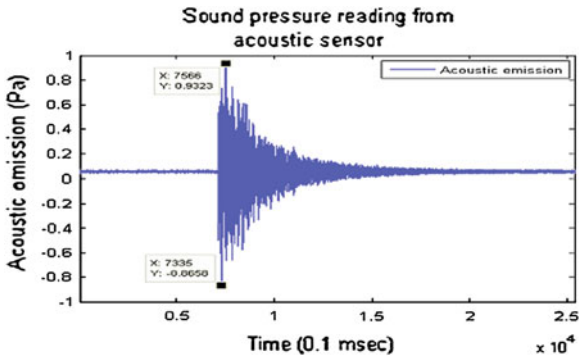

Fig. 46.4 AE waveform for shuttle ball striking the racket strings

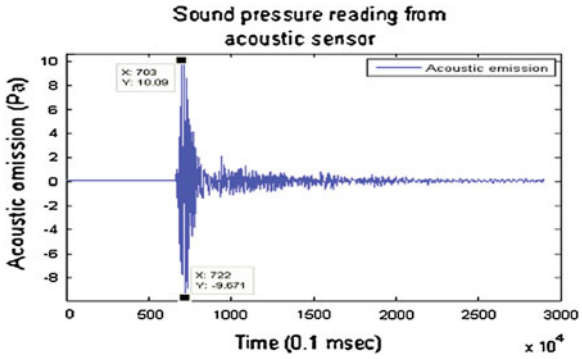

Fig. 46.5 AE waveform for shuttle ball striking the racket frame

Figure 46.7 shows the acceleration and AE signal for the shuttle ball hitting the frame of the racket. The racket hits the shuttle ball when the acceleration was -29.48 m/s^2. The AE burst happened, at the same time, the shuttle ball was hit, with the peak amplitude of 70.45 Pa. RMS was 10.5655, and crest factor was

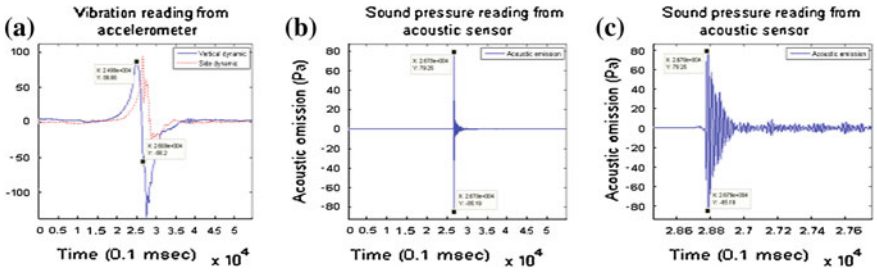

Fig. 46.6 Acceleration and AE for shuttle ball smashing on string. **a** Acceleration, **b** AE waveform, and **c** Closed up view of the AE waveform

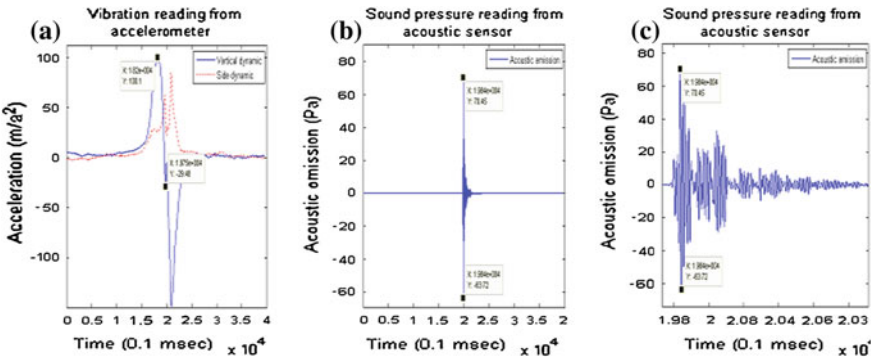

Fig. 46.7 Acceleration and AE for shuttle ball smashing the frame. **a** Acceleration, **b** AE waveform, and **c** Closed up view of the AE waveform

6.6681. Figure 46.7c shows the closed up view of the waveform, showing that the waveform diminished rapidly from the peak, but forming two big and several small waveforms.

46.7 Conclusions

The current work can be a useful contribution to the future design type of badminton rackets, can provide quantitative data and the data were shattered performance. Knowledge and estimated speed, it is possible for trained athletes to prove them crushing technology based on estimates that shuttle the ball speed. Combined with the peak amplitude, the top factor, AE racket type speed and speed, can become parameters adjustment ability.

By understanding the impact shattered by the dynamic movement and acoustic emission signal, can bring up a quantitative feedback data collected on facial muscles electric chart table (EMG) activity patterns [13] and the biomechanics of wrist, arm, knee, and leg movements [14, 15]. The three types of information combination can be a good contribution and sports training racket.

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Chapter 47
Study on College Sport Teaching Based on Modern Sports Training Theory

Guojin Zhao and Jian Yu

Abstract This paper expounds that the basic physical theory from the players, the movement techniques, and the quality of physical address is in the status of molecular kinetic theory. In the discussion of the function of material and technical theory and practice, the motion is there. Therefore, in the modern sports training practice is given a set of basic theory.

Keywords Sport teaching · Training · Sports theory

47.1 Introduction

The real game and training of training practice theory began to establish new China after. Although late start, it obtained a rapid development. It is divided into two stages of development, in six [1–3]. The first period of development is the "theory of absorbing and development training period" (1953–1981). This development is divided into training theory absorption stage (1953–1957), the initial formation and development stage (1958–1962), stagnation (1962–1975, during the "cultural revolution"), rehabilitation, and development stage (1976–1980), this is the second development period for "preliminary form sports training period (1981 to today)." From 1953 to 1960, the study of the training is around the special training theory; the theory and methods began in 1961, and published in sports textbooks for every sport in careful training problems. It can reflect concentration in the introduction, learning theory, and the former Soviet republics of the results of the train

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practice [4]. Then, in 1961, held in Moscow, "a socialist country training seminar" revelation began the practice of different projects to develop high quality thought in common problem. It began to explore the training process, load arrangement, the training method and general legal problems. Do not cover (1963) method in elite athletes years of training, step Run-sheng (1964) in endurance events long distance running, swimming beach notice sports load and performance, and MAO zedong peng (1964) "physical wave" of the legal literature [5]. Training management research plan, "great training" experience, and training our athletes summarized experience are put forward, based on the "two-strict" policy and "three" training principle [6]. Older scholars and organizers of training the exploration are a kind of strong spirit power, raise the level of competitive sports, and open a senior training study of the theory of the curtain.

47.2 Physical Fitness and Its Components

Players of the basic means players body sports ability is one of the important component. Player's level road of development is by its body shape and physical function and the sports ability development of determination. Form the shape of the in vitro. The body function of the system of human organs. The body of the sports is quality performance in all kinds of basic physical activity, often including strength, endurance and speed, flexibility and sensitivity, and so on.

This is the body form, function, quality of the three factors, have their own independent of character, but it also has the close relation, linked to each other constraints and influence each other, each layer of a factors can affect the overall level of health. In the three components, the quality is the sports of the external performance, so many sports training development of sports training should have the basic quality of the content of the body (Fig. 47.1).

47.3 Sports Technology and Its Composition

The sports action in sports science and technology to complete the method is the competitive ability level of the deciding factor. Their participation in the role of different sports, need to learn and master the different technologies. The reasonable

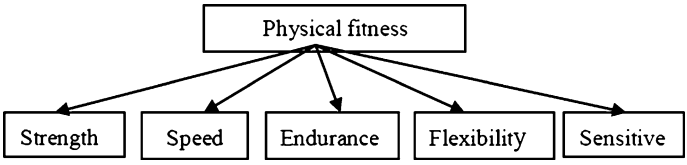

Fig. 47.1 Physical (physical) space structure

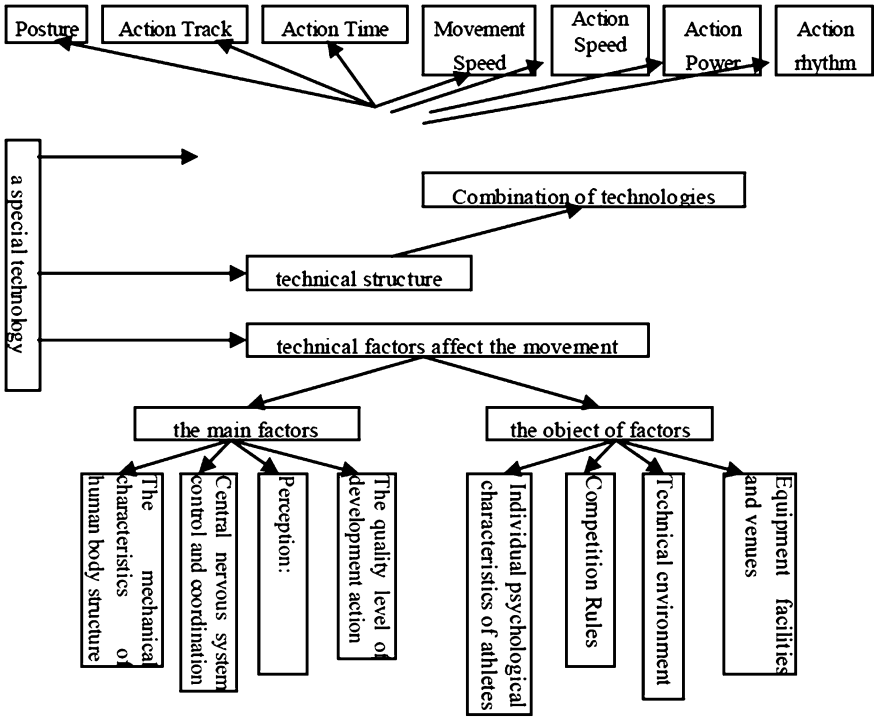

Fig. 47.2 Spatial structure of the action technology

and proper motion technology meet the requirements of project activities rules. An athletes' physical and mental ability is to help athletes achieve better sports results. All kinds of action are in all kinds of sports [7], have found that the human body movement mechanics principle of the standards and technology and technical requirements specifications; but each player must also be based on individual physiological characteristics of personal choice and the particularity of the sports technology in order to understand more effective participation in sports (Fig. 47.2).

47.4 Physical Importance of the Project in Motion

The term training theory system of classification of the key factors in the press, the power level sports training characteristics classification and the most feasible a classification. As: "the competitive ability is the participating athletes training and skills competition." The competition is of a different roles and different forms of physical skills, and mental ability and intelligence of the movement of the overall performance[8]. "The process of game, and it has a special physical, technology, heart, intelligence four sports ability, can be divided into form, function, quality,

coordination, technical and tactical, psychological, knowledge, and the eight democratic parties. While exercise performance by eight aspects of comprehensive, but sports performance of the size of the role of the basis is different for the sports, there is no significant difference. This is the core competition ability theory factors dominant group by sports theory basis classification. For a long time the wheat, sports fitness class athletes in a reasonable proficiency based on the technology of action, this is mainly rely on the continuous development of physical health level more power, faster speed and more endurance sports ability to improve."

Therefore, the sports fitness class athletes' ability and the advantage of the core components, committed to the development of sports fitness class athletes training program, are the common characteristics [9]. Although shape, function, and quality of the importance of different special decision is based on the characteristics of different body healthy athletes, but the physical structure of the model, from the form, function, and quality three administrative levels. Only in this way, the establishment of physical model conforms to the competitiveness of the theory in order to effectively reduce business risk. Physical skill level athletes' ability of the component is a minor role, this is relatively speaking, in addition to other competition (such as chess, Bridges, etc.), also is not a sports do not need physical strength, but it is the necessary degree. Physical exercise can see the important position of the project.

47.5 Quality of the Result in "Physical" and "Technology"

"Physical theory" is the theory of the core training and athletic performance. When the body health is a two "element factors", is the traditional sports training theory: the result is physical exercise (physical) and two foreign professional technology factors constitute the only comprehensive development sports, it lays the quality as the foundation for professional technical training, the former is the foundation, and this can only be based on the development in the former. The only method can improve sports results. According to the common sense for, as long as the body (health), there is no special technical problem, sports there is no problem.

To a great extent, the quality of the angle of the development track and field from the whole physical and other sports as well as physical health (physical), the understanding of the relationship between the mistake and track and field sports in all the basis of the movement. It has artificial down into complex physical quality of some of the easy part. For example, material (health) is endurance and speed, strength of children, agility, flexibility, and other qualities: endurance quality, decomposing speed endurance, and strength endurance. The idea has been subdivided according to all these works together to build the physical part. If a specific function of a campaign, the body can read some simple ground quality decided. The decomposition results make people instinctively think, sport is all of the movement of the physical basis in track and field sports, the basic concept of the formation, so it is also more training development quality of exercise all kinds of sports of the basic content [10].

47.5.1 Speed Quality

Quality is the movement of the human ability, including the ability to move quickly and body to external stimuli and rapid response ability and the ability to quickly move. In sports, to obtain, the speed is most important, it can be said that the movement of speed and soul. Visible speed quality should be based on speed, but the reality is that in track and field. The speed of the game in the requirement of process quality campaign is not the same, for example, the reaction rate is in short-term project, and the requirements of the game more and more are also increasing distance requirements. In the track and field events, low speed, high displacement rate. In different projects, the requirement is different, even in the same focus, sport but also have each different, such as the 1980s games in Moscow (100 m), gold (English) and Alan. Wales (10.25 s) starting velocity is 0.193 s, and the eighth (legal) began to 0.130 s, if we work hard began to speed training, he is certainly not help to improve sports results.

In other sports, the quality requirements are not the same speed; for example, the reaction rate in track and field response of hearing is the signal. Table tennis is visual signal technology and tactical response; in swimming, speed through the water flooding buoyancy, riding a bicycle is a kind of common people and cars displacement rate, and so on. Another example is run in basketball is the speed of the ball, but it is also the speed to the process of the ball. It has shown greater difference in speed and starting velocity, takes off the speed, turn body and shooting speed, and so on.

47.5.2 Endurance

Endurance is the ability to biology to long time movement. Many of the projects have a long time of sports or for a long time, the whole process of competitive athletes in particular sport intensity and the quality of the movement. We must have a good stamina and endurance project. Endurance of the development level of specific competitive level athletes plays a very important role. The reality is it?

For example, women's marathon race (2003), British play sporting success is 2 h 15 min, 25 s. Chinese players in the sun yingjie 19 min run 2 h 39 s; action is based on two athlete's point of view. "The endurance" is a famous exception, not the third person in time more than they, however, two kilometers in the Athens Olympic Games, more important is, Radcliffe after the process, and even more, it is ultimately not hold, left the runway, out of the race, the sun ying jie, fortunately, and the final success of the first six. If they both are running in the Athens Olympic Games, is a marathon, whatever the outcome, you will have to say in the past, but the problem is hard to explain to participate in the 10,000 meters race, so the results of unexpected are, especially for Radke. It is much less than the two individuals (endurance) Xing Huina, but it is very surprise, visit m gold medal.

Xing Huina is further research training, you can find a lot of successful experience, but "stamina" is concerned, in contrast, the two "lack of endurance" more apparent. We can see in the pure endurance, "stamina" and not the real basis of it.

In other sports, the quality requirements are not the same speed; for example, the reaction rate in track and field response of auditory signals and in the table tennis is visual signal technology and tactical response; M swimming speed through the water flooding buoyancy, riding a bicycle is a kind of common people and cars displacement rate, and so on. Another example is running in basketball, no ball speed, and the running speed of the ball, in this process they display a large difference in the speed and starting velocity, takes off, the rotation speed body, shoot speed, and so on.

47.5.3 Strength

Power is to point the human nervous system, can be in work and resistance or service ability. Track and field discus, shot put, javelin, hammer and other projects, mostly in power quality based motion, in fact, it exists in the process, but that does not explain the problem.

For example, the 1960 Olympic champion Ludeng bay, the weight of the bench press 155 kg, hammer score is 68.5 m; the 1972 Olympic champion Bondarchuk, down the weight of the push 120 kg, hammer score is 77.42 m; 1976 and the 1980 Olympic champion Dihe x, down push 90 kg, hammer score of 86.66 m, set in the former Soviet union, five projects for the hammer (bench press, snatch, clean jerk, dead lift, and squatting) strength training tools, each a bench strength down about 30 kg, but hammer results increase of nearly 10 m, the results "power quality" level higher scores below the hammer. The power quality only we can see is not its true but the basis of the movement (though we use some of the limitations of cases, but it can at least make it clear in throwing project. Power quality does not play a decisive role, but it is not based on movement).

The practice training, so some phenomena still have a lot of, for example, weightlifting athletes who cannot cross link of a marathon runner, also appeared in the 100 m after detection of the deceleration phenomenon. Its participation in speed and sprint is not necessarily linked gymnasts run-up position is difficult to improve, etc.

From the above example and phenomenon, we can see, sports, fitness (physical); in the special technology and the nonlinear relationship it is difficult to explain the $1 + 1 = 2$. Health (physical) as the foundation of the movement a "personality", rather than "normal", each sport has different health and the same movement, but also it is the development of the sports fitness athletes and its special personality technical characteristics. In some cases, excessive development of a certain or quality requirement on something or quality excellent combination of physical effects and opposes motion of the special technology to play. For example, weight lifter to a certain level of weight is to train and qualified this muscle, we must limit the development of certain muscles. The same training efficiency and the

increase of mutual may be contradictory, analysis of the specific training is to specific relationship.

"Quality" cause physical (physical) based motion is from a single factor of the linear relationship. Time is reflected in the frame. For example, a comprehensive physical exercise and special training is the entire contents of the training period, and on the basis of overall fitness training, and then the transition to the special training, the former is common in all sports (health). Sports personality (special technology) is physical quality and special separation technology, the quality and relevance of technology and unity. Training seems to be "normal" thing, based motion, and it is hard to find patterns of training, physical exercise ability can ignore the whole to the individual nature of the special technology.

47.6 Summaries

In this paper, the healthy body, quality, technical training in the behavior of the basic meaning of the modern movement began to explain theory with the existence of the difference of the three, and how they influence on the motion guide and practice.

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Chapter 48
SEM Model of the Tai Chi Course Based on the Tai Chi Course Sports Education Pattern

Wankai Fu

Abstract For a long time, Tai Chi education courses are based on the traditional model of education. Traditional educational model has many limitations for the current Tai Chi education, especially for Tai Chi as a special Chinese traditional item. Siedentop's "Sport Education Model" was emphasized for a long time and has been successfully applied in Australia and New Zealand. This paper discusses Siedentop's "Sport Education Model" Theory, combined with the present teaching problems during the process of Tai Chi and constructed a Tai Chi Sport Education Curriculum Model.

Keywords Tai Chi · Sport education · Curriculum model

48.1 Tai Chi Sport

Tai Chi sport has a long history in China; Tai Chi is a great success of Chinese martial arts, and attaches high importance to the balance of Yin and Yang and the consistency between mental and physical states. The ideas have been penetrated in the theory and methods of playing of Tai Chi, thus making Tai Chi change into a sport keeping health, preventing illnesses, and prolonging life [1]. Qiu [2] pointed out that Tai Chi constantly educates the tolerant and modest attitudes of human and creates the moderation idea preserved by Chinese people through the movement way of having a rest in mediation and seeking statics from dynamics, the soft and gentle sport style, the sports ideas of following others but forgetting

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themselves, bending or stretching naturally, and sticking to a consistency, the competition concepts of synchronous introducing and falling and keeping constant equilibrium. Wang [3] proposed that exercising Tai Chi can help train the virtues of the exercisers such as fairness, honesty, and making a clear distinction between good and evil, as well as the mental qualities such as being able to bow and rise at will, and keeping free from arrogance and impetuosity, and irritableness and anger. Tai Chi is a safe exercise way, which can promote the health of human body. By relying on the unique movement characteristics, Tai Chi makes the consistency between mental and physical states of exerciser achieved. Wang [4], through the literature material research and other methods, analyzed the studies on the physiological medical effect of Tai Chi on all systems of human being, and thought that Tai Chi exercises could promote the functions of the nervous system and the endocrine system and also improve the functions of the cardiovascular system, the immune system, the respiratory system and the movement system; Tai Chi makes the fitness and health care effects on human body achieved through a comprehensive role in all systems of human.

From the above, it can be known that Tai Chi plays an important role in developing human intelligence and improving to improve human physical quality, etc. In recent years, because the exercises of Tai Chi are not restricted by fields and time, the number of persons taking part in it tends to increase, and also Tai Chi courses have been offered in Chinese general colleges and universities. However, a good result is not achieved in the teaching of Tai Chi course. For a long time, the traditional physical educational model is applied in the teaching of Tai Chi course. The traditional physical educational model has some limitations compared with Tai Chi as a special Chinese traditional item.

48.2 Problems in the Teaching of Tai Chi Course

Tai Chi exercise is a self-training way through the role of will to make mental and physical states optimized. In essence, exercising Tai Chi is to exercise "will". In Chinese philosophy, the "Qi" of Tai Chi generally refers to the most basic substance composing all things in the world. In Tai Chi, the control of breathing is used as the foundation of human body's metabolism and is the key in the Tai Chi training. As for students, the purpose of exercising it is only for coping with examination and pursuing how to make actions standard, beautiful, and stable, in which the characteristics of the will and breathing cooperation of Tai Chi are abandoned. Just because of the absence in the intensions of the Tai Chi, not only Tai Chi is turned to be the boring "Tai Chi gymnastics", but also the interest of the students in learning Tai Chi is reduced. Wang [5] proposed that there were 81 % of the students feeling interested before learning Tai Chi, but the percentage of the students feeling interested after learning Tai Chi was reduced to 43 %; 77 % of the students thought that it was necessary for teacher to give an explanation to the intensions of the defense and attacking actions, but actually teacher seldom

provided such an explanation in teaching, which might exist but was very rough. At the end of the teaching of the course, the percentage of the students who still keep on practicing Tai Chi was only 9.5 % in the total investigation objects. Zhao et al. [6] made an investigation on 3,000 students and found that most students just learnt all actions of Tai Chi, but did not know the characteristics of the internal and external exercises of Tai Chi at all, and only could give a show at best; after the end of exam, the learning will be "returned" to teacher completely; a small number of students even could not learn a simple set of Tai Chi actions in a semester, and this was really embarrassed.

48.3 Theoretical Intension of SEM

48.3.1 What is SEM?

Sport Education curriculum and instruction model (SEM) is one of the famous seven teaching models in the United States of America. It was officially proposed by famous American scholar Darly Siedentop in the early 1980s. The SEM concept was originated from game education. Siedentop thought that the educational value of sports was the interpretation on the concept of game. The premises for game education to be sublimated to SEM are basic assumptions: (1) the so-called sport can be accurately understood as a kind of game; (2) the more mature the society, the more people involved in game, and mature sports culture. Siedentop also thought that games could attract participants through a powerful and complete way, and could not only attract students to actively join and also encourage them to be sports fans whose whole life had games [7]. At present, SEM has been widely applied in Australia, New Zealand, and Taiwan; in the local studies of China, the good teaching effect of SEM has been also proved. Therefore, the introduction of SEM can provide a new idea for the teaching of Tai Chi beyond doubts.

48.3.2 Purpose and Characteristics of SEM

Siedentop thought that SEM had three purposes for promoting students to become sport exercisers with ability, cultural quality, and enthusiasm: (1) possessing skilled technique and tactics and understanding the rules of competitions; (2) knowing well all aspects of knowledge about sports and having the ability to understand and evaluate sports rules, ceremonies, and traditions; (3) passionate on participating in sports, and becoming the activists in sports and also expecting to take part in regional, national, and international sports. The focus of SEM lies in the faith of people on the authenticity of sport items; there are six basic characteristics to make sport items authentic: (1) the seasons for sports games; (2) players

are the members of the team and are necessary to stay in a team for a complete season; (3) game season is specified based on a regular game; (4) each season has an event reaching climax; (5) design in intensive record refreshing and keeping and record keeping program; (6) festive-like joyful atmosphere in the whole game season and especially in the climax [8]. Siedentop compared the six characteristics with the typical unit teaching in physical education and found that unit duration in physical education was scare to be more than 3 weeks, and also the composition of a team nearly changed every day, and it was difficult to make the special cultural and spiritual qualities of a sport inherited through experiencing it. The purpose of the SEM is to train competent, beautiful, and passionate sport game player. The system design on such a set of tasks or learning activities is not only to promote students to change into more skillful game players, but also to allow them to understand the history of sports and the subtleties of the traditions and make them more willing to be active participants in the more extensive sports culture.

48.4 Path for Constructing the SEM of Tai Chi Course: Take Chen-Style Tai Chi 42 for Example

48.4.1 Determining the New Teaching Process of the Tai Chi Course

Through the analysis of the purpose and the characteristics of SEM and considering the problems in the teaching of Tai Chi, the teaching process of SEM is reasoned [9]. As shown in Fig. 48.1, the difference between SEM and the traditional teaching model lies in attaching high importance to the team cooperation of students. This requires the preparation of teacher in the early days has to be full.

48.4.2 Determining the New Teaching Units of Tai Chi Course: Tai Chi Sport Season

To establish the SEM of Tai Chi course, it is necessary to break the traditional Tai Chi teaching units. According to Grant thinking, the duration for the game season of a sport model should be not less than 20 class hours [10], the Tai Chi course in a year or a semester is divided into several “game seasons”. According to the divisions of the game seasons in SEM, all game seasons of Tai Chi course are called as practice stage, pre-season stage, regulation game, and after-season stage. All Tai Chi game season stages division and the tasks of each stage are shown in Fig. 48.2.

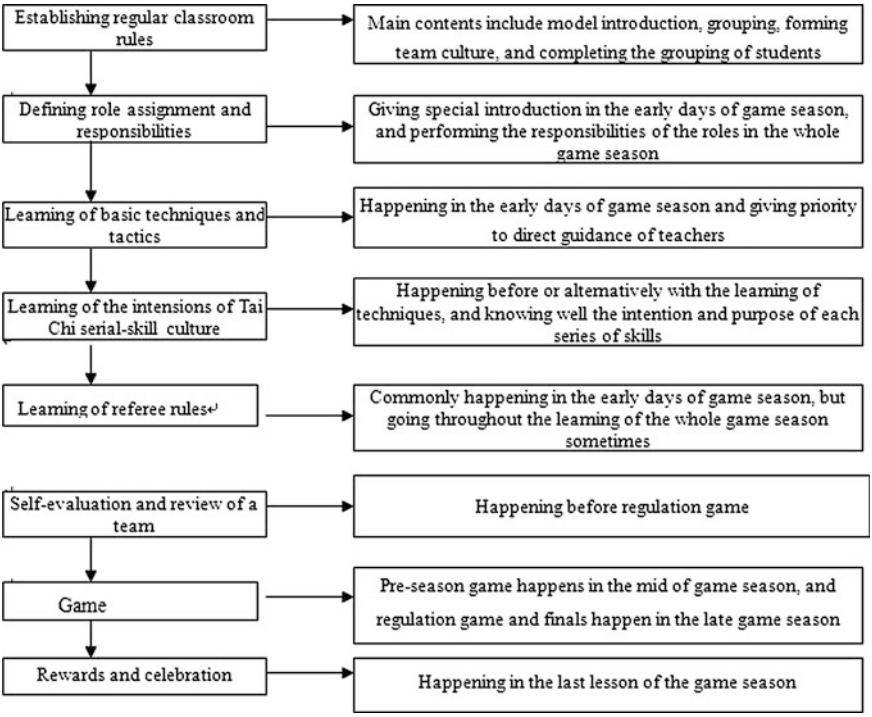

Fig. 48.1 The Tai Chi teaching process of SEM

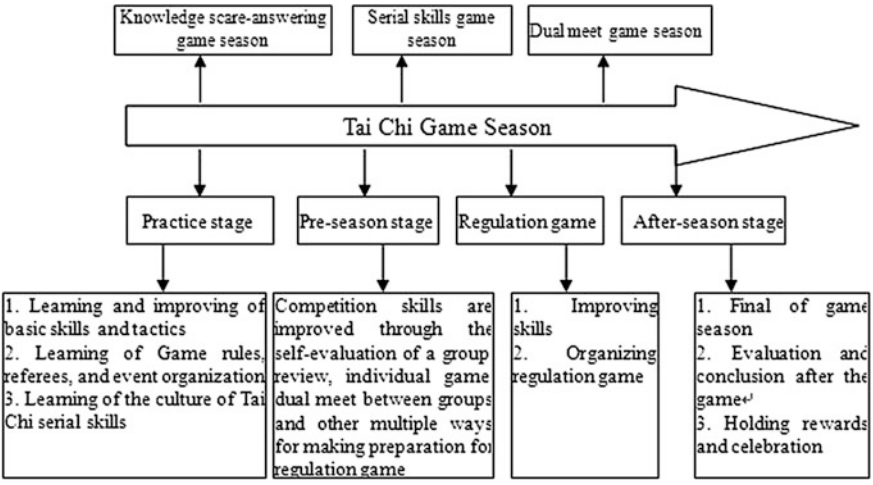

Fig. 48.2 Chen-style Tai Chi 42 is taken as example to give a specific introduction

48.4.2.1 Practice Stage

Under the guidance of teacher, students learn and master the basic skills, basic actions, and serial skills of Chen-style Tai Chi 42, and the rules, referee knowledge, management, and organization of Tai Chi game. Then, students, based on their own group, organize practice and improvement activities by themselves or under the instruction of teacher, and also make the management arrangements and competition strategies for rest stages.

48.4.2.2 Pre-season Stage

By using group as a unit, the Tai Chi techniques and skills of team members as well as related cultural knowledge are further improved. Meanwhile, games between different groups in a group are held, such as game between individuals, game between groups, friendship-based game, and communication-based game. Through these games, the purpose of continuously improving the skills and knowledge of individuals and team can be achieved.

48.4.2.3 Regulation Game

Students are organized to held formal individual game and group game. In a team, the individual and group skills and knowledge can be improved, and also their sense of competition and sense of team work can be strengthened. Simultaneously, students can be promoted to know well the management processes and relevant issues of Tai Chi game.

48.4.2.4 After-Season Stage

Finals of all games are held. The results and ranks of all individuals or groups taking part in the games are evaluated, and also conclusion and feedback are necessarily provided.

48.4.3 Determining the New Teaching Methods of Tai Chi Course

Teaching methods in SEM mainly include the direct guidance from teacher, the cooperative learning, and the guidance of partner. Direct guidance is a learning method under the face-to-face guidance of teacher. Cooperative learning is mainly conducted in a group, and requires members in a group to learn from other's strong

points to offset their own weakness and make every effort to achieving the group's purpose. Partner guidance is mainly to improve the whole game playing quality of a group, and requires students with excellent skills to help those with poor skills, fighting for final victory through team cooperation.

In the SEM of Tai Chi course, teaching methods mainly include direct guidance, cooperative learning, and partner guidance. However, in the use of these methods, the weights of different teaching methods at different game seasons and different teaching stages should be different. In general, at the practice stage, the direct guidance from teacher is primarily applied, and cooperative learning and partner guidance are supplemented. In pre-season stage, regulation stage and after-season stage, cooperative learning and partner guidance are primarily applied, and the direct guidance from teacher is secondary.

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Chapter 49
Research on the University Students' Self-Regulated Learning Ability in the Sports Teaching

Xiang-ling Wang

Abstract Research on the states in self-regulated learning ability for the university students in the sports teaching currently with the self-regulated learning theory in the method of questionnaire survey and statistics. The results show that there are some differences between the male and female students in the level of self-regulated learning ability, and on the overall, the boys are superior to the girls, then it needs the teachers to provide some macroeconomic regulations and guidance in them from the gender perspective training to enhance all the students/self-regulated learning ability.

Keywords Sports teaching · Self-regulated learning · Ability

49.1 Preface

Self-regulated learning is an important topic in the field of educational psychology in recent 30 years, the literatures of domestic and international research show that Self-regulated learning plays an important role in the learning process, The meaning of self-regulated learning is first proposed by Zimmerman in 1989, he thought it is the learner participate in their own process of learning actively from the cognition, motivation, and behavior in some extent [1], and it is decided by the interactions among individual, environment, and behavior.

In domestic, many experts and scholars proposed some different accounts of self-regulated learning from different perspectives, in which Mr. Zhou thought self-regulated learning is the process of learners to promote their own learning and

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choose their own learning way by the cognitive regulation and motivational strategies and to build and create their constructive learning environment [2]. The domestic researching shows that there are some scholars have made a lot of research on the status of the general culture courses self-regulation learning for the students, but it is little in the field of physical education of university. Now we will have a research on the course of the current physical education combined with the relevant methods of mathematical statistics by survey, it is of Important guidance for the students to culture and improve their self-regulated learning ability.

49.2 Research Methods Introduction

49.2.1 Document Method

Retrieved a lot of relevant information by computer and manual research including Monographs, domestic, and international science and technology journals, the papers in the report and the articles are more than 100 related in domestic and international educational websites, it is pivotal for the projects to do well in the oriented research in the preparatory period.

49.2.2 Questionnaire-Survey Method

To make the questionnaire data processed with SPSS12.0 soft, and to investigate in the sophomore students in four physical classes by questionnaire-survey method in Anhui polytechnic university, and 168 questionnaires were sent out, the result is 168 returned, returning-rate was 100 %, and 162 questionnaires were valid, the effective rate was 96.4 %.

49.2.2.1 The Scoring Standard and Revision in the Questionnaire

To divide the self-regulated learning content into six academic dimensions comprising motivation dimension (including goal setting, academic values, self-efficacy, and attribution), learning-method dimension (including Strategy selection and strategy use), learning-time dimension (including Time plan and time management), action-learning behavior dimension (including overcome disabilities, monitoring the learning process, evaluation and reinforcement the learning results), and material environment dimension and social environment dimensions then to design the College Students self-regulated learning questionnaire in reference to the foreign LAS-SI and MSLQ Scale and Pang Weiguo's "self–regulated learning Scale for the primary and secondary students" [3] and Zhang "Self-regulated Learning Scale for the Middle School Students" [4] through Consulting the experts in the sports

Table 49.1 The reliability calculator of college students' self-regulated learning questionnaire test–retest

Dimensions	Motivation	Learning method	Learning time	Action	Material environment	Social environment
Correlation coefficient	0.796	0.781	0.892	0.816	0.827	0.792

Table 49.2 The internal consistency coefficient test for the questionnaire data

Dimensions	Motivation	Learning-method	Learning-time	Action	Material environment	Social environment
Coefficient	0.796	0.763	0.901	0.832	0.821	0.784

education, psychology, and other fields relevant according to the characteristic in the College Physical Education learning.

The testing of the questionnaire items is to ask the students to answer the questions according to their own activities in a variety of learning situations.

The questionnaires included 60 questions, we disrupt the order of the subject in order to avoid the students to be disturbed by the order, the questionnaire scoring is of five level scoring method, the questionnaire scores are ranged about 60–300 point the higher the score, the higher levels of self-regulating learning ability [5].

49.2.2.2 The Questionnaire Reliability and Validity Research

Test–Retest Reliability

Taking two classes of 80 students for the first test in random, then retest 30 days later, and calculate the correlation coefficient of test scores in the first time and the later according to the questionnaire scores data, the test–retest reliability calculator result is shown in Table 49.1.

The results show that the dimensions reliability about the self-regulated learning questionnaire test–retest is of satisfaction.

Homogeneity Reliability Analysis (Internal Consistency Coefficient)

To analyze the questionnaire data with internal consistency test in Cronbach'a coefficient indicator, the results show that it is well in the internal consistency coefficient test, the concrete results are shown in Table 49.2.

49.3 The Analysis and Results of the Experimental Data

To analyze the students' self regulation learning ability situation based on the questionnaire data, the data results are shown in Table 49.3.

Table 49.3 The mean of each dimension about the college students' self-regulated learning questionnaire

Dimensions	Motivation	Learning-method	Learning-time	Action	Material environment	Social environment
Mean	19.04	16.85	15.68	16.52	16.76	18.85

In order to facilitate observation, there we take the mean of the results from each dimension (as the average score of each dimension), as is shown in Table 49.3, we can see that it is different in the level of the college students' self-regulated learning ability in each dimension in the in physical education classes, from the motivation dimension, we can see that it is the highest level as 19.04, indicating that the majority of students in physical education activities not only can draw up their own learning goals and plans, but also more emphasis on physical education, and pay more emphasis on their physical leaning process. In addition, we can see that it is the lowest in learning-time dimension as 15.68, indicating that the majority of students in physical education activities cannot manage and distribe their own learning time.

Further more, there is significant difference in gender in their physical learning process, as is shown in Fig. 49.1.

As is shown in Fig. 49.1, it is different in the six academic dimensions for the boys and girls in gender aspect, overall the boys are prior to the girls specifically in the motivation, learning time, action, and material environment dimension.

The main reason is the feature of the physical education learning activity, such as limb movement, Sweating etc., and it is in line with the character of most boys.

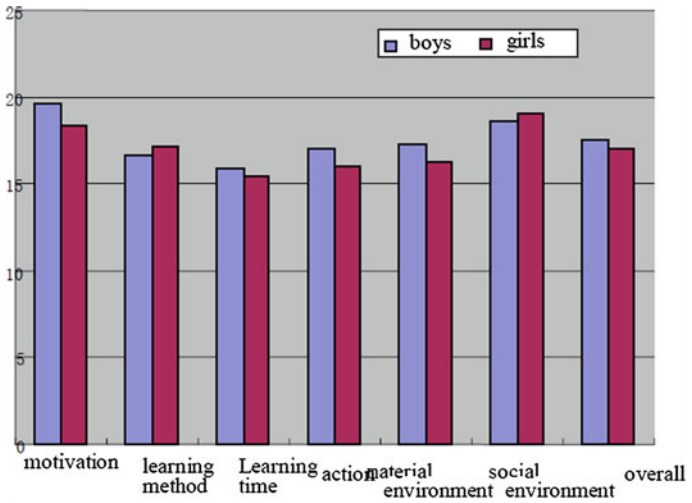

Fig. 49.1 Comparison in the mean dimensions of the boys and girls' self-regulated learning ability

49.4 Research on the Training Strategies of the Self-Regulated Learning Ability in the Sports Teaching

From the view of learning level, in general the students' self-regulated learning can be divided into five stages such as motivation stimulating → strategic plan and application → strategic enforcement and regulation → strategic result adjustment → self-evaluation and adjustment. For the five stages, it is of continuity and tradition in the orientation, but there may be repeated and circuitous in a certain period because of individual characteristics and the environmental conditions as shown in Fig. 49.2.

Under the help of teachers' macrocontrol and the overall design, the students can seek their own effective way and participate in the plan and implementation of the teaching strategies spontaneously in their self-learning process.

Furthermore, because the students have gender differences in the sports learning process, and most of the students are raw hands in the self-regulated learning process, then in the initial stage, it is prerequisite for the teachers to make the overall design and guidance in the perspective of gender, and specifically as follows.

49.4.1 To Stimulate Students' Learning-Motivation Actively

As is shown in Fig. 49.1, it is different in the six academic dimensions for the boys and girls in gender aspect, overall, the boys are prior to the girls, the main reason is the girls are more afraid of dirty and tired etc., then the teachers should be targeted to teach according to the girls' situation in some extent, and communicate more with the girls to grasp their specific status concerned about their mood swings in the sports learning. For the teachers, it is pivotal to stimulate the girls' learning motivation through the implementation of a variety of integrated teaching way, so that the girls can be encouraged to practice in sports more actively.

1. Guiding the students to set appropriate targets, it is of an important influence in the students' self-regulated learning process, the research shows that a clear and specific goals is conducive for students to have an achievement in their learning [6].

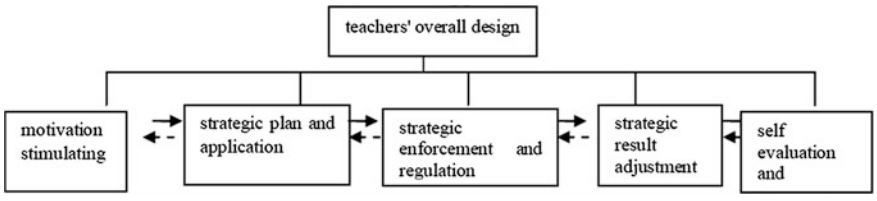

Fig. 49.2 The students' self-regulated learning stage

2. Focusing on the improvement of the students' self-efficacy, the students' self-efficacy is an important internal factor for the students to improve their self-regulated learning ability, and the higher self-efficacy may be contribute to the students' learning ability growth and to improve their own academic performance [7].

49.4.2 To Regulate Learning Strategies and Improve the Level of Strategies Application

The research shows that the learning strategies use and the frequency of strategy use are closely concerned with the students' learning achievement [8]. In the strategies teaching process, the teachers should not only make the students master the contents of the learning strategies, but train the students know-how to apply the learning strategies, as is shown in Fig. 49.1, the girls are prior to the boys in the strategies application in sports learning, basing on this situation, it requires the teachers to exploit the value of life and fitness actively in the physical education learning process.

At the same time of strengthening the girls' strategies teaching, it is also pivotal to culture the boys-oriented learning strategies, to make the boys improve their own learning strategies application levels effectively.

49.4.3 To Enhance the Students' Self-Monitoring Ability

As is shown in Fig. 49.1, we can know that it is very weak for the students in the action-learning behavior dimension especially for the girls, and it is poor for them in the learning time management.

As a result, most students can make their learning plan well, but it is difficult to execute their plan, and most students can persist through the beginning period, but most of them will withdraw in halfway.

In addition, the teachers should not only teach the students in the self-regulated learning knowledge related, but also monitor the students' learning process, and ask the students to supervise the implementation of self-regulation learning process mutually, to enable the students to understand the self-regulated learning ability is not innate, but formed in the long-term learning activities. It can strengthen the students' confidence to enable them to culture good habits of physical learning and exercise, and Improve the self-monitoring ability. Simultaneously, because of the influence of physiological factors and social environment, most girls are not like sports movement, and it is of less persistent habits for them in the sports exercise, Therefore, the teachers should pay more attention to the girls to strengthen their ideological level, and pay more strict monitoring to the conditions of their participation in physical exercise.

49.4.4 To Culture the Students' Environment Adjustment-Ability in the Sports Learning

The teachers should allow students to use or create the constructive social environment and physical environment for the sports learning. And in this process, to ask someone surrounding for help spontaneously is an important form for the students. Although self-regulated learning is essentially an independent study, but the independent study is not isolated and alone-learning completely, the self-regulation learners are of specific feature of the need to seek the help of others in the sports learning process, to seek the help of others will be more conducive for the learners to the mastery and familiar of technical movements.

Others, as is shown in Fig. 49.1, we can see that the students are good in general in the performance of the social environment dimensions, and in gender analysis the scores overall score for the girls are more higher than the boys, However, the girls are worse in the physical environment dimensions, then the teachers should guide the students to take the initiative to create a favorable social and physical learning environment, and guide them to how to make use of the material resources and human resources rationally and effectively, such as how to invite the buddies to go out for practice initiatively, and ask them to rectify their Irregular technical action, and also can take the initiative to organize their favorite sports games, so that more students and their buddies can participate in the sports and share the joy of the sports, and as a result, the students' environment adjustment ability can be enhanced.

49.5 Conclusions and Suggestions

From the above analysis, "self-efficacy" plays an important role with the students' self-regulated learning ability in the sports teaching, and should be to improve the students' sports interest in learning as the center, targeted from the learning goal setting, attributional style selection, model demonstration, emotional and physiological regulation, teaching environment construction and other aspects, to improve students' learning self-regulation ability, then can be cultivated for the students' self-efficacy in the sports teaching.

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Chapter 50
Research of University Athletics and Teaching Reform

Xinbao Du

Abstract Athletics has been for the people's favorite form of exercise. It has been stressed in normal university Athletics teaching. Then, since the reform has physical education for many years, the sport has been changed, and Athletics has met the challenges from other forms of exercise. How to improve the Athletics teaching. It is our responsibility to study it. This aticle looking forward to the prospects of the Athletics teaching in Normal Universities, and track and field teaching the future development of countermeasures in Normal Universities.

Keywords General · Athletics teaching · Countermeasures

50.1 Introduction

Athletics has been developed by human in social practice for a long time. It includes more than 40 single items and all-round sports which resulted from these items. Since the first ancient Olympic Games in 776 B.C., Athletics sport has been the major item in the following Olympic Games. Track-and-field sport plays an important role in all kinds of athletic sports items. Athletics could promote the metabolism of organism. And improve the function of inner organs of body; also develop and enhance the quality of body. In other word, the sport has the feature with formal diversity, simplified sports site and instruments [1]. And it is the best feature that is not limited by time, age of people, or even sex [2, 3].

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50.2 Developing History of Athletics Teaching in the High Colleges in Our Country

We have been following the education system of the former Soviet Union in our country, after the foundation of People's Republic of China. The Athletics teaching is the necessary lesson in physical education teaching. It include running, jumping, throwing, and other skilled items. The teaching requires the skillful ability, in general, it has been completed by teacher's instruction, showing, and guiding, but it is short of communication between teacher and students. The item examination of Athletics occurs great proportion. Since 1980s in twentieth century, the reconstruction of guide idea in physical education has become an important field. For it is exposed to be a rigid way of thinking, dull content, being short of method, and over-skillful rules. The instructing way is being transformed from measures to aims. Someone puts forward "all-life physical education", "happy physical education", it is a kind of teaching and practice reformation in physical education. By the end of the twentieth century "Health is the first" has been the instructing thinking on the base of the theory and practice achievement in twentieth century on physical education [4]. And also begin to study the installing curriculum. In this background, Athletics, this results from traditional educational system, highlights in the reformation of physical education [5, 6].

50.3 The Present Situation and Analysis of Athletics Teaching in the High Colleges

50.3.1 The Present Situation of Athletics Teaching in High Colleges of Our Country

Now Athletics teaching is meeting the challenge from the diversified, selective courses of other sports. According to the study of Zhang hua and Zhang Zhi-xin, some high colleges in Beijing also give Athletics selective courses besides the general selective courses. Among them, but only 20 % colleges can give Athletics selective courses regularly. The others do not give this course either for few students to take part in or without any reasons. As a basic course, it would choose three or four from the six items: sprints, middle and long running, hurdles, shot put, long jump, and high jump. Each of them is limited five study hours [6, 7]. You can know this from the questionnaire. Only 15.60 % students like Athletics course, but 50.99 % students nonlike; 48.35 % students nonlike the course but enjoy taking part in; 70.77 % students disagree to keep the course 2 [8, 9].

In Shang Zhi-qiang questionnaire on the present situation of the high colleges in Zhejiang province: only one college gives Athletics selective course regularly, occurs ratio −8.3 %; there are eight colleges not to give such course, occur ratio −66.7 %;

three colleges give no such course now which gave the course for few students' choice, occur 25 %; 11 colleges do not give this course at all, occur 91.7 %; the results above indicate: the selective course has been canceled, in fact. Instead, many colleges give courses such as table tennis, badminton, tennis, physical dance, and kickboxing which are students' favorite items. The number of those students who choose these courses stands before other items, its natural the Athletics selective course meets cold greeting. Many Athletics teachers are unwilling to take up this job, so they change their occupation one after another [10].

An investigation that Tang Jin-xiang has made on 23 colleges in Hunan [11, 12]. In her study, 32.5 % students think there are few Athletics activities in college and this sport is of simple forms; 42.9 % students do not like the surrounding of this sport, it is dusty, unhealthy to them and it is also a laborious sport [13]. In raining weather, no proper site for such lessons; in sunny day, it is too hot for students to stand it. 37.8 % students feel uncomfortable to have such courses; Tang thinks it is very hard for teachers to carry on this course well in this condition [14, 15].

That investigation is only a miniature of the present situation of Athletics teaching in our colleges. There are also many investigations carried in other places which indicate Athletics teaching is facing new challenge and is required to reform badly.

50.3.2 Analysis of the Present Situation

Such phenomenon exists in Athletics teaching, this is because of the following reasons:

1. Athletics sport does not emphasis students' health quality; it does not try to make the connection with the knowledge of other items. The result makes it to be dull, single situation. 5, 16–19 Students have no clear-out aims and lack of positivity.
2. The content of Athletics teaching is obsolete; its major content is athletic items, which exist for a long time. Another reason is the standardized test evaluation system; the standardized specifications of site and instruments. All these factors influence students' interesting and enthusiasm. Now, students who are not major in sports, have no motivation to acquire the proficiency. Six in the meantime, the teachers who are engaged in Athletics teaching do not pay any attention to the methodology; only put their emphases on the skillful item teaching, not to enhance students' interesting. This leads students to feeling dull, without any interesting. 48.35 % students like Athletics sports, but have no interesting in having Athletics lesson [16, 17].
3. Fatigued phenomenon in t Athletics teaching is also another reason which leads students' no interesting. In Athletics items, some are strenuous, which could excite greatly the organs of body, it is easy to make people to feel physiological

tired, on the second hand, the expectation of teachers on students is too high, it makes students feel psychological tired. They indicate they could not put their hearts into it, even unwilling to talk with others [18, 19].

4. The students attitude to physical education is socialized, lifelike, and amusement. In general, interesting is the chief motivation of students in selecting courses. Many a student selects courses according to the interesting. It is the interesting that has a tight connection with body quality and open propaganda. In students' opinion, Athletics is short of propaganda openly. Only good health quality could acquire the skillful ability. This psychological obstacle prevents students from taking part in this sport positively.

50.4 Forecasting the Trend

Liu, as an excellent model in our country Athletics is powerful enough to influence the opinion of the public and could make the public would recognize its meaning gradually, and take part in it willingly. Meantime, the reformation in Athletics teaching has been carried out in colleges; the guide idea of Athletics teaching would have greatly changed. There is no doubt we could meet a new time for Athletics teaching with all of the Athletics educators' hardship.

50.5 Developing Countermeasures

1. Reformation in Athletics teaching system. It should include the reformation of guiding thinking, information of teaching content; reformation of teaching methodology; the system of teaching evaluation; the organization manner of Athletics match and so on.
2. The guiding ideology is the starting point for Athletics teaching, nowadays, the guiding thinking should be improved as the time goes; reduce the emphasis on skilful ability teaching; it should pay attention to develop students' health quality while developing the skilful ability teaching; it should initiate all the time "health is first", "all-life physical education"; should guide students to be healthy on all sides; and let students recognize Athletics sport could improve health quality.
3. Athletics is said to be the "mother" of sports. It is the base of many items. So Athletics teaching should highlight its basic function, bring its advantages into teaching; expand properly the content of single item, try to initiate students' interesting by improving the methodology. For example, when giving sustaining and long running lesson, which students feel dull; teacher should instruct them the basic essentials first, then enactment the lesson with students' real needs together (such as: losing weight, climbing mountains, enhancing the

function of heart and lungs and so on), instruct them how to breath, control the strength, practice volume, even let students know of the way of making sport scheme and have a clear aim to reach. The content of sustaining and long running is also related with cross-country, which is an item of challenge and full of interesting; it could mobilize all positive factors of students and make students practice in pleasure mood to reach the aim.

4. The model and methodology of Athletics teaching should be diversified forms and exploring teaching. For example in jumping-on-back teaching, it is right for teacher to organize students to watch VCD teaching program, it is good for students to have perceptual knowledge before practice, some parts of them could be watched recently until students understand it. Then, teacher should guide students to tell the difference from other forms of jumping. It would let students expect for the item. During the teaching, the teaching process should be divided into two steps: one is to master ordinary rules; the other is to break through some specific item, choosing the teaching content according to students' real needs.
5. Developing the evaluation standards of Athletics teaching. The evaluation system of Athletics teaching includes evaluation of teaching procession and evaluation of students' grades. The evaluation of teaching procession should embody its guiding thinking, new methodology, and students' acquisition during the procession; the evaluation standard of students' grades should be all round; that is to say, not only embodies individual's difference objectively and exactly, but also reflects students' progresses in Athletics lesson; not only evaluate the state of students' knowledge, also makes the correct evaluation to students' attitude and hardworking. In this condition, it could reduce the pressure of students whose health quality is not so good.
6. Enhance the propaganda of Athletics sport. It is necessary for us to increase interesting items in Athletics sports meeting to initiate students' enthusiasm; change the model of Athletics sports meeting which is held once a year properly; try to organize matches to struggle for some single item in Athletics; enhance the atmosphere of Athletics in colleges; displays the skill and appreciation of Athletics sports meeting and train its own fans.

50.6 Research Results and Analysis

We have 13 groups of double items in man Athletics games. The top six of them respectively refer to: 10,000 m heel-and-toe waking race, 20,000 m heel-and -toe waking race; Second: 100–200 m race; Third: 3,000–5,000 m obstacle event; Fourth: 1,500–800 m race; Fifth: 400–400 m hurdle, 10,000–5,000 m and 3,000 m obstacle event-10,000 m; Sixth: 3,000 m obstacle event-1,500 m. The distribution character of top six double items is described as following: First group: with 10,000 m heel-and-toe waking race as the major item, the maximum gap between

the total score of major item and second item is 8, the minimum gap is 2 and the average gap is 4.6; For the items with 20,000 m heel-and-toe waking race as the major item, the maximum gap between major item and second item is 2, the minimum gap is 1 and the average gap is 1.4; Second group: With 100 m race as the major item, the maximum gap between major item and second item is 31, the minimum gap is 3 and the average gap is 10.5; S with 200 m race as the major item, the maximum gap between major item and second item is 15, the minimum gap is 3 and the average gap is 6.8; Third group: with 3,000 m obstacle event as the major item, the maximum gap between major item and second item is 15, the minimum gap is 1 and the average gap is 6.1; with 5,000 m race as the major item, the maximum gap between major item and second item is 15, the minimum gap is 7 and the average gap is 11; Group four: with 1,500 m as the major item, the maximum gap between major item and second item is 11, the minimum gap is 1 and the average gap is 5.2; with 800 m as the major item, the maximum gap between major item and second item is 13, the minimum gap is 1 and the average gap is 7; Group five: with 400 m hurdle race as the major item, the maximum gap between major item and second item is 33, the minimum gap is 1 and the average gap is 12.8. The double items with 400 m race as the major item have not emerged in recent 6 years. With 1,000 m race as the major item, the maximum gap between major item and second item is 10, the minimum gap is 3 and the average gap is 7.3; with 5,000 m race as the major item, the maximum gap between major item and second item is 4, the minimum gap is 2 and the average gap is 3; With 3,000 m obstacle race as the major item, the maximum gap between major item and second item is 3, the minimum gap is 1 and the average gap is 2; with 10,000 m race as the major item, the maximum gap between major item and second item is 16, the minimum gap is 2 and the average gap is 6.5; Group six: with 3,000 m obstacle race as the major item, the maximum gap between major items and second item is 13, the minimum gap is 2 and the average gap is 7.6; there is only person who chose 1,500 m as the major item. There are 14 groups of double items in woman track and field games the top four of them respectively refer to: first, 5,000–10,000 m heel-and-toe waking race and 800–1,500 m race. Second, 100–200 m race; Third: 5,000–10,000 m race; Fourth: 400–400 m hurdle race. The distribution character of top four double items is described as following: Group one: with 5,000 m heel-and-toe waking race as the major item, the maximum gap between the total score of major item and second item is 6, the minimum gap is 1 and the average gap is 3.5; with 10,000 m heel-and-toe waking race as the major item, the maximum gap between the total score of major item and second item is 6, the minimum gap is 3 and the average gap is 4.5; Group two; with 100 m race as the major item, the maximum gap between the total score of major item and second item is 7, the minimum gap is 3 and the average gap is 5.6; with 200 m race as the major item, the maximum gap between the total score of major item and second item is 19, the minimum gap is 1 and the average gap is 4.8; group three: with 5,000 m race as the major item, the maximum gap between the total score of major item and second item is 6, the minimum gap is 1 and the average gap is 3; with 10,000 m race as the major item, the maximum gap between the

total score of major item and second item is 5, the minimum gap is 1 and the average gap is 2; Group four: with 400 m hurdle.

Race is the major item, the maximum gap between the total score of major item and second item is 16, the minimum gap is 4 and the average gap is 9.6; there is one athlete who chose 400 m race as the major item and the gap between major item and second item is 2.

50.7 Conclusion

Through Physical Education Teaching Reform in the actual operation, it should be to enhance the physical fitness of students, enhance students' sports and cultural qualities, and develop students' physical exercise habits and life-long sports consciousness as a criterion. Physical Education should be guided by a multi-targeted, gradual increase of the own hematopoietic function, and explore the actual characteristics of our region is more scientific and more reasonable PE teaching model to promote our region and the process of reform of the National College Physical Education. Before physical education reform, schools should strive to optimize the faculty structure to improve the sports venues and facilities, improve the level of scientific research and other support efforts to increase physical education reform.

In the classroom, to give full play to the leading role of the main body of students and teachers, to change the traditional track and field course setting, teaching materials, and improve track and field course structure for the implementation of the curriculum goals of the university track and field, the establishment of the university characteristics of the track and field class system is extremely important. To this end, the college track and field courses should be set to the needs of students, the system should be more widely and more fully involved in all areas of fitness, sports, entertainment, leisure, pay attention to cultivating the cultural quality of the student's track and field awareness of fitness and athletics, we should principle of choice of teaching content to fully enhance the health of students, both to improve the interest of students to participate in athletics, and it helps to develop students' track and field skills and full of track and field courses should be set up throughout the university stage of education to change the basic course as elective course form, increase the proportion of the number of track and field in the class system, thereby increasing flexibility and broaden the students can choose to practice and space, not only can meet the needs of students, but also has a full choice. In addition, track and field theory courses should focus on training students to develop healthy living habits, and foster their appreciation of the high-level track and field events.

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Part VI
Sustainable Education Management

Chapter 51
Practice and Experience of Teaching Reform for Landscape Architecture Design

Ling-mei Zhang

Abstract In the professional courses of many garden professional courses "landscape architecture design" is a combination of theory and practice, but for a long time, the old course content and teaching methods have been monotonous and have difficulty in keeping up with the rapid pace of development of urbanization garden. For the teaching situation and existing problems, combined with the author many years of teaching experience, put forward specific proposals on the reform of teaching content and teaching methods.

Keywords Landscape architecture design · Teaching reform · Teaching effectiveness

51.1 Introduction

With the eco-city and garden city views deeply rooted and people with their own increasing attention of the ecological environment, the landscape of professional development is more and more diversified, landscape architecture as one of the garden four elements in the landscape planning system also plays an increasingly important role [1]. "Landscape architecture design" as a core course in colleges and universities of professional landscape architecture, urban planning, is a very practical professional courses [2]. The teaching is based on practical training, the conditions of enhanced mapping capability, so that students acquire a certain amount of landscape architecture, design theory knowledge, thereby enhancing the ability of the landscape professional and building professional exchanges and cooperation, thus

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enhancing the professional skills for subsequent courses [3, 4]. Landscape architecture design more emphasis on the organic combination of the building and the environment than ordinary architectural design and artistic requirements, design flexibility. As teacher of the landscape architecture design must be combined with the actual needs of the course characteristics and the market for personnel training, to overcome the traditional teaching weaknesses of the curriculum appropriate teaching reform, the teaching of the course content to better meet the needs of the community for the professional so that students after graduation can quickly adapt to the actual work, or to lay the foundation for further studies to learn.

51.2 Traditional Teaching in Landscape Architecture Design and Problem

True sense of the landscape architecture design should include three sections of the "garden", "Architecture", and "design", and landscape architecture design is exactly what forestry, architecture and art three professional cross-integrated curriculum, but now the undergraduate landscape architecture design course a lot of problems out of sync with the times, leading to the teaching content and the needs of society there is a deviation.

51.2.1 Focus on the Chinese Classical Gardens, a Single Learning System, Teaching Contents Need Refining

"Landscape architecture design" is a highly practical and comprehensive courses, garden undergraduate teaching materials more emphasis on the basis of theoretical knowledge of the classical landscape architecture design and its design method and composition skills, and building a combination of different disciplines, namely the lack of modern landscape architecture constructed understanding of the current job market demand, the latest building materials and decoration, landscape architecture, site design and environmental design, course content, giving students of this course the misunderstanding that the landscape architecture the design is simple copy the construction of the classical gardens in a variety of pavilions pavilion and Fang.

51.2.2 Lack of Applied Teaching Materials Support

Meter materials of the existing landscape architecture, almost all of the theory of teaching materials, there is no practical teaching materials, and existing theory textbooks for most of the research materials, and in fact, the architectural design of

the garden as an interdisciplinary, its artistic decision to teach requires not only a large number of theories about, and need the support of the application data. But a lot of engineering data involved in the design of landscape architecture, mechanical calculation of the formula commonly used size of the building components in architectural design courses, a common and basic, but in landscape architecture, design courses, inadequacies, even if there similar content, many of the textbooks and reference books are also the monotony of a large number of illustrations accompanied by text descriptions, the data is very lacking.

51.2.3 Teaching Model is Lagging Behind the Students' Practical Ability to Obtain Less Than

The mode of traditional landscape architecture design teaching lesson planning–lessons–training–tutoring–final exam–assessment of academic performance, the drawbacks of this model with the development of more and more apparent. First in the teaching mode, usually lectures by the teachers to teach students, and students in the teaching process is just a passive receiver body; even training links, they are mostly hand-painted drawing the floor plan of the corresponding landscape architecture, elevations and sections, and social practice in design trend of electronic seriously inconsistent; teachers in the arrangement of training projects, most of them can only give a relatively simple analog design conditions lack of real environment, inhibit the enthusiasm of the students' design; the training results of the assessment, they are mostly taken the way of teachers' scoring and review, did not play the initiative of the students, resulting in student training scripted, copied to the corresponding drawings painted in some teaching material, there is no serious thinking and the creative process, the practical ability to obtain apparent lack of training can not be achieved the target of less than a project set up.

51.2.4 Traditional Mode of Examination Hindered the Development of Students' Creativity and Individual Strengths

Traditional examinations with a single final exam, focusing primarily on the degree of knowledge, knowledge representation level of the examination, the examination in the form of a unified form of a closed book examination content is limited to textbooks, students tend to take the exam back of the class to take notes, test completely forget the examination-oriented measures and practices, such examination is difficult for students to give full play to all aspects of capacity, not to mobilize the enthusiasm of learning, hinder the development of students' creativity and individual strengths, difficult to adapt to the goal of colleges and

universities to cultivate innovative talents. Landscape architecture design, very practical, it focuses mainly on the cultivation of students' professional skills and practical ability and creativity, the purpose of the examination should be mainly on the practical application of skills and creativity of the students, these skills course examination decided that it traditional course examination, examination reform must adapt to the development and course characteristics.

51.3 Explore the Landscape Architecture Design Teaching to Adapt to the Times

51.3.1 Reform of the Theoretical Content, and Enhance Content Relevance, Application Type, and Contemporary

It can be seen from the disciplinary status of this course and students' employment characteristics, garden professional landscape architecture students are mostly the lack of related civil engineering knowledge and skills, so the theoretical content in addition to retaining the traditional landscape architecture essence, should be an appropriate increase the related civil knowledge, it is in teaching requires students to be familiar with building construction and basic building structure type; clear building module in architectural design; features and techniques to master the human scale of landscape architecture space; understanding of Chinese and Western architectural styles evolution; understand the basic rules of landscape architecture modeling; skillfully drawn landscape architecture flat, vertical, sectional, perspective, and aesthetic law applied to the design. However, these teaching content in most of the existing garden undergraduate textbooks is not comprehensive, and therefore can be in practice in teaching appropriate increase in this part of the contents, and in teaching practice, this part of the contents can be text, pictures, tables, data, courseware, multimedia and other forms, in order to increase the reception abilities and interests of the students.

The current landscape architecture design of teaching materials and more around the classical Chinese garden architecture-oriented approach, in practice this part of the teaching can be used as foundation and entry point to study. Classical Chinese garden is profound, life more or less there are a variety of classical architecture, or the antique building, students of this part is mostly my own eyes witnessed, impressed, so this part of the contents as the entry point of this course can increase students' perceptual knowledge of this course, Ting Lang Fang pavilion and other single building, and the resulting building courtyard is an important part of the theory of landscape architecture, which can be compared with Western architecture schools, allowing students to understand the landscape architecture design styles, traditional timber-framed tile practice with the West with a unique style, confining column construction practices were compared to

help students absorb the essence of the various schools engaged in the design of landscape architecture in the future, to create a more distinctive landscape architecture.

51.3.2 Teaching Methods and Means of Reform

The teaching process and teaching methods is an important means for teaching purposes, in particular, the reform of teaching methods and means it is particularly important in the process of teaching content is constantly updated to increase the teaching hours of continuous compression. On the reform of teaching methods, modern teaching methods, site visits, the reality of teaching, case teaching, practice classic is tinted, individual counseling and collective commenting combined to improve the teaching effect.

First of all can be used in teaching modern teaching methods to improve teaching efficiency and teaching effectiveness, the image of the multimedia teaching methods, vivid, intuitive, a lot of pictures and video to enhance students 'interest in learning, to expand students' knowledge, to help students a more thorough understanding and knowledge of landscape architecture, and thus lay a solid foundation to learn the course. For example, to explain the pavilion in the garden, pictures and video to explain all times and in different regions of different architectural styles pavilion type, thus enriching the students 'creative source to improve students' conceptual design capabilities. To enhance students' impression, can also be a real professional environment for on-site understanding of practice-based course will need to arrange courses. Suzhou gardens of China Southern landscape architecture convergence Park, the arrangements for landscape architecture to recognize the best place to practice, it can be combined with teaching need to arrange for students to practice, understanding Pavilion Lang Fang bridges and other single building' structure and some architectural pieces. Teachers taught the knowledge of teaching scene in reality, a live demonstration of the operation, to answer students' problems, the scene of the atmosphere can increase students' awareness of boring theory is to be understood in a real environment, and promote students to achieve from the visit to imitate and then to design the creation of a shortcut.

Case-based practice teaching can be followed in the teaching case, student to teacher-led initiative to explore the teaching model. Targeted and practical cases to guide students to independent learning efforts explore, develop the students 'enthusiasm and innovative capacity, practical ability has important practical significance. In practice, one can through the analysis of the typical design instance, guide the students' design thinking by analogy, so that students master garden landscape of the design method and the most intuitive access to the actual project; through the classroom teachers themselves engaged in the Results of Program as a design subject to the students as a training project, the students complete their program, you can take students to the project site to look at the

scene, mature project site inspection, the comparative analysis of their own inadequacies, and to analyze the advantages and disadvantages of the existing programs, but also to the transformation of the original program design, to improve their design.

Finally, discuss the teaching mode can be used in teaching, to guide students in the classroom, positive thinking, the ability to ask questions, and continue to inspire students and curiosity. Such as design garden tea room, you can guide the students to put themselves in thinking how to reflect the open space and hidden space in the design, how to design a different partition in order to meet the psychological needs of more customers, so that the tea room's design is more diversified.

51.3.3 Individualized, Hierarchical Set Up of a Training Project, the Reform of the Practice Teaching Mode

Training is an important part of teaching, using the final practice—understanding—Practice—understanding learning the law, training will be divided into the site analysis—program ideas and sketching-Project thematic theory boost-the program to discuss, design—summary and appraisal stage and the results of production, combined with the course characteristics, organic convergence of the overall planning of residential areas, parks and other green spaces and landscape of single building or group design, so that the training project closer to actual combat, or even directly to the students involved in the project. To carry out all levels of the design apartment in the apartment in the contest, and significantly improve the students' enthusiasm.

Classroom teachers have been involved in project planning and set to the link, such as a riparian scenic planning and design students from the analysis of the base address to program design, from the internal landscape architecture, environmental design, and then within the functional architecture of the scenic such as specific architectural design of the tea room, toilets, boat dock, make the appropriate landscape architecture, vertical profiles, and the production model of the corresponding landscape architecture and its surroundings. Which part of the drawing hand-painted techniques can be used to enhance the aesthetic creativity of the students; some patterns can be the use of electronic technology to create, such as the use such as SketchUP and 3Dmax graphics software to make building electronic model using Photoshop technology built environment design and post-Environment rendering order to enhance students adapt to the actual ability to work. Some single building can be considered solid model of student-produced landscape architecture, thereby enhancing the visual and scaling capabilities of the students on the proportion of students space to understand and imagination, and to develop the students patiently and carefully, solidarity, work attitude. To enable students to clearly explain the design intent and program in the report of the future

work program, after each time the course design project is completed, some students may choose their own design work made into a PPT file in the classroom to explain and comment on their own and the design work of others, the advantages and disadvantages of each program. Such a course design and to explain the mode of the program not only improves the students 'enthusiasm to expand the horizons of the students change from passive students to take the initiative to acquire knowledge, you can also exercise the students' language skills at the same time enriching the content of classroom teaching, active classroom atmosphere and teaching is better.

For the workload of large training projects can be "competitive cooperation" model, students divided into a number of group, division of labor between the groups, to complete the design task of the training project, after the end of the training, the teachers of each group results special Review and the pros and cons of the design process, helping students to further summarize the design experience and lessons learned.

Case system, the learning division of labor, helping to train the student unity, cooperation and competition, the spirit of innovation, the objective is also to reduce the burden of students, students from the traditional "struggling to catch up the manual labor of the map" freed to devote more energy for data access, site analysis, program ideas and communication, thereby enhancing the training effect.

51.3.4 Reform the Mode of Examination, to Make Up the Teaching Vulnerability

Test the learning outcomes approach is to make the assessment, the traditional mode of assessment is mostly based on the results of subjective questions and objective questions each a certain percentage of the final papers for the final academic achievement of students. For landscape architecture design course, the traditional mode of assessment is clearly not appropriate, but some theoretical knowledge that students must master, therefore students' final course academic results can be three–three system score, that is, students the final academic achievement is usually evaluation results, curriculum design, training results and final written exam composed of three parts of achievements.

Performance evaluation class, the students to master the necessary theoretical knowledge can be assignments, tests, attendance and other manner; curriculum design of outcome evaluations can assess student course design work, innovation and aesthetics, combined with the student program report ability to express the time of scoring, the way of students scoring can be used with teacher evaluation; 4 to 6 h quick question in the final exam is undoubtedly a measure of the students of this course the best means of learning to a site area and the surrounding environmental conditions to study the students to handle the general layout of several key issues, construction plane functional capabilities of space and shape capability,

drawing expressive and landscape design capabilities, the final answer to the drawings in the form of expression. This form of examination papers, a comprehensive design check of the quality of many requirements, students can determine the student's learning, students will pay more attention to the accumulation of ordinary learning, to avoid the traditional exam crash course phenomenon. At the same time to be fair, usually theoretical results can be used, curriculum design, outcome evaluation and the end of fast title design achievements of each one-third of the proportion of students at the same time the ability of the theory and practice can be a corresponding increased.

51.4 Thinking

Landscape architecture is an important constituent element of the garden and is an integral part of landscape projects. The job-oriented practical projects promote, strengthen practice, and improve the effect of teaching and learning that will continue to explore the direction of the practical teaching of landscape architecture design courses in the future. Landscape architecture design curriculum reform, not only enable students to master the basic knowledge and basic skills, but it is more important to allow students to use the knowledge to analyze and solve practical problems, the only way to make students in the future social competition have strong competitiveness.

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Chapter 52
Study on Independent College's Practical Teaching System

Yaoxi Wu

Abstract Improving the quality of practical teaching is an important guarantee for independent colleges to cultivate the application-oriented and composite talented personnel. And it is also a hang-up in the developing process that independent colleges are facing with. From the importance of practical teaching, this paper analysis the present situation of the independent colleges' practical teaching, and taking the Chongqing Normal University Foreign Trade and Business College as an example, and also points out that in order to promote the quality of practical teaching, independent colleges should construct a scientific practical teaching system.

Keywords Independent colleges · Practical teaching · Quality · Teaching system

52.1 Introduction

In China, the Ministry of Education has proposed that it is necessary to greatly strengthen the practice teaching and also feasibly improve the practical ability of college students. According to a great number of investigations, the majorities of independent colleges in China take the training of application-oriented and composite talented personnel as objective, and attach high importance to the training of the practical ability of college students and especially the ability to solve problems comprehensively by using knowledge of various disciplines at the present. For

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example, in Foreign Trade and Business College of Chongqing Normal University, the personnel training objective is set as training the "Profession + Foreign Language + Skills" application-oriented talented personnel with innovative spirit and practical ability. Therefore, how to make an improvement in the quality of the practice teaching and construct a scientific practice teaching system has proven to a problem, which is necessary for independent colleges in China to discuss and solve at present [1].

52.2 The Importance of the Practice Teaching for Independent Colleges

Practice teaching is one of the most important teaching parts of the process of talented personnel training in independent colleges, and plays a very important role that cannot be replaced by theory teaching in the improvement of the comprehensive quality of college students.

52.2.1 Practice Teaching is an Important Guarantee for the Realization of the Talented Personnel Training Objective in Independent Colleges

The Evaluation Indexes System for the Qualified Educational Work of General Independent Colleges, which was issued by the Ministry of Education of China, clearly shows that the objective localization of training the application-oriented talented personnel with innovative spirit and practical ability should be determined by Chinese independent colleges [2]. Besides, practice teaching has become one of the most important parts in the teaching process of Chinese independent colleges, and also a very important guarantee for the realization of the talented personnel training objective in these independent colleges.

52.2.2 Practice Teaching is the Key to Improving the Teaching Quality of Independent Colleges

At present, the evaluation on the teaching quality of schools in society is not only to verify how much the theoretical knowledge has been learnt by students, but also to attach higher importance to the practical ability and work ability of students. Therefore, by relying on the practice teaching, the level of teaching can be improved in an all-round way, and also the quality of teaching can be increased.

52.2.3 Practice Teaching is Helpful for Training the Innovation Spirit of Students and Improving Their Comprehensive Quality

The development of practice teaching is correctly in line with the characteristics of students. The initiative and enthusiasm of students in learning can be stimulated by the way of the practice teaching to a greater degree. In the practice teaching of multiple ways, not only the practical application ability of students is constructed, and also their cognition on society is improved, and thus the communication skills and team work ability are enhanced. As a result, students can be promoted to exercise themselves in practices without a stop and subsequently lay a good foundation for fitting into the world [3].

52.3 Current Situation of Practice Teaching in Independent Colleges

52.3.1 Coherence is Absent in the Arrangement of Practice Teaching

At present, the practice teaching in the majorities of Chinese independent colleges is only targeted at the current year's graduates. Moreover, the contents of practice teaching are only related to graduation thesis, graduate design, and graduation practice. All these parts are not strong in coherence and lack a consistency. Also, in the arrangement of practice teaching, the development laws of the abilities of students are not followed. Therefore, a good effect is not achieved from the practice teaching.

52.3.2 Practice Teaching is Boring and Dull in Forms and Relatively Backward in Contents

The making of the practice teaching plans in Chinese independent colleges is in shortage of standards, and also practice contents are totally divorced from the realities. At present, the majorities of practice teaching in Chinese independent colleges still stay in the way of inside school laboratory practices, and also their experimental contents are concentrated on demonstrations and theoretical verifications, the design, in which the comprehensive, practical, and innovative experiments are insufficient [4].

52.3.3 Lacking "Double-Quality" Teachers

The faculty in an independent college mainly comprises of full-time young teachers recruited by itself, teachers from maternal university, teachers from other colleges and universities, and a small number of experts or key technicians from companies or enterprises. However, these teachers are in shortage of the front-line work experience and professional practice experience. This situation makes Chinese independent colleges greatly short in the "double-quality" teachers.

52.3.4 Insufficient Practice Teaching Facilities and Base Constructions

The capitals of the development of Chinese independent colleges mainly source from the investors. The financial supports that are provided by the education administrative departments are rather limited. Therefore, this makes the hardware and software facilities of the practice teaching unable to be updated and upgraded in time and to meet the needs of students on learning the new technologies. In addition, the cognitions of social people on independent colleges are still in the initial stage, and also some enterprises or unites are unwilling to reach an agreement with independent colleges on the construction of practice bases.

52.3.5 Lacking a Necessary Monitoring and Evaluation System for Practice Teaching

At present, the management and organization of the practical teaching in many Chinese independent colleges are under a loose state, letting alone the construction of a complete and scientific evaluation system. As a result, the quality of practice teaching is out of control in independent colleges.

52.4 Constructing a Scientific Practice Teaching System

Practice teaching system refers to a teaching system with the most optimized structure and functions. It is constructed by focusing on the talented personnel training objective and also using systemic and scientific theories and methods to comprehensively design all elements of the practice teaching according to a reasonable setting of practice courses and links. Also, this system and the theory teaching system cannot be separated from each other. In general, it includes practice teaching target system, content system, management and guarantee system, and evaluation system.

52.4.1 Constructing a Practice Teaching Objective System

52.4.1.1 Revising Teaching Plan and Improving the Personnel Training Scheme

From 2002 when Foreign Trade and Business College of Chongqing Normal University was founded to now, the teaching plans have been revised for many times, and also the class hours for practice teaching and the proportion of relevant credits have been enhanced. In general, the percentage of practice teaching of liberal arts programs is necessary to reach 15 %, the percentage of science programs should reach 25 %, and the percentage of art programs should reach 30 %. In addition, it is necessary for the specific contents of the practice teaching to be reasonably arranged into all practice teaching links such as experiment, internship, training, course design, graduation design, innovation production, and social practice in accordance with ability levels to some extent.

52.4.1.2 Optimizing Course Setting and Reforming Course System

Course system is the overall planning of the teaching contents and plays a decisive role in the knowledge structure and ability structure of personnel training, and also can help to solve the problem (i.e., what teachers should teach to students and what students should learn) in teaching. On the basis of a full investigation, Foreign Trade and Business College of Chongqing Normal University sets the course system to be general education (generally required courses and general elective courses), professional education (professionally required courses and professional elective courses), teacher education (education theory courses, education practice courses, and education scientific research courses), and practice (professional practice, internship, employment guidance, graduation design, and graduation thesis, etc.). In the mean time, specific rules have been formulated by Foreign Trade and Business College of Chongqing Normal University on the process of practice teaching. Therefore, the flexible arrangements of education and learning are realized, and also the comprehensive quality of students is improved in an all-round way.

52.4.2 Constructing a Practice Teaching Content System

In general, practice teaching comprises of experiment, internship, training, and graduation thesis (design), course design, social practice, and military training, production, business activities, and social investigations included in teaching plans, science and technology production, course contests, and other activities. According to the requirements of personnel training objective, Foreign Trade and Business College of Chongqing Normal University attaches high importance to the

construction of a scientific and reasonable practice teaching content system by focusing on the improvement of the comprehensive quality of students and the training of the innovative spirit and practical ability of students. This system mainly comprises of four modules (i.e., fundamental practice, professional practice, comprehensive practice, and innovation practice), as shown in Fig. 52.1.

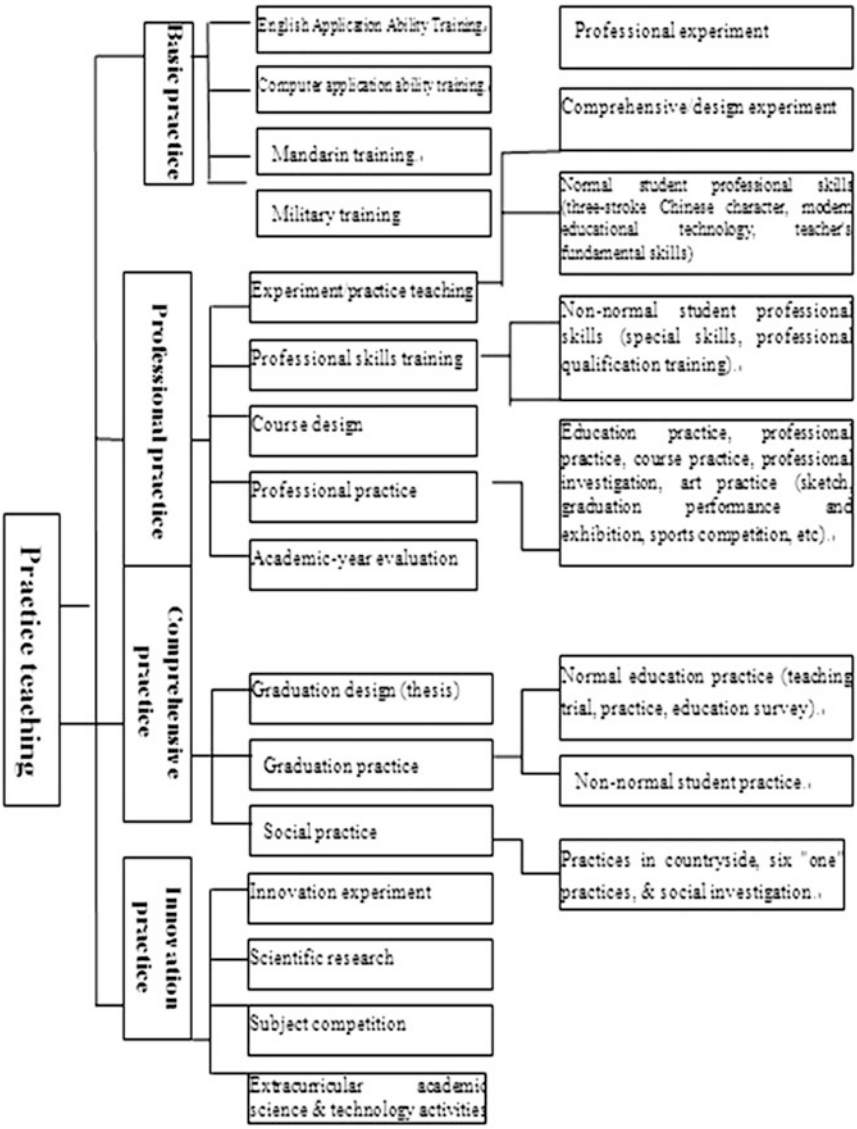

Fig. 52.1 Practice teaching structure of foreign trade and business college of Chongqing normal university

52.4.3 Constructing a Practice Teaching Management and Guarantee System

52.4.3.1 Establishing and Perfecting Management Rules and Regulations System

According to all practice teaching links, a series of management guarantee systems have been formulated by Foreign Trade and Business College of Chongqing Normal University, such as Laboratory Working Regulations of Foreign Trade and Business College of Chongqing Normal University, Experiment Teaching Work Flow of Foreign Trade and Business College of Chongqing Normal University, Graduation Field Work Management Methods of Foreign Trade and Business College of Chongqing Normal University, Graduation Design (Thesis) Work Manual of Foreign Trade and Business College of Chongqing Normal University, and Skills Competition Management Methods of Foreign Trade and Business College of Chongqing Normal University.

In addition, the Outline for the Teaching Plan of Practice Teaching of Undergraduate Courses is formulated as well, in which experimental teaching, practice and graduation design (thesis), and other teaching work are standardized, thus ensuring the practice teaching to be implemented smoothly.

52.4.3.2 Strengthening the Construction of the Teacher Team for the Practice Teaching

On the one hand, the in-service teachers can be selected to participate in enterprise practice and training. On the other hand, the double-quality teachers in other higher learning schools and scientific research institutes and the key technicians and senior management personnel in enterprises can be fired irregularly or regularly to give face-to-face communications and exchanges with students at classroom.

52.4.3.3 Increasing the Investment in Laboratory and Perfecting Construction of Laboratory

Laboratory is the main battlefield of the practice teaching. With the purpose of improving the utilization rate of laboratory, the Laboratory Opening Management Methods of Foreign Trade and Business College of Chongqing Normal University is formulated, and also laboratory fixed funds management is established, providing fund and system guarantees for the opening of laboratory.

Therefore, the principles, forms, organizational implementation, and relevant policies for the opening of laboratory are further clarified, and simultaneously the enthusiasm of teachers and students in participating in opening of laboratory is fully mobilized.

52.4.3.4 Strengthening the Construction of Practice Bases

Practice base is a bridge between school and society. Foreign Trade and Business College of Chongqing Normal University has attached high importance to the construction of practice and training bases, and also has formulated the Teaching Practice Base Construction and Management Methods. Also, the school continuously opens up and expands practice and training bases according to the principle of convenience, the principle of relative stability, the principle of ensuring quality, and the principle of mutual benefits through school—school cooperation and school-enterprise cooperation, generating a pattern outside -school, and inside school practices complement each other and synchronously develop.

52.4.4 Constructing a Practice Teaching Evaluation System

Both teaching and learning effects will be directly influenced by whether teaching quality evaluation system is scientific. The characteristics of practical teaching decide that its evaluation methods are fundamentally different from general theory teaching evaluation methods. That is, a summative evaluation cannot only be applied when the teaching activities are ended, namely simple scoring or writing comments.

Therefore, to evaluate the quality of the practice teaching, it is necessary to make full use of multiple methods according to the different characteristics of practices and also combine qualitative and quantitative analysis together.

52.5 Conclusion

Practice teaching is not only an important part of the whole teaching plan, and also an important teaching link for enhancing the ability of students in combining theory with practice, training the innovative spirit and practice ability of students, and improving the comprehensive quality of students.

It is necessary for all independent colleges to tightly seize the golden opportunity in the period when private education has attained a rapid development, continuously explore a strong systematic practice teaching system with rich characteristics of independent colleges, specific objective, and clear layers.

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Chapter 53
Study on Higher Vocational Hotel Management Teaching Reform Based on People-Oriented Management Philosophy

Xiurong Wang and Jian Zhang

Abstract Hotel with humanization management pursuit of customer satisfaction, on the one hand, emphasizes the customer as the center; on the other hand, the employee satisfaction is the important position. Based on pressure, some people even put forward "staff first, customer the second". The management idea stresses that there is no satisfaction of the staff if there is no satisfaction of customers. Attention to employee satisfaction is the emphasis on customer satisfaction; it is to point the specificity of the hotel products. In Humanistic management theory of the modern hotel, the user needs in the hotel in the first place reflects the principle of humanistic concern, from construction, furniture, decoration, and other environmental design, operation procedure and vocational service such as the environment design, fully embodies all aspects of this principle. At present, the hotel management "people-oriented" has become a hotel industry trend.

Keywords Hotel management teaching · Higher vocational · People-oriented management philosophy

53.1 Introduction

"People-oriented" management philosophy has gained popularity for a while, where it has the effect in the modern enterprise management. The hotel industry is a typical industry in services. Both internal staff and external customers, "is its main elements". "People-oriented" management style of the hotel industry, of course, should be taken seriously. Land ethics, a new understanding of the "people",

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the introduction of enterprise management from environmental ethics [1]. In the new era and new requirements, proposed to the business management, so how to convert "people oriented" from the perspective of land ethics is a pressing the current problems [2].

53.2 Theories

53.2.1 People-Oriented

Early capitalism enterprises establish capital as the center. For profit maximization, capital is the major determinant. Once the money is converted into capital, it has characteristics of continuous movement to create a residual value [3, 4]. In addition, the competition is the basic characteristic of the market economy. The law of competition is the survival of the fittest. The company will develop high efficiency or they will be wiped out of the market. Such a competitive environment promotes every company which can hardly walk, to make more money, and fast money. The characteristics of management must take to "capital" for the "base". Schedule the capitalist mode of production, especially in 1950, in the person of the contribution of business increase productivity; forcing the enterprise to realize a person is more important is not physical capital. "Humanism" began to put up against "capitalism", and gradually replaced the "capitalism" dominant share of the enterprise. The human-oriented management style also arises at the historic moment. The management of the way reflects the modern commercial enterprise should be regarded as people itself, and not sees them as a factor of production or resources. Management should pay more attention to human physiology; Attention? Human feelings pay attention to the natural features. Therefore, strictly, it is with the person this of the word, "oriented" is in fact a philosophy in the sense of "basic" and "basic", "objective" mean, is a new type of the understanding of the nature of management philosophy of sense. The hotel industry is a type of service industry, in the management process; "person" will be more close relationship. Direct contact with the hotel interests, many influence factors of "man" is outstanding, the hotel management theory of the humanized management came to be. Hotel operation including two goals is in the management direction and external customers and employees [5]. Therefore, people-centered management theory in modern hotel reflects the people-oriented ideology, including customer satisfaction and employee satisfaction, the two meanings. Customer satisfaction is the ultimate goal of the operation of the hotel, "that is the core of" people-oriented theory in modern hotel management. Customer satisfaction is asked the hotel with the customers as the center, considers the needs of the customers based on the characteristics of the combined with the hotel itself, development business principles, the management decision, and through the proper expression and good communication with the customer agrees to or get recognition [6].

53.2.2 Land Ethics

American scholars Leo wave's "land ethic" complete "sand village yearbook (1947), is called the" new "bible" of modern environmental movement. The final paper of the book is "the earth ethics", Leo wave DE thinks, moral self-discipline freedom movement; this comes from slander and recognition: "man is a community interdependent part a member". Therefore, "ethical" land human role of conquerors community from the land conversion to ordinary citizens and member of the community. It means not only that respect each members, but also means that respect the community itself [7]. Hidden in this assertion is, Leo wave DE admits, though in a sense, people just ordinary members? The "biological community", but in another sense, they are the natural environment, and a huge technical ability, which made them very different from the other members. Power skills more powerful, also have been more and more need for the human civilization is affected by the "land ethics". The "land ethics" is intended to help survivors of the earth "from modern humans control technology". Because the earth only when we as a community, we belong to it, and we will come to you to love and respect it. The most original content in Leo wave's ethics is the land a whole socialist principle: "one thing, when it helps protect the integrity of the information community life, stability and beautiful, it is correct; on the contrary, it is wrong". There are three parts to build the theory of land structure moral:

1. The ecological view of nature. Leo wave see the earths of mountains, rivers, insects, fish, and flowers and trees as a living organism, men are also a part of. Leo's emphasis on the human species is wave of the relationship between the ecological system and natural environment. The ecological center point of view, humans and other than human biological in ecological overall organic coexistence, points out that the processing of the relationship between man and nature says long-term development direction of mankind.
2. The ecological whole theory of methodology. Leo wave to point out the decision in human's ecological activities only through anthropocentric approach is very dangerous, because the ecological methods are often neglected, and then ruled out a lot of those in the earth community members, they are not commercial value, but these members of the role of the progress of the land based ecosystems. Therefore, we must focus on all of the ecological system species and survival of the future of the long-term interests. We must put the harmonious, integrity, beautiful the ecological system and environmental protection is essential.
3. The ecological ethics. As ethical concept extension based on land ethics, not only human beings should be responsible for himself, is responsible for the seed, and should be more responsible for the whole biosphere. Therefore, the human behavior must comply with the interests of the whole biosphere. Realize the sustainable development of human and the development, human must set up the general principles ecological concept.

53.3 Conflicts and Relationship

"People-oriented" management and "capital-face the management" or material face the management is an obvious progress. Today, however, the further development of the society, when the conflict "land of moral", we must put this management idea need recently illustrations.

53.3.1 Conflict

(1) Emphasize "people" in the "people-oriented" management of hotel, on the one hand, means employees, on the other hand, means that customers, but we are easy to ignore the other part of the interests of the people, who is in the living environment, not walk without a walking stick and customers (including the reality of the customers and potential customers). In the operation of the hotel, with emphasis on the interests of the staff and customers are worth the promotion, but we must also consider other people who have not the realities of business value, in society and these members are based on social and ecological system. For example, "hogwash oil trade" and "no degradable waste discharge" is popular criticism some hotel. Some hotels for the interests of the customer that, publicly announced that they do not use "hogwash oil", but stood in their business status, sell it to use cooking oil illegal businessmen, on the one hand, and to increase their income, on the other hand, not hurt their own customer benefits. However, "edible oils" into the market affect the entire social environment. In order to facilitate customer packing food, save costs, some hotel provides customer the dissolution of the food containers, it in the surface in the interest of the customer, but sacrifices the overall interests of the society. In addition, some hotel noise pollution is hovering landing in the scenic area, etc.; the damage is not directly related items the interests of the people. The land not only their own ethical promote human responsibility, responsible for future generations, but is also responsible for the whole biosphere. At this point, it is wrong if we one-sided understanding of "people-oriented management" is to protect the interests of employees and customers. The hotel must take "human" as a part of the whole society, and not as a, and not a few or a group of people, but the whole human and its life environment. Realize the social responsibility of the enterprise is not only an involvement of all the expectations and requirements, but also the important cornerstone, causes the enterprise to enhance competitiveness of power, in order to achieve sustainable development. (2) Put too much emphasis on hotel management "human" interest, we often ignore the interest in the natural environment of the material. When people got tired of eating generally poultry, livestock, they begin to eat a variety of wild animals, and it has become a trend, and even is regarded as a sign of status. Under the guide of the so-called "people-oriented" concept, some hotel uses its best endeavors to promptly satisfy the interests of its clients. The deer bear, or

even the ant, the grasshopper, owls, snakes, mice and other ingredients have become hotel delicacy. Some hotels is even if the state to protect animals, such as the ant eater, swans and other hotel to attract customers. On the surface, is to provide a "customer satisfaction", the business is very good, and profit, more important is, do so "staff satisfaction" is easy. However, this "people-oriented", make the interests of "material" is a violation. It is known as "the graveyard of wild animals", the country's biggest wildlife trade market—wildlife market as the most popular place for the hotel. Have 30 kinds of snakes, more than 100 kinds of wild animals in the market trade, with an annual turnover of more than. More than half of the restaurant cook of wild animals, 60.9 % of the respondents claimed edible wild animals. Every year, in Shanghai restaurant cooks 1,000 tons of snakes; other local cooked about wild migratory birds—the ducks. Hainan wild bird's crazy killing in the province birds falling from the original 344–214 species, the number has been greatly reduced, and basically we can't see birds. Land ecological system is to promote ethics of the long-term benefit of all species and the prospect of survival. "It is with the person this" may not only meet the "people" who is their customers, especially the part of the population, doesn't it humanity as a whale's needs. It must consider the harmony of nature and the symbiosis between the species. This bad behavior also means that the punishment of the human nature. For example, animal easily spread disease, rabies, the mad cow disease; AIDS is spread by wild animals. In addition, the damage caused by food chain ecological disorders, humans will cause irreparable harm yourself. (3) Put too much emphasis on "people" interest in hotel management, we often ignore the overall interests of the organization, resulting in operation shortsighted. The system theory indicates that organism can run, from the whole to the order as it will often "stable state", which means different part of the overall balance. The hotel is a stable development the balance of the organization structure, balanced work load, tasks, and resource allocation, the balance of power, the quality of service of balance, the balance of group behavior and enterprise culture, balance of benefits. But the hotel is comprehensive organizations, as well as a more cooperative operation the organization's position. In addition, people in various aspects of the difference between, it is impossible to avoid conflict will lead to, between the individual and collective, between departments and the entire organization. So balance is easily broken. When the conflict, as an individual attention to the "people" is should not be high attention. In the practical management, especially some relationship-leader is not as task-leader, often to the "people-oriented" as the foundation of "human relationship management", and damage the balance of the organization. For example, the hotel work very flexible will have some free time. In addition, the operation of the hotel and peak is off-season. In the off-season, in the hotel work relatively free. In his spare time, if the hotel to the so-called "respect" to manage and use the laissez-faire attitude to staff, this is not good. In fact, respect doesn't mean laissez-faire, hotel employees should be in the interests of the whole respect and long-term perspective. If the hotel is a small ecological system as a whole, every employee behavior must meet the ecological system as a whole. In order to realize the sustainable development organization, we must

establish the overall interests. Create health organization, hotel must establish the concept of human dignity of every staff from the system, moral values, and to establish a proper relations between people, and limit speech and behavior. Leaders must show charm and example of the power of the interests of the protection and influence of the organization staff. (4) in the economic and social environment, the hotel management "people first" often make mistakes "everything in term of money". For example, in hotel management, establish the guest's classification and the VIP guest is consistent with the standard of 28 marketing principles (high customer, who is 20 % of customers, provide enterprise 80 % source of income). From one perspective, this is the express a humanized management, according to it differences between people, provide targeted service, VIP reception specifications should of course be different ordinary guests. Expressed special respect of important guests is natural thing to do. But if there is too much emphasis, make public in public and exaggerated, introduce other guests to query and even disgusted, this is equivalent to "put their eyes on money". In fact, consider different customers, providing personalized service is a contradiction, not equal treatment to customers. But smart hotel has a "face the management a more profound understanding of, each guest to offer the same emotional service, at the same time, attention, "quietly" reflects the characteristics of their personalized service. Land ethics don't deny that the interests of the priority of the existence of mankind, think the interests of human existence of other members should take precedence over any living things in the interests of the community to survive; Biological survival of other members of the community should give priority to the does not exist the interests of the people are interested in. According to this view, "people-oriented" management different treatments different people or group is not wrong, but when meeting interests, we must take account of the coordination between the different interests, or we will lose the basic principle of the "people". (5) hotel "people-oriented" management often face the dilemma of the interests of a conflict between the "employee" and "the customer". The hotel industry popular saying "the guest is always right"! This standard is obviously stood in the customer side of mankind. On the surface, employees lost it are with the person this treatment. At the same time, it seems to be a hotel with some of the "staff first, customer the second" principle. So, in practice, no matter how human scale operation, it never will be able to reach a balance these two interests. For example, during the Spring Festival, catering hotel is always associated with "shortage" on the one hand, there are many restaurant the demand of customers, on the other hand, have the feelings of the employees to go back home. The hotel is difficult to reconcile the two; another example, some guests as low quality behavior and beat the employee, how to protect the interests of employees, how to achieve this customer demand. "It is with the person this" facing difficulties this final customers or employees is the most basic. In fact, the land ethical theory has clearly told us, the so-called balance should be comprehensive and long-term, should be a dynamic equilibrium. This balance is not after the interests of the local cannot restore temporary imbalance. We can't use "people-standard" principle to simply analyzed the temporary don't balance, and the negative humanistic management.

The real people-oriented management is to balance through a series of management skills, for instance, some hotels in the "guests first" the principle, set up internal "resentment award" to balance employee psychology; this is a kind of dynamic adjustment.

53.3.2 Relationship

The moral is rooted in human emotion, not reason "contract" rational basis. Harmonious and constantly create products for human needs is the nature of the business management. In this, the "land ethic" and "man-oriented" is consistent, the common purpose is to satisfy the interests of the final human. But the premise must is all part of the ecological community interest coordination and the overall interests of the maintenance. Despite the different point of view, both of which can be described as the same thing.

53.4 Conclusions

In the commercial practice, people-centered management theory has become the mainstream. But with the development of society, as more of the environmental problems constantly, humans began to examine his own the path of sustainable development. The scope of management moral must also be extended to the whole of nature, but is not limited to human society itself. At this point, people face the management must also-to know because land and ethical conflicts. In the people-oriented, "person" is by no means an isolated individuals or groups, but the whole "social" social system structure. We must put "person" as a whole "natural people". The social system is built on the foundation of human beings, it is same, in huge natural system. So when respect human social attribute, we also must consider human natural attributes. We must put the "people" as a whole "ecological". This concept of "society" and "natural people just" reflects the human nature in the leading position in the land of ethical principles. For all to humans, natural resources and species and fear, then "people" of the whole human is only a person, conform and natural symbiosis and sustainable development. People-centered management theory is the direction of the hotel operation; it is the trend of the development of modern hotel management, it and the people from the "tools" and "use object" to "enterprise unit" reflects the modern society, respect for human rights and the pursuit of harmony. The land management of the ethical theory, standing in the higher ethical view in person, it will the people as from the "social people" to "ecological cell", reflect the sustainable development of the human society and the harmonious coexistence of human and nature species.

Because of different points of view, they will have conflict, but this development is the eternal theme, the ultimate goal, both are "people", is how to make "person" sustainable benefits.

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Chapter 54
Practice-Based Characteristic Examination Methods of Students in Independent College

Hong Yan Liu

Abstract Completion of the teaching objectives and the realization of the teaching effectiveness are tested through the examination of the course, so it is critical to reform the assessment methods in the teaching reform. Practice of reform for the assessment methods of Sports English major course of the independent college are focused on this paper. It makes an in-depth discussion on the main features of the process of assessment and the capacity evaluation of students in their learning assessment process, in order to promote the development of the educational reform of the independent institute.

Keywords Sports-English · Ability cultivation · Characteristic examination

54.1 Introduction

"National education reform and development of long-term planning programs (2010–2020)" has put forward on the quality of education reform that, "Improve the evaluation of education and teaching. Explore a variety of evaluation methods to promote students' development and motivate students to be upbeat, independent, self-reliant, and strive to become a talent". It can be seen scientific and rational assessment of education can stimulate the entrepreneurial spirit of students, and improve students' confidence. "Education Plan" stresses to improve and enrich the evaluation methods and play a good education evaluation role for the student to get develop their functions, which has a very practical significance. The education quality evaluation methods are so specific deep into the school teaching practice. It acts as one of the organic part of the education examination. Scientific methods

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of examination is to establish the advanced ideas of education, set a reasonable course content, implement quality education, improve the efficiency of classroom, and plays a role in promoting the efficiency of the classroom teaching [1]. The promotion role cannot be underestimated. The independent institute is to train applicable talents that reflect the characteristics of independent colleges.

After a long-term teaching practice, some professional assessment has been made to the independent college. They focus on the Sports-English and attempt at reformation. They want to evaluate the teaching effect of Sports-English major from a comprehensive, systematic, and impartial evaluation manner and make systematic planning from the effect of sports teaching. The English professional planning system is also making its systematic planning in terms of the test content, the form, the management evaluation system, and so on [2]. They have designed a set of evaluation methods that are relatively complete, practical, and able to give full play to the exam functions and reflect the characteristics of the assessment. In order to promote the course of the independent institute's overall reform, promote the depth and lateral extension.

54.2 The Guidance Ideas of the Characteristic Examination Method

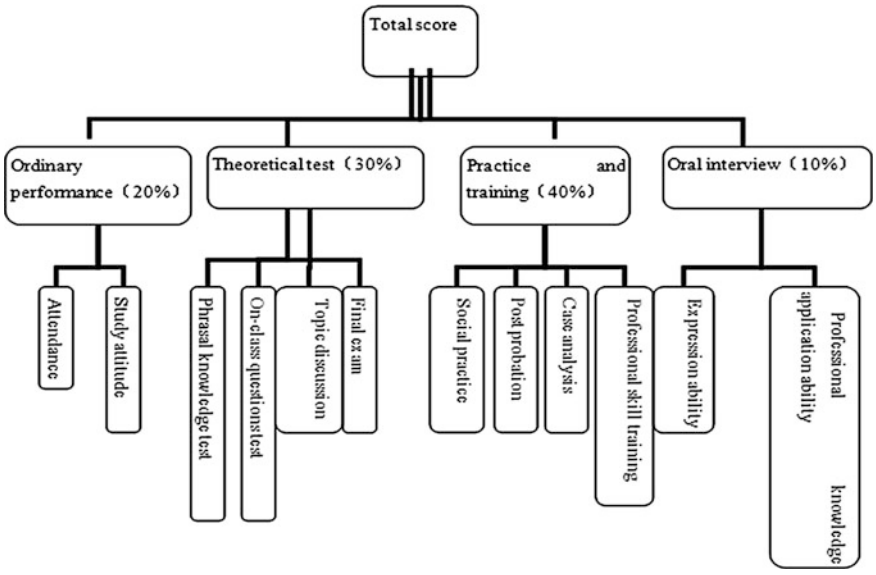
Due to the inertia of thinking, the examination system of the independent school is often copied from its alma mater mode. However, the independent colleges act as the private college [3]. There is still a large difference in terms of faculty hardware and software basis of students' quality. In the teaching practice, many independent colleges have also recognized this, but they lack of innovation in the improvement process. And some simply reduce the requirements on the basis of its alma mater exam trouble. As a result, they go to another misunderstanding. In this way, the level of teaching exam cannot achieve the higher education requirements. The examination way of the independent school is still biased toward the closed book written exam. The examinations are thought about by the classroom teachers. The proposition teachers are mostly doing everything by rules. They show little initiative, handling all matters strictly by the book. The examination way of the independent college still stresses to the request for test, and the test is done by the teachers' proposition [4]. Most of the proposition teachers seek ease in examination way. The content of knowledge covers the intellectual coverage. The content is out of date. They could not keep up with age. They lack innovation in the structure of the paper. The objective memory test accounts for a bigger chunk of the examination. There would be a valuation of student ability and the evaluation plays less attention to subjective items, and the test effect is not good.

Therefore, we put our focus mainly on the evaluation of the ability to listen and speak English. Adhere to the skill examination as the main line, "Theoretical knowledge for sufficient degree and hands-on skills to work for the post" can be

taken as the principle. Highlight the basic theory knowledge and make analysis and solve the problems. Make planning and practical skills and language expression appraisal of comprehensive capability [5]. Achieve "noble moral quality, the healthy physical and psychological quality, enough theoretical knowledge, and strong hands ability". Taking these as the purpose, form the evaluation system with the characteristics of the whole course openness, diversification, specialty, and with the core of the ability examination.

54.3 The Examination Manner of the Characteristic Examination Method

In the whole assessment system, the usual and final inspection should be combined. The theoretical examination and the skills assessment should be combined. Oral and written examination should be combined. The comprehensive subject and the single subject should be combined. Open book and closed questionnaire should be combined. The concrete structure is as follows:



54.3.1 Knowledge Inspection

Theory knowledge inspection is based on professional course knowledge and their key points and difficulties points. In addition, this includes the requirements and the characteristics of their course arrangement. The organization and

implementation assessment can also be paid attention. Highlight the ability to learn the basic theoretical knowledge and the degree of students learning in their process of evaluation.

54.3.1.1 Phased Test

Phased tests along with the hall questions test and the examination content discussion adopt various flexible methods in the assessment process. That is to say, the instance to undertake the requirement to ask the teacher to make a detailed examination of the theory and the project content and the specific implementation schedule. Moreover, the text document record should be kept. Phased tests are taken once a every month. The hall test is taken every 2 weeks and at last the topic discussion is taken once a month.

54.3.1.2 Final Test

The final is the comprehensive analysis of the subjective topic primarily. Open book examination is adopted to make the open assessment. Within 2 weeks before the exam, some examination papers will be issued for the students. One cannot find the correct answer in the professional textbooks. Inspire students to make the data access and read books [6]. Actively think the problems and make a research on them from a passive attitude to an active one.

54.3.2 Ability Inspection

Ability test link has completely abandoned the paper and pencil test paper form. It makes use of the simulated situation assessment, project design evaluation, and social practice examination. Three ways are combined.

54.3.2.1 Simulation Situation Assessment

In every professional Sports-English major, any English course involved, the key lies in the ability to listen and speak. The assessment requires every student to speak not less than 10 sentences of english dialog who attends the assessment in the performance process. The content of the show must be combined with sports knowledge. The content of the show must have certain scenarios of the stories. And the performance time shall be not less than 15 min. At the same time, the kind of items and performance by the participants in the assessment of the scene should be designed by the students themselves.

Through the simulation situation assessment, the students' sports knowledge and their English conversation ability have already been examined. At the same time, the team spirit of the students, the practical ability, and the creative ability have been cultivated as well. In addition, because the content of assessment itself a performance, it is a well chance for a students to show his opportunity to the teacher. Therefore, in terms of the assessment effect, every student is very serious when they are preparing, and they are filled with enthusiasm.

54.3.2.2 Program Design Assessment

In addition to learning the English professional , the necessary sports knowledge should be grasped as well. For example, one should still have to master relevant sports knowledge, like the overview of sports, sports industry, sports marketing, sports facilities, sports events, and so on. For those specialized courses, we take the project design such as the sports marketing, the comprehensive assessment of sports facilities, and the project assessment. According to what they have mastered in sports knowledge, they can select a kind of sports facilities and introduce to teachers and do marketing. In this process, the teacher may ask some of the random question according to the student introduction. And the students who participate in the assessment should both introduce clearly the sports facilities, and make use of the learnt knowledge of sports marketing skills. They should persuade the teachers who act as their clients. Moreover, in the examination of the sports events, the students are requested to be independent in planning one or more sports games.

54.3.2.3 Social Practice Assessment

The final purpose of learning is the transformation of knowledge to ability. Social practice assessment requires the students to use the spare time directly and enter into relevant sports industries. In this way, they are able to realize the education and employment in zero distance.

54.4 The Evaluation Standard of the Characteristic Examination Method

Due to the fact that what characteristics of the assessment approach emphasize the skill examination, in the inspection process, the following evaluation standards should be grasped:

54.4.1 Subjectivity Standard

That is to say, in the inspection of each link, what are being stressed and respected are the students' autonomy, initiative, and creativity. Provide students with thinking research and creative time and space with the maximum limitation. In addition, guide students to be able to grasp the following four abilities: they are able to learn; they are able to plan; they are able to design, and they are able to create.

54.4.2 Team Standard

That is to say, the assessment process should be treated as the interactive process and emotional communication process between the teacher students so that they can do information transmission. Also, the assessment process should be treated as the interactive process and emotional communication process among the students. Through the "team planning and design", with "project team" as the basic form and take the cooperative activity among team members as the main body; take the completion of the group program as the main object and take the overall level of the main target group as the examination form. In this way, create a good atmosphere of cooperation for the students.

54.4.3 Experiment Standard

That is to say, always make sure that every student has innovation potential and the thinking spark. Actively encourage the students to explore new ideas with all kinds of new methods. In the inspection process, construct and optimize the student psychology situation and the shape the incentive mechanism of the students' success imagery. In this way, cause the student to obtain the successful emotional experience and enable them to try and pursue new success.

54.4.4 Process Standard

Namely, establish and promote students' all-round development of potential and develop the evaluation system. We should not only pay attention to summarizing evaluation, but also take the formative evaluation. We should not only have to pay attention to the evaluation of the core knowledge, but also pay attention to the evaluation that comes with knowledge. We should as well attach great importance to study the basic theoretical knowledge. More importantly, we want to notice and examine the innovation consciousness of students, and their cooperation spirit and the practice ability.

Independent college should give full play to the organizer and the investors and put weight on both of their advantages. Prominent characteristics of their training should be highlighted. Cultivate talents that are of the application and innovation types and who have a relatively good theoretical basis. Independent college exam should also highlight such ideas and go in its way. In the test design, one should reduce too hard thinking but to practice. Take human beings as the principle. The examination shall be promoted to become a promotion to the teaching. Urge the educational reform. Motivate the style of study vane, instead of the utilitarian and examination baton. In the exam management, work and establish the accurate orientation and seek truth from fact. It is the human-orientation idea this exam management mode is paid attention to. Create democratic, equal, and educational environment achieve the highly emotional agreement behavior of the administrators and the managers.. Finally, realize scientific management, set up the teachers' and students' life-long learning ideas. In this way, both the teachers and students are constantly improving their comprehensive ability.

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Chapter 55
Study on Teaching Methods Between NIT and VUW

Shuying Liu

Abstract This paper first describes the current teaching at Nanyang Institute of Technology (NIT) in China, and then uses a set of Wh-Questions to evaluate the teaching methods within NIT by comparative analysis with teaching methods at Victoria University of Wellington (VUW). In light of the learning opportunities, the paper finally puts forward the strategies to change the current teaching state and teacher training at NIT in order to improve the quality of teaching.

Keywords Teaching methods · Teacher training · Evaluation

55.1 The Current Teaching at NIT

There are 40 students in a class at NIT. One teacher is usually in charge with two or three courses in different classes in a whole semester with certain textbooks. So a teacher has to teach various courses in different classes for four or six hours every day. Simultaneously, the students sit quietly to listen to lectures without raising questions while they take notes. It means the teacher crams English grammar, vocabularies, reading skills, listening skills and examination skills to the students. They have to passively accept what the teacher gives. During the whole teaching process, the teacher is a speaker to convey information to the students, without any feedback from the students [1].

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55.2 Observation Teaching at VUW

There are 15 students in every class. Two teachers are in charge with one class. According to students' level, teachers adopt different guidelines to teach the students. In the class, the teacher gives the students adequate time and flexible activities to practice. After class, homework helps the students accumulate information and, finally the teacher sets up their own perspective by using what the students have learned. It means the teachers and the students regard the class as a placed to obtain knowledge. Of course, the teachers and the students regularly get feedback. It helps the teacher know students' deficiencies in learning and the teachers can change his or her teaching activity immediately so that the students can improve their learning ability as soon as possible [2].

55.3 Evaluation on Teaching in the Class at NIT with a Set of Wh-Questions

Teaching in the NIT classroom is to create the environment for students who can easily convey their ideas. In order to evaluate teaching in the classroom at NIT, I use a set of Wh-Questions (why, who for, who, what, how, and when) to guide the evaluation [3].

55.3.1 What is the Purpose of Doing the Evaluation in the First Place

The aim of an evaluation is to design teacher strategies to reduce teachers' burden in teaching, design good strategies for training teachers and to improve the quality of teaching.

55.3.2 Who Among the Stakeholders Want to Know the Value of What is Being Done?

This information will be valuable for the administrators. This will help them design better teaching programmers, the administrator is able to value what is being done, and seeks solutions. As well, the teachers' purpose is to foster students by improving the quality of teaching. They should be concerned about strategies to improve their classroom practice when teaching [4].

55.3.3 Who Should Carry Out the Evaluation?

The evaluation must be undertaken by an insider, such as an administrator, teachers, and students.

From teachers and students' feedback, the administrator knows their reflection on each other, and then he or she gives them fair evaluations. So the teachers know how to change the teaching plan or how to negotiate with the students. The students are likely to realize their weakness and strength in learning. After reflection and negotiation, both of them can cooperate with each other well in the classroom. During the teaching process in the classroom, they are going to evaluate each other again until the administrator and the teacher find out new solutions [5].

55.3.4 What Exactly is Being Evaluated?

The teaching process is the main aspect being evaluated. The whole teaching process shows how the teacher guides the students to do activities in the classroom, how the teacher gives the feedback to the students and, whether the feedback is proper for the students, and so on.

55.3.5 How will the What be Evaluated?

Three types of evaluation tools will be used. They are tests, questionnaires, and observation. Test easily offers outcomes of learning to the administrator and the teacher. By analyzing outcomes, deficiencies are found during learning process. Questionnaires help the administrator know what teachers and students think about. From the students' reaction in the class the teacher knows whether they are interested in the class or not, and we still know whether they can catch what the teacher said or not [6].

55.3.6 When will the Evaluation Take Place?

The evaluation will take place at the end of the lesson. When the lesson is finished, the administrator is able to analyze the feedback to evaluate the whole teaching process. Then the proper strategies can be designed to assist with teaching and teacher training. Ultimately the quality of teaching will be improved.

55.4 Comparative Analysis by Evaluation

By observing teaching, teaching management at NIT is not prescriptive and strict. Teachers do not prepare for the lesson well because they undertake two or three courses at a time. The teachers have no time to design various activities in the classroom. They have no chance to have a meeting, in which they can exchange their teaching methods and, negotiate how they will do better than before to remedy their teaching weaknesses. Without financial support, the teachers are unwilling to improve their teaching methods and renew their old teaching concepts and knowledge. Furthermore, traditional study habits in China are give-and-accept between teachers and students. The students seldom ask questions to the teachers unless they think their questions are worth raising. That is, the teachers and the students have almost no communication. It is impossible for the teachers and the students to get regular feedback from each other, even if they have examinations, which is a way to give students a score. Last but not least, the amount of students in one class is so large. There are only 15 students in the class, just like a kind of tutorial, which is easy for teachers to manage a class. Whereas, there are 40 students in a class at NIT, obviously it is harder for teachers to teach those [7].

55.5 Changes in Teaching at NIT

55.5.1 Reduce Teachers' Burden in Teaching

To reduce the NIT teachers' burden the large class has to be divided into small classes the same as tutorials at VUW. The tutorial's function is not to instruct, but to set the students the task of expressing his thought articulately, and then to assist them in subjecting their creation to critical examination and reconstructing it. The tutor is not expected to have a specialist's knowledge of all the facts of the students' course, but he or she must know where the facts are to be found and how to handle them (Moore 1968). So senior students are hired as tutors to help lecturers fulfill the teaching purpose. In this way, the shortage of teaches at NIT is tackled. Of course, it is important to give the teachers more financial support in teaching to attract high quality teachers.

55.5.2 Teacher Strategies

The classroom actions taken by teachers were experienced by students. The teachers at VUW create learning opportunities for the students by effective learning activities, and enable the students to incorporate their capacities and interpretations with their interests, preferences and enthusiasms.

There are two steps to carry out ideal teaching at NIT. One is interactive teaching. The teacher integrates knowledge of students with proactive plans, places the main emphasis on preset learning goals and the demands of the curriculum. Another is reactive teaching (Cooper and McIntgre 1996). Teachers evolve plans more directly from their knowledge of students. The teachers are willing to adjust learning objectives in order to cater for the student's interests and intention. In this stage, the teacher's thinking and actions are explicitly directed towards the achievement of a close match between lesson activity and student interests.

The teachers should use the classroom as a stage. They are themselves directors to create different real life situations as learning opportunities. The students are actors who use simple words and simple sentences to perform on the stage. After they are able to fluently use language in listening and speaking, it is better for them to learn the complexity.

Lastly, In China, most teaching materials are more complicated than the VUW ones. If possible, the teachers at NIT should have the right to choose teaching materials according to their need. Simple and interesting teaching materials facilitate the teachers to teach and the students to learn.

55.5.3 Teacher Training

Teachers have not only to assist students to make use of knowledge from a variety of sources, but also to check its significance and credibility by their own knowledge. So the teachers need the dynamic skills which they attempt to foster in their students. They are demanded to have good personalities and abilities to confidently communicate with students. Teacher training is a big problem at NIT, professional teachers need to be further developed.

1. Innovations move along the social network of personal acquaintance.

Education is important to stimulate communication among teachers, so that they exchange experience and advance each other's thinking. The teachers need to be regularly sent for further study at domestic or abroad universities. In this way the teachers can increasingly renew their knowledge and thinking.

2. Innovations in complex situations cannot be cloned.

Any substantial innovation must allow teachers to identify with it in a personal sense, to modify it in particular ways, so that it becomes their own, not merely a copy of somebody else's developments. The teachers should be given more space to create their teaching ideas.

3. Cooperation development between teachers and students.

Teachers have to be prepared to create learning opportunities which are considered to be useful for the future, but valid for the present. Problems in the

interaction between teachers and students can often be explained by this clash of a "negotiation culture with a Command culture", because of the teacher's traditional position and students' study behavior. The teachers are able to negotiate with their students to learning activities. The teachers and the students will co-operate continuously on determining the objectives.

4. Exploit new technology

Increasingly, knowledge can also be gained outside school, and information technology is likely to play an ever greater role. There are implications for the teacher's role. They have to develop a new self-understanding, as facilitators and mediators of their students' interactions with a variety of human and material resources.

There are distinct differences between teaching at NIY which is lecture based to the VUW programmer which is more interactive and student-centered. As teaching is a cross-cultural experience, confident communication skills and well prepared resources are essential.

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Chapter 56
Research on the Academic Burnout of Chinese University Students

Shiguang Ni, Haiying Ma and Hong Li

Abstract 439 college students were assessed with The Undergraduates learning Feelings Questionnaire in terms of the traits, causes, and educational advises of academic burnout. The results indicated that: (1) The traits of academic burnout were negative attitudes and behaviors, emotional exhaustion, and reduced efficacy. (2) Precursors to college student burnout were learning interest, negative dispositional traits, motivation, course load, stress, and the school factors. (3) Prevention on the burnout would be innovation management and service, teaching system reform, and personal change.

Keywords College students · Academic burnout · Precursors · Quantitative method · Constant comparison method

56.1 Introduction

Academic burnout has been a popular topic of research in psychology and associated disciplines in the past three decades, which caused more and more attention all over the world. The term academic burnout refers to a state of emotional exhaustion, a tendency towards depersonalization, and a feeling of low personal accomplishment among students especially college or university students.

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An investigation of 1,317 Chinese university students discovered that about 23.4 % was in academic burnout, only 4 % was severely one [1]. Academic burnout may lead to mental distress in the form of anxiety, depression, frustration, hostility or fear. In a word, Burnout is always more likely when there is a major mismatch between the nature of the study and the nature of the person who does the study.

Because the core task of Higher Education is talent cultivation, learning problems during the period of students' college lives has been playing a more important role in college educational quality and students psychological development. There are two kinds of research perspectives, respectively, one of which is macro-research perspective. Researchers of the Education Science focus on the evaluation of college educational quality by assessing the process of students' learning. For example, National Student Engagement Survey are generally used by colleges and universities in USA and China to estimate the quality of students' learning processes, which aims at improving the process and effect of students' study by influencing the policy development of university [2]. Meanwhile, micro-research perspective is usually submitted by Psychologists who focus their attention on students' mentalities and behaviors, especially negative and inefficient psychological learning factors. Academic burnout has provided a favorable theory frame to argue those factors. It has been a hot topic to explore the mechanism of burnout, then to improve students' academic engagement by applying efficient intervention methods.

Factors that lead to academic burnout and possible ways to deal with it have been widely discussed in the literature. Academic burnout origin in the study of job burnout, especially definition of burnout of Maslach and Maslach Burnout Inventory (MBI) widespread applied in learning situation [3]. Maslach et al. [4] measure burnout in three dimensions: Emotional Exhaustion, Depersonalization, and Personal Accomplishment. Most researchers view academic burnout as a comprehensive syndrome of physical and psychological exhaustion, stress, depression, even frustration. If these feelings are not recovered, physical and psychological resources of students would be used up. Most of prior researches used quantitative methods such as questionnaire or mental scale to explore the relationship between burnout and personal and situational influencing factors. For instance, a quantitative investigation from American researchers predict that course load is the most important environmental factor resulting in academic burnout, which was verified by a qualitative research from European experts [5, 6]. However, we find that learning interest and motivation plays the most important role in the process of burnout of Chinese undergraduates.

The chief aim of this work is to investigate the features and causes of academic burnout of Chinese undergraduates using methods combined quantification with qualification. So, is it really different antecedents of academic burnout between Chinese and European and American students? How to test and verify the causes of academic burnout? There are no methods combining quantification with qualification to explore the nature of burnout in China, which can help us to explore the expressions and causes of college students' academic burnout integrally and systematically.

56.2 Method and Subjects

56.2.1 Questionnaire

The data for the study were obtained from a survey instrument designed by the author to examine burnout and related factors.

The questionnaire consists of three parts. The first part demographic information, while the second part is the quantitative tools of the questionnaire-MBI which offer three indicators emotional exhaustion, negative attitude, and low personal accomplishment to measure burnout [7]. The third part is the qualitative tools—the students feeling of learning questionnaire, which include open items, such as explain or define the academic burnout, did you ever experience the academic burnout, and what's the symptom. The survey went through multiple iterations and was pre-tested by three experts and four faculty colleagues.

56.2.2 Interview

Deep qualitative interviews are implemented during the survey process. Eight interviewees are from Harbin Institute of Technology at Weihai, Shandong University and Beijing University of Posts and Telecommunications, which are sophomore and junior. The outline of the interview is based on the third part of the questionnaire.

56.2.3 Subjects

The sample was composed of 439 Chinese university students. The sample included 267 male and 169 female. The number of freshmen is 159, sophomore is 89, with 132 juniors and 30 seniors. They were from five key universities, which consist of Beijing Normal University, Beijing University of Posts and Telecommunications, Harbin Institute of Technology at Weihai, Shandong University and Shandong University at Weihai. The specialty distributed in Accounting, Vehicle engineering, Mechanical design and automation, Computer science and technology, Chinese language, and Literature and psychology.

56.2.4 Procedure

The quantitative data from the second part of questionnaire was analyzed by SPSS13.0 and Amos4.0. Meanwhile, Grounded theory was used to explore the

qualitative data from the third part of questionnaire and the interview, which the constant comparison method was used. The steps are following; first, we classify the data based on concept and the kind of question, then we integrate the concept, conclude raw opinion. Last we develop and describe the theory.

To ensure the coding credibility, 20 % of the questionnaire (72 from 439) was analyzed by an expert who did not know the purpose of the research, then he put the information into the already existing classes, which could ensure 95 % confidence level in the academic burnout analyzed process.

56.3 Statistical Analysis

56.3.1 Negative and Inefficient are the Typical Characteristics of Burnout

Table 56.1 gives descriptive statistics of the respondents by the qualitative data of the third part of questionnaire. 334 students (about 80.7 %) feel they are in trouble with burnout, though 96 students (19.3 %) have no trouble in learning. There are three dimensions of academic burnout:

Negative attitude and behavior manifest as indifferent or negative attitude towards learning, as well as passive and low efficient learning behavior. Some students conclude:

> I am easy to follow God and doze off in class or do something unrelated to learning. No hope, nothing interesting.

> I want to go vacation. Just play the phone or play games instead.

Passive feelings. Show a lack of enthusiasm, emotional emptiness, slack, physical fatigue, accompanied by a strong sense of frustration and anxiety, some students think:

> Usually, I have nothing to do and confused about the future. I feel empty and depressed.

> I feel sorry for not learning, and become very regret. I couldn't feel the joy came from learning.

Low personal accomplishment. Have low self-confidence and low self-evaluation, feeling helpless. Only 9.1 % of the frequency can be summed up in this dimension. Some students talk:

Table 56.1 Descriptive characteristics of academic burnout

No.	Characteristics of burnout	Frequency	Percentage (%)
1	Negative attitude and behavior	277	55.6
2	Passive feelings	176	35.3
3	Low personal accomplishment	45	9.1

I have already lost confidence in English completely.

I doubt about the practical use of what I learn. I am not a good student, knowing that I spend my parents' money while dawdling here.

56.3.2 Significant Polarization: Coexistence of Burnout and Engagement

We use the theoretical median to measure the degree of academic burnout. Let burnout score, whose total score is 56 (total score average is 4), as a detection standard whether students experience burnout. The total score is 46.85 ± 12.55, with detection rate of 22.7 % (as shown in Table 56.2). Students whose average is 4–5 accounts for 18.9 %, while the ones whose total average score 5–6 and 6–7 respectively, account for 3.4 and 0.4 % of the total. This suggests that just a few students "every day" or "several times a week" experience burnout, and the students "once a week" experience burnout take up a small part.

Table 56.2 shows that burnout total averages score 1–2 accounts for 7.3 %, never experience burnout feeling. While those who score between 2 and 3 accounts for 25.5 %. In fact, the frequency and extent of fatigue these students is very low, Most of their learning time is the opposite of burnout academic engagement. These students can focus on learning and experience the feeling of pleasure. They can dedicate themselves to learning with full enthusiasm, and have the courage to accept challenge.

56.3.3 Lack of Learning Interest and Motivation are the Primary Causes of Burnout of College Students

The qualitative data focuses on four dimensions according to the frequency as in Table 56.3.

Learning interest and motivation. Mainly refers to the students lost interest in learning or doubt the employment prospects of their specialty; students lack or have no motivation even no explicit learning goal. This factor, accounted for nearly 60 % of the overall, is the primary cause. Students conclude that:

I suspect the employment prospects of our major and disinterest to talk about it.

Table 56.2 Distribution of total score average of students burnout

Total score of academic burnout	1–2	2–3	3–4	4–5	5–6	6–7
Frequency	32	112	195	83	15	2
Percentage (%)	7.3 %	25.5 %	44.4 %	18.9 %	3.4 %	0.4 %

Table 56.3 Causes of academic burnout

No.	Causes of burnout	Frequency	Percentage (%)
1	Learning interest and motivation	256	57.3
2	Negative personality	94	21.0
3	University factors	52	11.6
4	Course load	45	10.1

There seems no relationship between what we learn and the future society.

Mechanical as it is, learning is step-by-step. I don't know what to do in the future. No desire to learn and no power to move on.

Negative personality. Mainly refers to students are negative and undisciplined, poor self-control and easy to external attribution, poor learning management capacity and other negative personality traits. They think:

I can't resist that much temptation outside of learning.

Slack in study, a negative attitude, and my inexertion.

No reasonable learning arrangements, nor good life planning.

University factors. Mainly refers to the bad curriculum schedule, irrational teaching methods, teachers' low levels and other factors. Some students held the view:

Our teachers' professional capacity is on a low level, lectures are not attractive, you know to read the PPT, the examination or test pre-drawn subject

It's no meaning because of outdated curriculum and every teacher use textbooks they written

Course load. Mainly refers to students cannot cope with the numerous lessons and homework in a short period of time, and learning brings students continuous negative stress. Students said:

Learning burden is too heavy, and there is too much homework.

Learning brings me great pressure and makes me out of breath.

We find that learning interest and motivation and negative personality are individual factors, these factors account for the 78.3 % of overall. University factors and course load are situational factors, these factors take up only 21.7 %. This is different from the causes of academic burnout in Western students, in which course load rank the first.

56.3.4 Reform of Teaching and Learning is the Main Countermeasure to Help Students

The countermeasures in students' minds can be summarized as the three dimensions shown in Table 56.4.

Improvement of education management. Mainly refers to the provision of productive and efficient professional education, and convenient management and regulating professional services. Students to summarize as:

> Plan for a variety of activities, such as professional seminars, motivational lectures, and professional exchanging meeting.
>
> Reduce boring meeting, and increase the amount of scholarships and award-winning ratio.

Teaching Reform. Mainly refers to deepening the reform of the teaching program, building professional framework which is reasonable and meet the characteristics of professional goals, besides, the reform of the examination system is also needed.

> Setting curriculum according to the needs of the community, and enhance interest and interactive in lectures.
>
> The final exam tends to be objective, thorough. Curriculum time and examination should be arranged reasonably.

Enhancement of students' capacity. Mainly refers to the burnout students' self-introspection and self-management, action to promote change. Students think that:

> Learn to seek professional help, let better ones to help themselves.
>
> Don't make excuse for depravity, and manage ourselves well.

We generally believe that students of burnout is the result of their own "Fallen", then the best way to solve the problem is the change and promotion of students' individual level. However, students believe that the more innovative aspects of the educational aspects of the curriculum, teaching methods, assessment methods will bring the students burnout more help, this is coincide with learning interest and motivation are the main causes of burnout point of view remained the same as mentioned in preamble.

Table 56.4 Intervention methods for academic burnout

No.	Countermeasures	Frequency	Percentage (%)
1	Improvement of education management	153	41.1
2	Teaching reform	144	38.7
3	Enhancement of students' capacity	75	20.2

56.4 Discussion and Analysis

In this study, academic burnout problems have been reviewed by the method of qualitative and quantitative analysis; studies have confirmed the characteristics of academic burnout and its causes to sum up the similarity and difference between the domestic and foreign student.

56.4.1 Characteristics of Academic Burnout

According to the MBI series scale, existing research mainly adopts questionnaire survey method and investigation method to reveal a three-dimensional stability structure of burnout. Further evidence have been provide for three-dimensional stability structure of burnout and also improved the ecological validity because the academic burnout characteristics and three dimensions of structure are similar revealed by our qualitative research. Furthermore, we find what the difference between academic burnout and work burnout is that academic burnout will not cause alienation with classmate or teacher, in other words, the Non-humanization of Psychology.

There are 80.7 % student said that they ever have the feeling of the academic burnout, which reflect that the negative learning intention is popular in academic. But we can't judge the seriousness of the academic burnout in a rush consider that It's a problem of yes or no. Our quantitative research confirmed our speculation that although 22.7 % student suffer the academic burnout but only 3.8 % are severely.

56.4.2 Antecedents of Academic Burnout

Academic interest and motivation, negative personality is the individual factors accounting for 78.3 % of the proportion of the total. Assignment overload and school environment is the situation factors accounts for only 11.7 %. It seems that student with special psychological characteristics tend to suffer academic burnout as the negative reaction toward the academic environment, It's the effect of individual and environmental factors. However, in the same time western research found that assignment overload and the outside influences is the main effect of academic burnout external factors. Although there are several similarity between Chinese and foreign students' academic burnout characteristic, there are some difference of the cause, more likely to have relation with the education system and teaching habits, students' background, or even cultural background.

56.4.3 School Education Countermeasures About Burnout

China's higher education has reached a popular stage of development, and continuous expanding of university led to the current situation that student's employment problem is getting more and more severe. At the same time students pay more attention to the their major's employment prospect, This guides people to learn "utilitarian" and "immediatelization" values if the Curriculum and social practice relate well and if the knowledge applies to future employment. So reform countermeasures are put forward for teaching link—especially hope schools can update training goal, and connect course goals with practical needs.

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Chapter 57
Research on Financial Management Connotation of Colleges and Universities Based on Management Innovation

Li Liu

Abstract With the development of the reformation of China's higher education system, the operation scale of university capital continues to expand. The economic activity of colleges presents a diverse and complex trend. College financial environment has undergone major changes as well. The original internal financial management of university cannot fully adapt to the new situation. How the financial management, which is an important part of the interior management of colleges, can be given new meanings and thus adapt to the requirements of the times, comply with the university development needs is worthy of further inquiry. This paper combines with the operation management philosophy of foreign universities. It is the present study of the financial management connotation of universities in our country. In addition, it puts forward some operation and management innovation ideas of their own universities.

Keywords University and college · Financial management · Operation · Innovation · Connotation

57.1 Introduction

University financial management is an important part of the university management. It covers work such as funds raise, allocation, using, settlement, supervision, and effectiveness assessment of colleges and universities [1]. At present, domestic scholars make researches which focus on college funds and investment

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diversification, college financial internal control mechanism, the university budget management reform, the state-owned assets supervision and the financial accounting system, the college financial performance evaluation, the financial risks and early warning, and so on [2]. These studies are important for the promotion of financial system reform and financial management innovation of China's colleges and universities, but there are also some problems such as: the target is not clear; the analysis system is inadequate and so on [3]. All of these need further research and discussion.

57.2 The Financial Management Ideas of Universities and Colleges in Foreign Countries

Throughout the financial management model of foreign universities, this paper takes the United Kingdom and the United States as examples. The United Kingdom and the United States are two countries that are doing the most successful work on higher education in the world. The analysis of the university financial management experience and features of these two countries has a very important guiding significance to the perfection of the university financial management connotation in our country.

As the country with the largest higher education scale in the world, the United States attaches great importance to the investment in higher education. The U.S. federal government puts an annual budget of higher education as the highest priority. In general, government funding accounts for half of the university income. American universities have also created a very flexible and extensive fund-raising channel, which has provided a financial guarantee for the development of American colleges and universities.

The financial management model of U.S. colleges and universities can be summarized as centralized management and decentralized management, which are two typical patterns. The centralized financial management system facilitates centralized management of funds in schools and is also convenient for the government unified leadership so as to get a comprehensive plan for the development of schools. However, it is not conducive to change the budget management, fund collection and expenditure control of the colleges and universities. Decentralized financial management system facilitates the colleges and universities to work with full enthusiasm, but it does not help the university's centralized management and is unbeneficial for the unified planning and development. U.S. colleges and universities implement an overall budget of university financial management on the basis of the ending of the two university financial management modes. In the first place, it is the model formula budget. The method of the model formula budget is to adopt part of the typical budget formula. The major reference standard for its budget formula is to base on the size of the students in the colleges and universities. In the second place, it is performance budgeting. The performance budgeting idea is that U.S. colleges and universities intend to introduce the basic

method of modern corporate finance management. U.S. colleges and universities are trying to create responsibility centers system so that the university and college units can become the "capital center" or the "expenditure center" and so on.

Overall, U.S. colleges and universities' accounting calculation is based on the accrual basis.

In terms of the United Kingdom, the vast majority of funding of colleges and universities in the UK comes from government funding. But in terms of handling internal problems such as discipline of school construction, personnel, teaching, the government has no right to interfere.

British university financial management model is the implementation of the typical financial classification application. The financial budget for the university is compiled by the school university finance units in unification. The main body of the budget allocation of funds is the schools. They place emphasis on the allocation of funds and work system. In this case, the deans of the schools and the deans of the faculty are given with adequate personnel, finance, and the autonomy of the school administrative handling. The administrative units are given the right to work but they have no right to decide the matter. Each performs its own functions. The school only opens a bank account so that the school should concentrate human, material, and financial resources. In addition, in order to increase the autonomy of the two units, the control over the budget and research funds can be under appropriate decentralization.

To sum up, the financial management of the colleges and universities in both the United Kingdom and the United States should all attach importance to the operation management and the effectiveness concept. They should adopt preferential policies and actively raise funds and continue to enhance the supervision of the financial management in colleges. In this case, the funding should be improved with the modern enterprise management approach. This can greatly enhance the financial management in the colleges and universities in our country.

57.3 The Innovation Idea of Financial Management of Colleges and Universities

The environment and the content of the financial management of colleges and universities in the new era require the colleges and universities to attach great importance to both social and economic benefits. In addition, they should actively make innovations on the new connotations of the operation management ideas and financial management ideas. The specific innovative research ideas are reflected through the initiatives given below.

57.3.1 Adhere to People-Orientation and Take the Qualified Service as the Priority

"Basic Accounting Standards" has listed the "good service" as the ethical standards that should be followed by the accounting personnel who are engaged in accounting work. There are some provisions in this regard for the education sectors. Practical experience tells us that the college finance department should take qualified services as the priority. They should consciously obey the work at the school center and take the initiative to serve the majority of students and staff. Take people as the orientation, which will tend to promote the improvement of the financial environment through the carrier of qualified services. Otherwise, if it cannot provide quality services, it may result in risks.

57.3.2 Adhere to the Scientific Financial Management and Broaden the Sources of Funding

Colleges and universities should establish a reasonable funding and scientific and financial management concepts. They should actively carry out the fund-raising activities with multiple channels and in accordance with the law. For example, speedup receivables and delay payables management so as to carry out the short-term financing. Financial management will greatly ensure the reform and development of higher education. With the establishment of the independent corporate position and the change of source in educational funds, traditional financial management approaches and patterns cannot satisfy the rapid development of higher education. For the purpose of survival, improvement, as well as the social and economic benefits, the university is supposed to direct itself at benefits and circle itself around the aim of benefits. Furthermore, the university should innovate in such aspects as the notion, the functional mechanism as well as the pattern of financial management. Absorb the social funds to run schools. If there are some conditions, universities may try to learn from the Western countries to enter the capital market issuance of bonds and equity financing. Actively make efforts to create conditions to stimulate donations to schools and encourage individuals to improve the social institutions. Make some efforts to change the current status of the financial management.

57.3.3 Make Innovations in the Financial Budget Management of the Colleges and Universities

In the first place, implement the budget management innovation as it is necessary to actively explore a new mode of budgetary management. When many colleges

and universities continue promote the hierarchical management system, there are still many problems. In this regard, the united States and the United Kingdom have made some useful explorations. Try to learn their performance budget handling methods so as to improve the "unified leadership and grading handling" mode. In addition, they can learn the system of U.S. colleges and universities, which are trying to create responsible center systems for the economic accountability or target responsibility system of the United Kingdom. Make the "grading handle" mode not so "a place of chaos".

In the second place, make budgeting complied method innovation. The heavy investment is shifted to the re-output budget. Introduce the performance budgeting and zero-based budgeting based on the cost-benefit analysis.

In the third place, make the budget management mechanism innovation. The university budget expenditures arrangement should base on the cost-based performance. It should take the purpose to establish the performance mechanism. Establish the university budget management mechanism with the core of performance budgeting. Link the funding to the performance evaluation, and maximize the money value.

57.3.4 Strengthen the Concept of Cost-Effectiveness, and Strive to Maximize the Operating Efficiency

With the change in the pattern of the development of higher education in our country, the financial management content of universities is being more and more widely used. Make efforts to enhance the school level, and improve the operating efficiency, which will become one of the greatest challenges facing the colleges and universities in the new period.

But for a long time, our universities generally attach no importance to the education cost accounting. In terms of monetary funds management, they focus only on the general day-to-day cash management. There is no attention being paid to the financial management work such as the fact that prediction and control of the actual demand for the monetary funds are not adequate, the different currencies funds on deposit morphology and conversion and the reduction of the monetary cost of capital and financial management. Unused funds or the time value of money is being greatly ignored.

57.3.5 Improve Financial Supervision and the Effect of Financial Disclosure

The United States has progressed to focus on "5E" operational performance audit of the economy. That is to say, it makes evaluation on the efficiency, the effect, the

environment and the appropriateness. For most of the public institutions abroad, including hospitals, colleges and universities, the use of public resources is included in the statutory scope of the audit. And the related literature on audit features of systematic research can be traced back to 30 years ago. The audience scope of the audit report determines whether the audit findings can play a substantive role.

57.3.6 Strengthen the Basic Accounting Work Standards, Build a Sound Financial Internal Control System, and Standardize the Economic Order in Schools

First of all, strengthen the building of the financial team. Equip it with the corresponding accounting professional and the high-quality accountants. Strengthen and standardize financial accounting basis. Make sure the proper use of accounts reasonable imputation of the budget account level and assess the costs and strict operating cost accounting to reflect the true accounting information. Financial sectors and participate in major business decisions, investment decisions, distribution policy, etc., to play a supervisory role in fund management.

In the second place, universities should be in accordance with relevant state laws, regulations and financial rules and regulations, combined with the actual situation of science of the new era of the school to develop the financial rules and regulations of the school. It should include: the economic responsibility system, the financial revenue and expenditure system, examination and approval system, the internal audit system, asset management system, network information management system, budget management system, performance appraisal system. Set of school financial institutions at all levels and job responsibility, norms of school behavior management approach.

Furthermore, establish the effective constraints and monitoring mechanisms. Make the financial supervision and internal audit, and democratic supervision combined to ensure the normal school in various economic activities, orderly, standardized operation. With the establishment and development of the socialistic market economy system, China is deepening the reform of the education system. The traditional model of financial management and accounting systems cannot meet the needs of the new situation in market economy. Under this circumstance, it is a new assignment for every financial manager to face that How to adapt to the new environment and requirement in colleges.

University financial management is related to teaching, research, logistics, and other aspects of the school. It is rich in content. The role of financial management cannot be replaced by any other management. So we should adapt the new era of financial management requirements; establish the scientific financial management concept; apply the business ideas and change their ideas and increase the intensity of reform and innovation; study as soon as possible and establish a practical

financial management system; promote the university comprehensive management level and then to a new level to better serve the higher education and promote the development of college cause.

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Chapter 58
Study on Management Innovation of Higher Vocational Colleges

Li Song

Abstract China's higher vocational education is in an important stage changing from scale development to intension development. However, improving the internal management quality of higher vocational colleges is an important part of the intension construction. In this paper, the main strategies for the management innovation of higher vocational colleges are discussed from four aspects (i.e., setting up the consciousness of managing school, establishing the concept of open education, constructing the mechanism of secondary management, and improving the benefits of knowledge management).

Keywords Higher vocational colleges · Management innovation

58.1 Introduction

After years of the development of China's higher vocational education, the numbers of higher vocational colleges and students have already taken up 50 % of the total numbers of China's higher educational schools and students. According to statistics, the number of the higher vocational colleges independently established all over the country in 2009 had reached 1,215, and also 3.13 million of students had been enrolled [1]. At present, higher vocational education has stepped into a new period, in which its focus is shifted from scale expansion to intension improvement. Therefore, the higher vocational colleges in China can currently keep pace with the development demands of the times only if reforms and innovations can be continuously made by them.

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Y. Yang and M. Ma (eds.), *Proceedings of the 2nd International Conference on Green Communications and Networks 2012 (GCN 2012): Volume 2*, Lecture Notes in Electrical Engineering 224, DOI: 10.1007/978-3-642-35567-7_58,

58.2 Setting Up the Consciousness of Managing School

Under the conditions of market economy, the survival and development of higher vocational colleges have been restricted by both market economy and educational laws. From the perspective of management, school management means that the educational resources organized by schools are effectively integrated by school management personnel. However, from the perspective of operation, school management refers to introducing some management ideas and methods of enterprises into high vocational colleges, for the purpose of redesigning management content and process, and also optimally restructuring and efficiently operating the resources and assets of higher vocational colleges with the market mechanism, etc. [2]. However, the change from management to operation is the fundamental for reconstructing China's school management theory and leading schools to transform from the traditional administrative management model to the school management model that is appropriate for the development of market economy.

58.2.1 Necessary to Set Up the Consciousness of Managing "Educational Products"

Different from general higher education, higher vocational education is a type of higher education with clear vocational value orientation and characteristics. Currently, it is necessary for higher vocational colleges to lay a stress on the development of business operation activities with unique characteristics. On the one hand, it is necessary to attach high importance to the improvement of educational quality and the development of educational products. On the other hand, it is necessary to take the business operation strategy of "making exports develop smoothly and driving imports", establish a channel for the communication between schools and employing units, and also provide supports for each graduate to seek a proper position. As a result, the purpose of "smooth exports and prosperous imports" can be achieved.

58.2.2 Necessary to Set Up the Consciousness of Managing "Unique Brand"

High-quality product brand is the intangible asset of an enterprise. To realize the "fast-speed and high-quality" development, it is necessary for higher vocational colleges to establish a close connection with the characteristics of the industries, making education advanced, unique, or high quality. Simultaneously, unique brand specialties and subjects, which possess certain social influences, can be produced.

Specifically, the following several aspects should be mainly valued: the specialties, which own a stable development and are oriented at market, are powerful in vitality, and also are easy to create competitive advantages and grow mature; certain scientific research results have been achieved in the specialties; the faculty is very excellent, and also the teaching facilities are all ready.

58.2.3 Necessary to Set up the Consciousness of Managing "Capital Operation"

In higher vocational colleges, there are rich and high hardware and software resources such as manpower, technology, field and facilities, etc. Therefore, it is necessary to put these resources in the practical production and operation of the enterprises, so as to bring them into full play. Meanwhile, the applications of joint education, professional training, technology research and development, field and facility leasing, and stock cooperation and other ways can make the resources utilized actively. Thus, economic and social benefits can be created.

58.3 Establishing the Concept of Open Education

Through scale development, higher vocational colleges attain an increase in complexity, and simultaneously tend to be in a disorder state. Therefore, they can continuously absorb energy and information from the environment and enhance the vitality only if an open management system is formed [3]. In fact, enclosed management has made schools lose necessary contacts with the society. Certainly, the motivations and contents of innovation will lose.

58.3.1 Oriented at the Society

In terms of domestic situation, one of the most important objectives of open education is to positively and actively serve for society, and also establish and maintain a stable, long-term, and favorable cooperation relationship with the enterprises. For this reason, special communication departments, which are in charge of establishing relationships with outside-school enterprises, can be set up by schools. Meanwhile, the relationship and communication with the enterprises can be strengthened and the school-enterprise cooperation can be promoted through holding enterprise leader and technical supervisor lectures, encouraging relevant teachers to take a part-time job in the enterprises, and also urging enterprise scientific and technological personnel to take a part-time job in the schools.

58.3.2 Oriented at the Future

Namely, it is necessary to greatly develop the school-enterprise cooperation, and keep paces with the development of the modern education technology. Basically, the current higher vocational education is still at the level of junior college education. However, a great number of students graduated from junior college education greatly hope to have opportunities for receiving an undergraduate education and even graduate student education. Therefore, to be oriented at future, it is necessary for higher vocational colleges to establish a cooperative relationship with the well-known domestic and foreign universities and colleges, and then provide an interface for distance education, thus making the traditional education and the modern education technology connected mutually.

58.3.3 Oriented at the Learners

Namely, high-quality continuing education should be provided for the front-line technical personnel in the production, construction, management, and service. Whether students hope to work or further study after graduation in futures, it is necessary for higher vocational colleges to promote them to possess relevant foundations, and leave a flexible interface, so as to create the necessary conditions for their future development. In open education, higher vocational colleges are also required to provide students with the services related to self-study exam, remote education and vocational qualification exam trainings, and also make higher vocational education break the limits in both space and time, and thus satisfy the requirements of in-school students, graduates, and all kinds of social personnel on learning.

58.4 Constructing the Mechanism of Secondary Management

Organizations are the carriers of the organizational management activities. Therefore, it is necessary for the management innovation of higher vocational colleges to be guaranteed with organizational innovation [4]. Besides, the management organizational structure of higher vocational colleges should be innovated by following the change of the strategic goals. Currently, in the innovation of the management organizations of higher vocational colleges, high importance should be attached to the flat management organizational structure and the implementation of secondary management. Meanwhile, it is necessary to bring the dynamic roles of different departments into full play, thus making the focus of responsibilities, powers and benefits decentralized.

58.4.1 Construction of Flat Management Organizational Structure

Flat management organizational structure mainly features few management levels, less personnel, and saving management cost. The primary tasks of the flat management organizational structure of higher vocational colleges are: (1) strengthening the professional construction of functional departments; (2) strengthening the construction of secondary schools or departments; (3) strengthening the construction of the school-enterprise cooperation management organizations reflecting the characteristics of higher vocational colleges; (4) weakening and simplifying the nonprofessional administrative organizations, reducing intermediates, and improving work efficiency.

58.4.2 Construction of Secondary Management Organizations at Decision-Making Layer

In flat management organizational structure, decision-making layer is the central joint node of a network structure. The key of the construction of the decision-making level is to select a qualified president. Under the background of market economy, the core competitiveness of a school is the "resources + ability + resources and the allocation and integration way of abilities". The resources and abilities owned by a school are relatively stable, and are impossible to have a great change within a short time. However, the allocation and integration way of resources and abilities of a school completely depend on the advanced management idea and super management quality of the decision-making layer. Therefore, in this aspect, decisions can be made by a school according to the actual needs.

58.4.3 Construction of Secondary Management Organizations at Execution Layer

In flat management organizational structure, execution layer is the multijoint node of a network structure. The main functions of the execution layer can be concluded from the following four aspects: (1) relevant forces are organized to execute school decision; (2) subordinate's work is necessarily checked and controlled; (3) the connection with the school-enterprise cooperation units and bases should be maintained for carrying out activities; (4) providing feedback for all kinds of information in the process of execution.

58.5 Improving the Benefits of Knowledge Management

Knowledge is the primary source for the core competitiveness of higher vocational colleges. It mainly refers to the tacit knowledge, which is contained in the brains of teachers and managers. Through continuous accumulation and innovation, it becomes an internal resource of schools. Meanwhile, it is conveyed by teachers to students, promoting students to change into the application-oriented personnel with powerful competitiveness [5]. Therefore, it is necessary for higher vocational colleges to establish a sound knowledge management system, making the core competitiveness of higher vocational colleges enhanced without a stop.

58.5.1 Creating Knowledge Bases with Characteristics

According to the properties, knowledge can be divided into explicit knowledge and tacit knowledge. These two types of knowledge play a very important role in the development of schools. Therefore, on the one hand, it is necessary for higher vocational colleges to classify, process, and arrange the existing explicit knowledge, making it ordered. On the other hand, it is necessary for schools to organize the forces of all aspects and especially the experts of all aspects together according to the needs of long-term development, formation, and core competitiveness maintenance, and also systematically identify and explore the tacit knowledge settled in teachers and make an effective integration on it. Thus, the scattered and disordered tacit knowledge can be promoted to be ordered and classified, and then gradually changes into the core knowledge of school.

58.5.2 Promoting the Mutual Conversion Between Tacit Knowledge and Explicit Knowledge

To realize the creation and added-value of knowledge and achieve the purpose of inheriting, communicating, expanding, and recreating knowledge, the key of school knowledge management lies in the effective conversion between tacit knowledge and explicit knowledge. On the one hand, a variety of learning-oriented organizations should be established, and different exchange places oriented at discussion, salon and demonstration can be opened up, so as to carry out a series of academic exchange activities. On the other hand, it is necessary to extensively develop the academic exchange activities between different schools, and set up a virtual talent pool and a sound external knowledge information network, making schools fully and timely make use of social intelligence resources and improve their ability to adapt to external environment.

58.5.3 Strengthening the Effective Application of Knowledge

On the one hand, it is necessary for higher vocational colleges to positively and actively apply all sorts of existing knowledge in scientific research. On the other hand, it is necessary to make an enhancement to the management and implementation of intellectual property rights and promote the conversion and flow of the knowledge innovation results of higher vocational colleges, so as to bring the technological advantages and social radiation functions of higher vocational colleges into better play and simultaneously give a full reflection to the value of knowledge application.

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Chapter 59
Research on Human Capital Input of Applied Colleges and Universities Students

Di Yu

Abstract In recent years, applied colleges and universities are a kind of rising institution of higher learning in our country. It takes the "Applied" as the orientation aim of school and attaches importance to practical teaching and cultivation of students' comprehensive quality and ability. The aim is to satisfy the requirement of social and economic development of China and cultivate high-level applied talents and play a positive role in developing local economy. The human capital input in this article is on account of the range of applied colleges and universities. It analyzes the input condition of school human capital and individual human capital for those students during the period of school, taking a measure of follow-up survey by the means of demonstration to students' employment and the value measurement of human capital, to evaluate the output value of human capital on students during the period of school from applied colleges and universities through the result of measurement.

Keywords Applied colleges and universities · Human capital input · Value measure · Output benefits

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59.1 The Generation and Development of Human Capital Related Theories

Human capital theory has been produced from the eighteenth century, more than 200 years of history. In fact, the human capital theory has been appeared in Plato's classical writings in ancient Greece, and this theory has become a prototype of current human capital theory. Capital is a charming word in our eyes, it represents the infinite value. In the book of "Das Capital", Marx mentioned that the definition of capital is that the value is increased by remaining value. Capital itself is a factor of production, as the durable products are put into production and create new value. For the human, we also see it as a factor of production, by the input of human labor to create value. The famous economist Adam Smith in his "Wealth of Nations" first proposed the concept of human capital. Besides, labor creates certainly value, it also clearly stated that workers must be educated or the school training to improve labor skills and levels, and all these consume time and cost. The investment to the worker can be considered the first sprouting of human capital investment ideas. French economist Jean-Baptist Say stated that the cost of providing education or training to workers is needed to be remunerated from worker's salary. It includes not only general wages, but also including the interest of training cost. German economist Johann Heinrich von Thune claimed that under the same condition of materials and equipment, workers who received higher education, training can create more revenue. U.S. economist Howard Schultz first published a speech entitled "Human capital investment". The speech introduced systematically the theory of human capital. He found that the investment of education, job training, health, and migration, etc., plays a very important role in economic growth, as these factors are human capital that is some kind of investment results. Rate of return on investment in education and the contribution of education to economic growth made a quantitative study. The concept of human capital was officially brought into economics.

Based on the human capital theory, economists have begun to do research about human capital value and contribution. David Ricardo, who has completed Classical Economic Theory, in his Value Theory System mentioned that the growth of social wealth depends on the number of workers to expand and the quality of workers to improve. From Marx's theory of labor value, it can summary the measure model of labor in relative to output contribution: W [total wealth (use value) amount] = V [total labor time (value)] × q (labor productivity). U.S. economist Edward Fulton Denison and others has done quantitative analysis of the human capital factors through exactly calculating economic growth factors of a number of nations. In 1935, Walsh Joseph Leonard first did the cost estimation of human capital value. From the 1950s, China's scholars deeply studied the human capital value and other issues. They put forward measure model of human capital, according to the human inherent value measure and future value measure and discount.

59.2 The Characteristics of Human Capital Input About Applied Universities

Since the 1980s, the higher education in China has gradually developed new thinking and model of running a school to develop a number of undergraduate colleges and universities which mainly intensify practice teaching, actively probe into teaching reforms of higher education, pay attention to the applied personnel training and raise practical operation and innovation abilities of students. The applied colleges and universities should firmly revolve around "applied" as the purpose of school development and student training, cultivating high talented applied talents who are able to adjust themselves to development of economic society and requirement of social development, with the guiding to provision of service for society and the purpose of embodying talent view, quality view and education view of spirit of the time and requirement of social development.

59.3 The Non-homogeneous of Human Capital Input

Because the content of human capital input is polyphyletic, involving regular school education, socialization vocational training, migration of labor force, health care, employment, medical care and so on, we should emphasize the influence of human capital value under common usage of various investment patterns, when carrying out human capital input. Aiming at the applied colleges and universities, the education of students' human capital input is not homogeneous too, generally including capital input of professional education, capital input of practice, capital input of comprehensive equality development and so forth. Expectation value fuzziness of human capital input.

59.3.1 Expectation Value Fuzziness of Human Capital Input

Through combining the various resources of material capital input with labor, and the results of transforming into society labor, the process of making a profit may exist in great uncertainty. Human capital itself is bodiless and recessive and also hides in individual, transforming into benefit value only by means of carrier of human's social work. Meanwhile, it possesses specificity which can bring into play the best utility in adaptive domain, otherwise can appear devaluation and disappearing. In that way, the expectation value gained by human capital input of individual is fuzzy and indefinite for individual or input subject.

59.3.2 The Dynamics of Human Capital Input

The performance of human capital is continuity and is variation based on different objective current situation of human. When students achieve a degree of regular education, they might receive some other professional training outside school. When coming upon the stage and being engaged in productive labor, they also receive all kinds of on the-job training. When dropping out labor process, they still participate in various continuing educations. The input of human capital might be influenced by numerous factors, such as environment factor (family, work unit, and region) and oneself condition factor (age, health, and energy). In the dynamic process of continuous development and improvement of human, human capital input also gradually change so as to satisfy requirement of large-scale socialized production and high-tech development. In term of time, human capital might accompany all your life; in space, the investor of human capital will ceaselessly change through space transfers. So the big and small of the human capital value may be subjected to influence of human capital input and varied kinds of factors.

59.4 Pluralism of Human Capital Input Subject

Human capital input subject is pluralism, these subjects will change their positions, when helping individual finish education and training in the contemporary and different periods. Human capital input subject mainly contains family, school, enterprise, government, social training institution, all kind of communities and so on. Colleges and universities are one of the main subjects that accomplish the human capital input to student individual, taking on the whole and systematic education and teaching of students during the period of school. Applied colleges and universities should develop the initiative of investment subject during the period of students at school and conduct reasonable input of capital so as to cultivate "applied" talents. But because of the appearance-verve relationship among these kinds of pluralism subjects, it is difficult to estimate which investment subject achieves ultimate investment result obtained; therefore, it will give rise to the difficulty in distribution of value among all kinds of subjects.

59.5 Applied Colleges and Universities Students' Human Capital Value Measure and Profits Evaluation

59.5.1 Human Capital Value Measure

Howard Schultz and Gary S. Becker laid a human capital measure system from macro-approach. Its basic idea proposed by Brummet and Flamholtz in 1968 is

that human capital values equals to the sum of all-expense paid for human capital formation. The range of individual human capital value measure is very extensive. It refers to the sum of expense paid for all acceptable education, training, and migration during the process from the birth of individual to not create labor value. Because these inputs lie in each stage of man, the human capital value is dynamics [1]. Then it is a difficult thing that measures the value which is acquired in future by means of capital invested by the human capital input subject during certain process.

As for school, human capital value measure input into student has very important significance. First, human capital value measure input into student is the basic means to calculate human capital input. When inputting students' human capital, item description of input, the amount of input, and the high-low of input level are all the important factors which influence human capital value measure. Second, either distribution theory of western economics or Marxist labor value theory, all human capitals need participate in income distribution, then to evaluate the value created by human capital during practical process through distribution.

59.5.2 Evaluation of Human Capital Input and Output Benefits

Its input has the characteristic of marginal benefit increment. While inputting human capital, applied colleges and universities select the evaluation index of inherent human capital value which adapts applied talent development. In order to evaluate human capital input and output benefits of applied colleges and universities [2], the thesis conducts a survey and research on both the two aspects of school human capital input and individual human capital input accepted by applied colleges and universities students (Table 59.1).

Respectively, using 150 graduation students of 2004–2007 grades in the school of economic management of Harbin University as respondents, according to the difference between school human capital input and individual human capital input, we, respectively, selected eight human capital input index to evaluate, investigators taking important fair value hierarchy of three level scale laws as a basis to score. It will take school input index as variable $X(i)$, $i = 1, 2, 3, 4 \ldots 8$, and take individual input index as variable $Z(i)$, $i = 1, 2, 3, 4 \ldots 8$.

Through the follow-up survey to respondents, it does statistics according to the receiving education and wage and treatment after obtaining employment of 150 respondents during the period of school, taking the human capital input and working income of two students as example, calculating net value of human capital input:

The present value computing method of human capital input into students by school during the period of school:

Table 59.1 The form of human capital input index system of applied colleges and universities

Index selection criterion	School input decomposition index	Index selection criterion	Individual input decomposition index
Professional knowledge education	*X*1	Comprehensive knowledge learning	*Z*1
Practical training	*X*2	Training bases outside school	*Z*2
Teacher strength	*X*3	Physical and psychological health	*Z*3
Laboratory construction	*X*4	Every abilities	*Z*4
Practice base foundation	*X*5	Amount of information	*Z*5
Comprehensive quality development	*X*6	Quality accomplishment	*Z*6
Exclusive skills	*X*7	Compound type skills	*Z*7
Career planning training	*X*8	Work experience	*Z*8

For example 1 the student is 2007 grade's accounting profession undergraduate, obtaining CET-4, NCRE-2, Certificate of Accounting Professional and Qualification certificate of specialty and technology by examination. The following data adopted is the yearly average value during the 4 years. Let: V_1 is human capital input value, C_t is processing cost in the year T, r is interest rate, and P is present value.

School human capital input of this student during the period of school:

$$C_t = \sum_{i=1}^{8} x = 6,200\,\text{yuan} \tag{59.1}$$

$$V_1 = \sum_{t=1}^{T} C_t(1+r)^{T-t} = C_t(P/C_t, r, n) = \sum_{t=1}^{4} 6,200(1+7\,\%)^{t-1} = 27,527.6\,\text{yuan} \tag{59.2}$$

After graduating in 2011, the student has been enrolled by a local commercial banking in the same year, with 5,800 Yuan monthly earnings, bonus payment, and yearly total wages 69,600 Yuan [3]. The final value of human capital output of the student after graduating:

Let: V_2 is human capital value, Y_t is wage payment in the year of T, R is interest rate, and F is final value.

$$V_2 = \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} = Y_t(F/Y, r, n) = \sum_{t=1}^{4} \frac{69,600}{(1+7\,\%)^t} = 14,650.4\,\text{yuan} \tag{59.3}$$

Taking part in the learning outside school, passing the examination of Standard Chinese Grading Certification, and also acquiring teacher certificate and Driving License.

Let: V_3 is human capital value, Y_t is wage payment in the year of T, r is interest rate, and P is present value.

The individual human capital input of the student during the period of school:

$$C_t = \sum_{i=1}^{8} z = 5,170 \text{ yuan} \tag{59.4}$$

$$V_3 = \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} = C_t(P/C_t, r, n) = \sum_{t=1}^{4} 5,170(1+7\,\%)^{t-1} = 22,954.5 \text{ yuan} \tag{59.5}$$

Let: V_3 is human capital value, Y_t is wage payment in the year of T, R is interest rate, and F is final value.

$$V_4 = \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} = Y_t(F/Y_t, r, n) = \sum_{t=1}^{4} \frac{69600}{(1+7\,\%)^t} = 14,650.4 \text{ yuan} \tag{59.6}$$

The human net capital input by school into the student $= (V_2 + V_4) - (V_1 + V_3) = -21{,}181.3$ Yuan.

For example 2 the student is 2004 grade's financial management specialty undergraduate (in this moment the school has not transformed into applied undergraduate academy, so the human capital input index to students by school is lower than 2007), who obtained the CET-4 and Certificate of Accounting Professional by examination [4]. The following data adopted is the yearly average value during the 4 years.

Let: V_1 is human capital input value, C_t is processing cost in the year T, r is interest rate, and P is present value.

School human capital input of this student during the period of school:

$$C_t = \sum_{i=1}^{8} z = 5,600 \text{ yuan} \tag{59.7}$$

$$V_1 = \sum_{t=1}^{T} C_t(1+r)^{T-t} = C_t(P/C_t, r, n) = \sum_{t=1}^{4} 5,600(1+7\,\%)^{t-1} = 24,863.6 \text{ yuan} \tag{59.8}$$

The student graduated in 2008 and has always been choosing job, after waiting for employment for 8 months, is working in a small-enterprise. Monthly earnings are 1,000 Yuan and the total of yearly earnings is 15,600 Yuan. The final value of human capital output of the student after graduating:

Let: V_2 is human capital value, Y_t is wage payment in the year of T, R is interest rate, and F is final value.

$$V_2 = \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} = Y_t(F/Y, r, n) = \sum_{t=1}^{4} \frac{12,000}{(1+7\,\%)^t} = 2,525.9\,\text{yuan} \quad (59.9)$$

The student has ever practiced for 2 months outside school, during the period of waiting for employment, and inputs a part of cost of living.

Let: V_3 is human capital value, Y_t is wage payment in the year of T, r is interest rate, and P is present value.

The individual human capital input of the student during the period of school:

$$C_t = \sum_{i=1}^{8} z = 4,600\,\text{yuan} \quad (59.10)$$

$$V_3 = \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} = C_t(P/C_t, r, n) = \sum_{t=1}^{4} 4,600(1+7\,\%)^{t-1} = 20,423.7\,\text{yuan} \quad (59.11)$$

Let: V_3 is human capital value, Y_t is wage payment in the year of T, R is interest rate, and F is final value.

$$V_4 = \sum_{t=1}^{T} \frac{Y_t}{(1+r)^t} = Y_t(F/Y, r, n) = \sum_{t=1}^{4} \frac{12,000}{(1+7\,\%)^t} = 2,525.9\,\text{yuan} \quad (59.12)$$

The human net capital input by school into the student $= (V_2 + V_4) - (V_1 + V_3) = -40{,}235.5$ Yuan.

Based on the net value of human capital input of two cases, it can be seen that the result of example 2 is less than the result of example 1, illustrating the more human capital input during the period of school, the more benefits acquired by student in the future job. But now these two results are all negative values. The result shows that the content issue of human capital input of colleges and universities students still needs to continue to grope and discuss and we should exactly find training orientation of applied talent according to the practice of economic society.

59.6 The Suggestion on Human Capital Input of Applied Colleges and Universities Graduates

Because the employment situation of current colleges and universities graduates is severe, the author thinks it is very necessary to carry on research on human capital input of colleges and universities student. The difficulties of obtaining employment

bring about great pressure on schools and students. Because of the decline of rate of employment [5], student individual may undertake more human capital input, certainly, some of them very blind. Through this study, we exactly want to solve the problem whether the human capital input and cultivation to students input by applied colleges and universities finally can be approved by society and through this kind input how many contribution rate of social output it is. Aiming at above problems, the author proposed some suggestions to the applied colleges and universities graduate human capital input.

59.6.1 Strengthening Characteristic Specialty Construction and Enhancing Service Ability

As an applied bachelor colleges and universities, it need firmly catch the core of cultivation of "applied talent" and adjust existing specialty structure into making the different specialty balanced development. The specialty opened by school need practically serve the local economy, make use of the tertiary industry development and transport eligible applied talents to demand post.

59.6.2 Reinforcing the Planning Education of Professional Career and Human Capital Input of Vocational Counsel

Our school systematically sets up the course of professional career planning and vocational counsel. The author makes statistics to the recent years' employment rate of our school students (taking accounting specialty as example): the employment rate of 2008 graduates is 87 %, the employment rate of 2009 graduates is 88.8 %, and the employment rate of 2010 graduates is 93.4 %. It can be seen that the employment rate evidently floats upward after processing the course of professional career planning and vocational counsel. Although this result is not the only factor influencing the increase in the employment rate, from objective point of view, it is very necessary and efficient to do well professional career planning counsel education from fresher. Especially, to the applied undergraduate universities, it should even more invest more from teachers, practical training, establishing workshop and so on.

59.6.3 Improving Their Personal Culture and Practice Skills

According to the investigation, we found that different colleges and universities have various results of training students in the way of comprehensive quality, although they use similar human capital input. It caused that human capital play

different roles as the productive factors. Besides school, there are also main factors from students, including lack of active civilization, knowledge and skills, at the same time, they cannot make further exploration for their own professional knowledge, with the weak abilities of self-management, self-study, interpersonal communication, self-employed and so on. Therefore, the school should lead students consciously to enhance own human capital input and intensify professional knowledge and comprehensive quality.

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Part VII
Knowledge Management Engineering

Chapter 60
Framework of Transformation of Scientific and Technological Achievements Based on Social Physics

An Liu

Abstract Researchers use different methodologies to analyze transformation of scientific and technological achievements in order to find out its inherent structural mechanism and dynamic model. However, when policy makers are trying to adopt these advanced theories to formulate relevant policies, they more than often encounter difficulties. From the perspective of social physics, this paper conducts an abstractive analysis on the framework of transformation of scientific and technological achievements by reviewing innovation systematic approach and proposes concepts of field, force, and flow in the transformation of scientific and technological achievement system which are composed of knowledge innovation, technology innovation, and management innovation. Under this analysis framework, this paper also proposes a detailed analytical process and evolvement route from theory to policy based on "object-function-interface".

Keywords Transformation of scientific and technological achievements · Social physics · Innovation system

60.1 Introduction

The concept of transformation of scientific and technological achievements can be understood from both the broad perspective and the narrow perspective. From the broad perspective, transformation of scientific and technological achievements includes the formation of the knowledge production to the ultimate productivity.

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It includes the transformation of all links in this innovation chain. From the narrow angle of view, transformation of scientific and technological achievements puts its main focus on the end of the innovation chain. In other words, it is the transformation of the application of the technological achievements to the realization of reality productivity that can realize economic benefits [1]. In the year 1996, the People's Republic of China carried out "Law of the PRC on Promoting the Transformation of Scientific and Technological Achievements". It starts from the narrow point of view and focuses on the transformation of scientific and technological achievements, which can be defined as: This law is enacted for the purpose of promoting the transformation of scientific and technological achievements into real productive forces, standardizing such transformation, hastening scientific and technological progress and facilitating economic and social development. The phrase "transformation of scientific and technological achievements" as used in this Law means the entire process of the follow-up tests, development, application, and widespread use of the applicable scientific and technological achievements, made as a result of scientific research and technological development, through to the final creation of new products, new techniques, new materials, and new industries—all for the purpose of enhancing the productive forces [2].

In foreign countries, there is no corresponding concept as transformation of scientific and technological achievements, for most of them follow Schumpeter's Technical Innovation Theory [3]. In addition, they developed to the "system paradigm" since the 1980s. The concepts of national innovation system, regional innovation system, industrial innovation system, and technology innovation system have been produced. Moreover, there have been a lot of relevant researches. Among the relevant researches, researches done by Freeman [4], Nelson [5], Lundvall [6], Edquist [7] and Cook [8] are the most classic. The representative domestic research achievements include researches done by Feng [9], Liu [10], Li and Zeng [11] and others.

The scholars have applied different theories to make analysis on the transformation of scientific and technological achievements from multiple angles. However, when the policy-makers hope to adopt these advanced theories in policy-making, it is often difficult. In this paper, a review of the innovation system concept has been done. The framework of transformation of scientific and technological achievements has been analyzed in an abstract way from the perspective of social physics. It puts forward the field, force, and flow concept of the transformation of scientific and technological achievements, which is constituted by the knowledge innovation, technological innovation, and management innovation. At the same time, under the overall analytical framework, the "object-function-interface" based transformation of scientific and technological achievements has been analyzed in detail and the evolution path of theory-policy is also put forward.

60.2 Theoretical Foundation

60.2.1 Social Physics

French sociologist Comte was the first one to coin the norm of "social physics" [12]. He believes that only when the theoretical assumptions confirmed with the confirmed "compatibility" are consistent to the observed "verification" can the assumed assumption be converted to the scientific statements.

The Chinese scholar Niu Wenyuan [13] has pointed out that it is universally acknowledged that a generalized difference exists no matter it is for the physical world or the human world.

According to Fermat's principle of least action, principle of least action has been proposed for the social organization optimization [14]. It is admitted that the society will inevitably have structures and that the structure must have levels. Synergy is necessary between classes. It is admitted that the space point with the shortest delivery time must be to seek out in each level in order to reach the highest degree of social recognition, the minimum degree of social distortion, and the minimum degree of information distortion in the transmission process of n levels: matter, energy, and information.

60.2.2 Innovation System Theory

The theory of technological innovation is developed to a systematic direction since the 1980s.

With the disappearance of globalization and the international border, the "national state" in the economic sense has been increasingly giving way to the "regional state". Region has become the economic interest body in a real sense [15]. At the same time, some scholars believe that the boundaries of the innovation system are not subject to a fixed geographical boundary limit [16]. They have put forward the concept of industrial innovation system [17]. In addition, there is a combination of the two theories, which is the cluster innovation system theory. They have included the regional innovation system and the industrial innovation system. For example, Porter [18] studies the national and regional competitive advantages from the perspective of industry comparative advantage and industrial clusters.

These views can be summarized as the different manifestations of a single and general "innovation system" approach.

60.3 Transformation of Scientific and Technological Achievements from the Social Physics Perspective

60.3.1 System of Transformation of Scientific and Technological Achievements

The process of transformation of scientific and technological achievements can be divided into three stages: the generation of the scientific and technological achievements, the transformation of the scientific and technological achievements, and the application of the scientific and technological achievements (Fig. 60.1). This involves the government, universities, research institutions, industry, intermediaries, finance, users, and other elements. Transformation of scientific and technological achievements is a complex systematic engineering.

Knowledge innovation is the basis of technical innovation and it is the source of new technology and new inventions. The main body of the knowledge innovation system is the research institutions and universities.

Technological innovation not only refers to the innovation of the technology system itself, but the recombination of production factors caused by the introduction of scientific and technological achievements into the production process. In addition, it is the whole process of transferring into the goods or technology on the market.

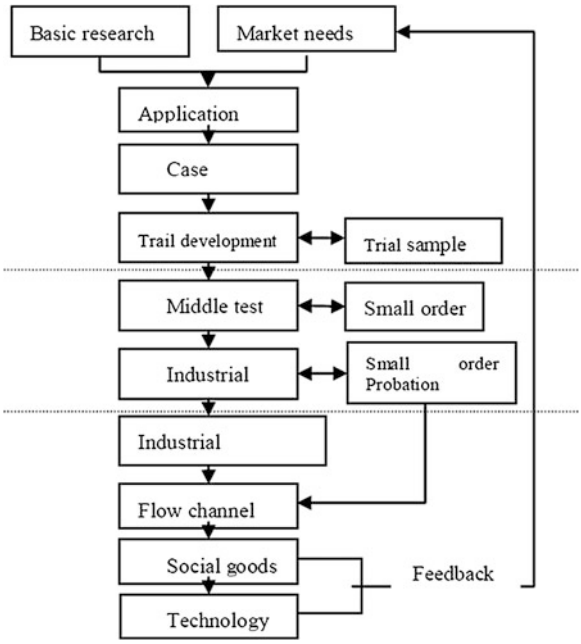

Fig. 60.1 The general process of transformation of scientific and technological achievements

Management innovation is a dynamic activity of creating new resource integration. The main body of management innovation is the government and service organizations.

Here, we will talk about the basic analytical elements of the transformation of scientific and technological achievements from the three levels: the field, force, and flow. It is analyzed from the perspective of social physics.

60.3.2 Field

Physics call the distribution of a physical quantity in a region of space known as the field. According to the most significant features of social physics, "quantum of society and social quantum", it can be found that scientific and technological achievements can be abstracted into a collection of system elements (E).

The spatial distribution is labeled as S. Assume that the starting field of element E is denoted by A. The entering field is labeled as B. Then vectors can be used to describe the movement E, which represents the movement from A to B. The reason that the directional movement from A to B occurs is due to the fact that B cannot be self-satisfied. The element E can solve the problem [19].

The field has gradient, divergence, curl, and other features. Let $U = U(x, y, z)$ be the number field of S-space distribution, $K = P(x, y, z)\, i + Q(x, y, z)\, j + R(x, y,$ and $z)$. k is the vector field. Its relevant characteristic at the M point is expressed as the followings:

Gradient:

$$F_T = F_A + F_B = k\frac{Q(Q-q)}{r^2} + F_B \tag{60.1}$$

Divergence:

$$F_T = F_A + F_B = k\frac{Q(Q-q)}{r^2} + F_B \tag{60.2}$$

Curl:

$$F_T = F_A + F_B = k\frac{Q(Q-q)}{r^2} + F_B \tag{60.3}$$

60.3.3 Force

"The differences in the broad sense and non-equilibrium will inevitably lead to the generalized gradient in the broad sense. It is a unified recognition that the generalized gradient will inevitably produce power in a broad sense". Similarly, the

"force" in the transformation of scientific and technological achievements is caused by the element differences in each subsystem, the main body and the field and non-equilibrium. We labeled it as F.

In the general sense, the force comes from the interaction between nodes in the field as well as the sum of the background force. The size of the interaction force between two nodes and elements of quality Q, and between two nodes is proportional to the product of the elements of quality gap $Q-q$ is inversely proportional to the square of the distance R between the two nodes.

$$F_T = F_A + F_B = k\frac{Q(Q-q)}{r^2} + F_B \tag{60.4}$$

60.3.4 Flow

"The force in the broad sense will inevitably lead to the generalized movement and the flow in the broad sense. It is a unified recognition that the generalized gradient will inevitably produce power in a broad sense". The "flow" in the transformation of scientific and technological achievements is caused by the element flow in each subsystem, the main body and the intersubjective field. We labeled it as L. The size of the flow can be characterized as the ratio of the force and obstruction coefficient:

$$L = \frac{F_T}{V_{ij}} \tag{60.5}$$

F_T is the resultant force that promotes elements to flow. The greater the resultant force is, the larger the intensity becomes. V_{ij} is the blocking coefficient for elements to flow from i to j. The greater the resistance coefficient is, the greater the blocking coefficient of the flow becomes.

60.4 Analysis Path of "Object-Function-Interface" in Transformation of Scientific and Technological Achievements

In order to effectively transfer the theory descriptions to the policy, here we return to the "general system theory" approach. Learning from the ideas put forward by Liu [20] and Bergek [21], the policy evolution path of transformation of scientific and technological achievements of the "object-function-interface" path is put forward (Fig. 60.2).

General system theory thinks that the system includes two component parts: the elements and the relationship between elements. They have formed a coherent whole and the system has certain function.

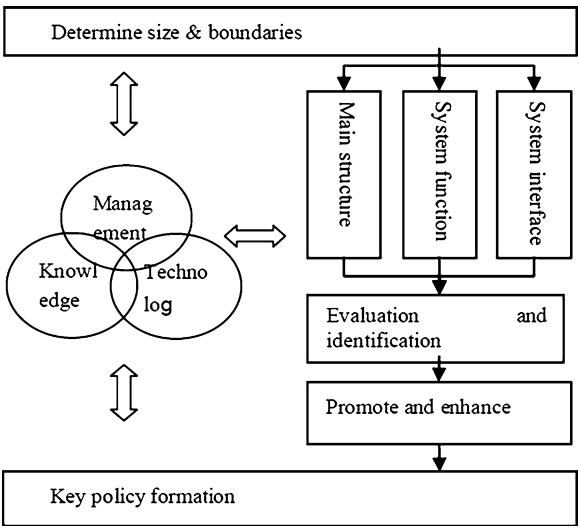

Fig. 60.2 Transformation of scientific and technological achievements of the "object-**f**unction-**i**nterface**"** path

However, it is far from enough to analyze only from the function. At the same time, we stress the main bodies, elements, and functional interface of the transformation of the scientific and technological achievements. Only by identifying where the bottlenecks are can the problem be addressed and the overall system efficiency is improved.

1. Determine the system scales and the boundary

In the face of specific issues, it is very important to determine the scale and boundaries.

This includes the selection of objects of scientific and technological achievements, industry, innovation system, and other research objects. Also, determine the breadth and depth of the research questions and the scale of the spatial domain.

2. Analyze the subject structure

Organizations and institutions are the main elements of the system. The organization is a formal institution created consciously. It is equipped with a clearly expressed target. They are the behavioral participants or the main bodies.

Structure refers to the network formed by the main layout of the initial conditions and the occurrence of contact and interaction. The structure is formal and informal, tight and loose, and cooperative and competitive, such as "political research" cooperation, standardization organizations, and technical alliances.

3. Analyze system functions

Including:

Knowledge innovation categories: knowledge generation and diffusion; education training.

Technological innovation categories: entrepreneurial activities; the formation of the market.

Management innovation categories: policy development; creation and transformation of the organizational system; use of capital; justification.

4. System interface analysis

The interface analysis is to discover the relationship between the main bodies, the structure, and the activities in the system. In addition, these relationships may be the bottlenecks.

5. Functional assessment and goal setting

After determining the system functions and interfaces, we have a basic understanding of the system operation mode. But the system does not spontaneously inform the current operating status. It needs to analyze the main structure to achieve these functions and activities. At the same time, by setting the overall objective and the activities into the subgoals to be achieved, identify room for improvement.

6. Promote and impede the identify mechanisms

On the basis of the above-mentioned functional assessment and target setting, identify the promotion mechanism that promotes the current functional development and the hinder mechanism affecting the realization of the functions and features as well as the mechanisms of allelopathy and of mutual growth and decline. Speaking from the perspective of policy research, analysis of obstacles, and mechanisms is particularly important.

7. The key policy-making

In the end, through identifying promotion and hindering mechanisms, formulate key policy to improve the systems' functions for each target. The general principle is to develop or supply policies that promote and strengthen and weaken development.

60.5 Conclusion

In this paper, the quantization operation of the innovation system concept, the use of social theories of physics, theoretical element analysis of the scientific and technological achievements is talked about. To build scientific and technological achievements "object-function-interface" structure, and thus analytical framework from theoretical research to policy formulation and analysis processes.

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Chapter 61
College Innovative Talents Training Mode Based on Practical Teaching Reform

Jinghong Hu and Yongqing Zhang

Abstract Innovation talents training mode must be based on creative organization culture, and the fundamental purpose of the university practice teaching is to cultivate students the professional quality of the experiment so that it can adapt to changing market demand, so university practice teaching system should have a comprehensive reform, strengthen the innovation of the construction of the platform, and the innovative team of university practice teaching, construct the market orientation teaching team of practice teaching innovation of universities, strengthen the practice teaching links, and strengthen the practice teaching innovation in the effectiveness, etc.

Keywords Innovative talents · Practical teaching reform · Market orientation

61.1 Introduction

In China, the higher education in the transitional phase, is the general teaching elite education, grasp the main position in the general teaching. University graduates are facing severe employment situation, employment quality more and more low, and wages are down. Establish a particular innovation talents training mode become important strategic choice. Research in the innovative talents training mode in university must be based on the reality of the status of environment quickly, in the laboratory is the key part of to improve students' practice ability. Through the product market position, strengthen the practice teaching,

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strengthening the effectiveness of the practice teaching reform, in addition to the development of consciousness, and the ability of students' autonomous innovation is an important way to foster creative talents.

61.2 The Current Situation of Practical Teaching in University Restricts the Cultivation of Innovative Talents

The overall situation of the rapid development of science and technology and the development of the cross subject, colleges and universities should be responsible for training innovative talents, should already have these functions, including the comprehensive knowledge structure, solid basic skills, ability reasonable structure, and independent key ability and of life is a positive attitude. The basic characteristic of innovative talents is the innovation ability and the innovation spirit creative achievements. In the time of knowledge and economic process, training and growth of innovative talents is the instruction knowledge, learning process, and production process of knowledge; in addition, only the manufacturing process of the uniform of the knowledge, the three aspects (creative spirit, innovation ability, and creative achievement) can be the perfect to display, promote the growth of the creative talents effectively. Link practice teaching is the principal means of cultivating innovative talents.

At present, there is some serious drawback to the current situation in university practice teaching, mainly in the following three aspects:

(1) The problem of practice teaching in funds and management system: in recent years, in the university, a large amount of funds for infrastructure, in fact, for the construction of the laboratory, the input is relatively small; And the force of habit of small-scale peasant economy and management and use the mode of the domestic existing workshop the use and management of the laboratory in university system equipment as a general phenomenon for a long time.
(2) Team construction is the laboratory at the university of the teacher is not very good, those with high degree have a trend of laboratory construction of contempt, but the experienced in this field are lack of advanced education training. In the construction of university laboratory technical personnel, shortages and waste of talent coexistence, integrated advantage has not give full play to the training innovative talents, reflecting, in college, mature innovation practice teaching culture is still not fully formed.
(3) Higher education idea lag. Long-term since, our country's higher education's main goal is to study the industrial civilization, focus on the instruction knowledge, understand the teaching process knowledge accumulation process, evaluate students' mastery of the number based on knowledge, and ignore students' potential ability of development and innovation ability. Knowledge is closely related to the cultural background of the form. Learn the knowledge

of the process, need to pay attention to the real world situation, and we emphasized the knowledge into the real world situation it is the production and use of. The main purpose of practice teaching in university is deepening and consolidates the classroom teaching content, this is a teaching assistant part, most of the content is mainly based on the verification experiment, and the content and progress is dependent on classroom teaching. Virtual phenomenon exists in experimental teaching of the purpose and goals of the knowledge and skills, the real are not real. This process, methods, and goals to display a free phenomenon, the school is lack of decision maker's system reform and the construction of experiment teaching, the experiment teaching cannot more attention, it should be worth.

61.3 The Enlightenment of Innovative Talents' Training from the Market Orientation Theory

Market oriented theory in the process of transformation from the, from the concept of production, marketing field marketing idea, this is the market marketing of the development of the theory of results. The market localization structure theory basically can be divided into two types: behavior perspective and cultural perspective.

In the market orientation structure, there are three behavioral factors: the customer is first, competitor-orientation and department cooperation, add two decision criteria: the long-term view, pay attention to the profit.

The market orientation is not only behavior [1], it is linked to the enterprise's value system, and culture and the relationship between the behavior is increasingly close, and the value of the clients activity, it is from cultural belief systems, reflects and rooted in it, is becoming more and more strong. Only the powerful enterprise culture can produce sustained behavior.

Deshpande and Farley [6] proposed a definition of product market positioning: purpose of trans-department processes and activity is the production and meet customer needs assessment last. This activity and processes need is deeply rooted in the enterprise culture. Only in this way, the production high quality customer value can be sustainable behavior of the enterprise departments and employees, and then enterprise can combine all departments in the energy resources.

Some researchers think that the market orientation culture is made up of four parts: the common and basic value orientation of enterprise support market; the market standard; rules of market positioning [2]; the market orientation behavior. The common value is the biggest support the market orientation.

Market behavior orientation Angle a certain behavior related focus on studying the market orientation. Narver J, Slater S argues that market orientation is for enterprise customer orientation, through the organization of the department, coordinate to achieve the goal of a profit. On this basis, they give a specific definition and market positioning: organize information of current and potential

customer demand, through the trans-department dissemination of information, the organization appropriate information reaction. It includes three aspects: the production and dissemination of the market information, sales information reaction.

Besides Jia gas and Kerry, Ruekert also study the market orientation Angle of information to the needs of customers, he thinks that the market orientation is the organization and get information to the needs of customers, according to the information, formulate and implement marketing strategy. The market orientation degree of a enterprise can be measured based on the following: for the enterprise, first of all, a large amount of information from the clients for enterprise members and use; Second, how to make the strategy to meet the need of customers; Third, how to implement the strategy to meet the need of customers.

It is worth nothing that, in view of the above market orientation organization culture and information processing. The two views differ in expression of the product market position, but they are not quite the opposite, they complement each other. Therefore, it is said that scholars have different understanding of the product market position, this is based on different theories foundation, and they are of the same material. From the above, the present research status of market orientation is mainly from two aspects, one is the view of the behavior, and the other is a cultural perspective. This kind of behavior is appropriate Angle of some behavior of the enterprise related enterprise market position, see the market positioning for a specific group of enterprise behavior, these actions show that around customers, competitors and interagency cooperation, market intelligence, is the production process of distribution and reflection, and a particular business combination; Cultural Angle defined the market orientation for enterprise culture, can produce high quality customer value, so that sustainable superior achievement [3], a very effective ways to organize the necessary activities. The two ideas put emphasis on product market positioning the basic ideas and operation level of application need integration.

The current market orientation research results mainly from the nonprofit organizations under the environment of the market competition. The study in the integration of the market localization theory and nonprofit education system is blank. But the market localization for an important means to promote the achievement of the organization, also have a lot of creative inspiration of creative talents training mode of college and university:

First of all, all of the organization's activities are based on the needs of the customers. Of course, as colleges and universities whose clients include students, parents, and other social various interest groups, has some particularity; Their demands not only from the realistic employment pressure, but also from long-term development potential, etc.

Second, the innovative talents training mode must be based on creative organization culture, therefore, need schools even the society as a whole to change the current concept, change assessment of the orientation of value in school talent, is mainly aimed at the instruction knowledge, the students' innovation ability as the destination.

In addition, the market localization is a series of organization behavior, and more than collection, transmission, and market information from only a reflection of the organization department. It will require innovative talent training and must have the common behavior from teaching to the logistics in every link.

In the following code, the link of practice teaching as an example to explore the concrete measures to innovative talent training.

61.4 Features of the Practical Teaching System Under the Innovative Talents' Training Mode

In the university innovation activities and most of them are in the laboratory to complete. In recent years, the Chinese university laboratory construction has been on the fast development stage [4]. The university has a lot of advantages of knowledge resources, and a large number of high-tech talent, is proficient in technology and theory, understanding and familiar with related technical development trend and industry; at the same time they also accumulated a lot of scientific and technological achievements and experience and research. Knowledge and technical superiority resources fully play their part in university teaching practice, the intangible assets will save to create good technical conditions, and foster creative talents.

There are two features practical teaching system of university in the market innovation talents training mode, one is in the practice teaching system, and the other is the practice teaching for the entire training plan.

First of all, this practice teaching system based on the innovative talents training system. Based on the content of the traditional inheritance to create, through the integration of the existing practice links, realize the system of global optimization of teaching practice, and the content of establish four link as important points, including the course of practice [5], the survey practice, the design and extracurricular practice, practice of academic public professional practice and comprehensive practice this four steps level progress, enterprise's actual need as the guidance, ability construction as the core, to meet the needs of the business as the goal, and actively promote school-enterprise cooperation, adhere to the scientific planting, and build a practical training system, it is the business needs as input, in order to meet the needs of the business innovation talent as the output, effectively shorten the distance of the actual effect of talents training and business requirements. Adhere to the practice teaching system, and through the practice teaching is the whole process of learning in the university level.

Second, update and optimize the teaching content. On one hand, scientific design of the experimental teaching outline, reduce the experimental contents, they are used for presentation and form, and add a comprehensive, contrivable, open and innovative experiment teaching content, to ensure enough practice, of the students' basic skills and creative ability in experimental teaching, and encourage

the students to do the experiment. On the other hand, use the position of the enterprise good improvement of talent's comprehensive quality, building outside school training base, production and service, lets the student in the forefront, in social interaction and professional status, can promote effectively the two-way interactive teaching and learning [6], in addition to let more students into the enterprise and participating in the development of the actual project understand the operation mode and visits to the most practical of enterprise development technology, based on the market orientation, improve the competitiveness of the student's employment. The practice teaching is also included in the development project.

61.5 Reform Measures of Practical Teaching Under the Market Orientation Innovative Talents' Training Mode

In recent years, the university, as the main base of cultivating innovative talents in China, promotes the construction of the innovative talents' training platform, by the ways of the fast development of the constriction of laboratory and enhancing the university's innovative team construction etc. ways. And the practical teaching reform under the market orientation innovative talents' training mode needs us to do the following works:

(1) Strengthen the construction of the innovative platform and innovative team of the university's practical teaching.

The laboratory is the important carrier of scientific and technical innovation, by equipping the advanced instruments and equipments, to attract the high-level technology talents, and enhance comprehensive advantages of laboratory in the scientific research. In addition, in the science times, the scientific research involving the span of time ad space and the investment intensity and the complexity is improved vastly [7], the number of the scientific and technical personnel and the scientific research institutions is mushrooming by exponential form, and the behavior of scientific and technical innovation is appearing a trend of changing from individual innovation to team innovation. Therefore, according to the trend of the development of the entomic society and the science and technology, and the development plan of international industry, strengthen the innovative team construction, aim to drive the cultivation of innovative talents.

As for the innovative team of the university's practical teaching, based on the laboratory, divide scientific research groups according to the different majors, the professors and Ph.D. Supervisors with higher level of scholarship and good team spirit manage the practical teaching, scientific research, and the labs' external service etc. directly. Like this, on one hand can be improve the structure of labs' personnel, adjust and optimize the structure of personnel, and solve the

phenomenon of the shortage and waste of talents coexisting in the construction of university lab technical staff; on the other hand can improve the level and effectiveness of usage of instruments. Meanwhile, the staff from different levels work together that is benefit for communication and improvement, it may be said that answered multiple purposes.

(2) Persist the student orientation and teacher-directed in practical teaching reform. For the student orientation, the institutions of higher education practical teaching must provide individual service to satisfy the students' extensive value demands, and must provide service for the students with higher succession and value consciousness. Respect the students' subjectivity and individual, and achieve the overall development of the students. For the teacher orientation, need to break the boundary of teachers' theory teaching and experimental teaching, in the policy, teaching in theory course and laboratory course should be treated equally, establish the concept that the theory course and laboratory course are important equally.

61.6 Conclusions

Establish specific training mode innovation talents has become the important strategic choice of Chinese university answer all the challenges. This paper according to the market orientation theory, research how to improve its effectiveness of practice teaching reform, and development of the students' consciousness and the ability of independent innovation. Improve existing link of practice teaching of fault, which aims to explore new ideas and policy suggestions to the innovative talent training mode.

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Chapter 62
Study of Harmonious University Traffic Safety Education System

Qichun Zhong

Abstract This article views the traffic security education forms, technical requirements, and technical people. Member of the production level and the current multimedia production technology, hardware and software environment. Development present situation, the thorough analysis the traffic safety education software function demand, open facing the hair of the biology traffic mission department of transportation safety education video use sound. Frequency editing system, through this system, users can improve production to face education goals set by the efficiency of teaching product, convenient and quick to realize and traffic safety teaching. Education related teaches product material database management and the editor of video, audio editing work.

Keywords: Traffic safety education · Education system · Constructing

62.1 Introduction

With the rapid development of economy, China's access to the rapid motorization development period. By March 2010, the motor vehicle quantities are for 192 million quantities, the motor vehicle driver of about 205 million people. With the transportation industry newsletter fierce development, road traffic accident is frequency, the first since 1899 have occurred together to remember. Record since the car accident, total global car accident killed 30 million people, equivalent to half of the second world war death toll. Now in our country, every 5 min on average one people in a car crash

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death, every minute, a man in a car crash disability [1]. Starting with the experience has shown, a country's rapid economic development, also often traffic safety. In serious condition of the deterioration of the crisis our country at present the serious situation of traffic safety confirms this. Economic development to stimulate the rapid growth of the motor vehicle quantities long, but at the same time the social public traffic safety consciousness, traffic safety set method, traffic safety facilities construction, traffic management means and not with the motor vehicle. The rapid growth of the volume and the rapid development of road traffic system and obtain the corresponding improved, lead to road traffic safety level deterioration, road traffic accident die high number. Traffic safety management is a systematic project, in order to reduce the traffic accident hair birth rate, all countries in the world in exploring the traffic safety, to people, vehicles and road harmonious one. In order to prevent and reduce traffic accidents, after years of research and practice, this paper puts forward the road traffic management "4 E" strategy, namely engineering technology (Engineering), law Enforcement (Enforcement), safety Education (Education), and the First Aid (Emergency Care and First Aid) [2]. The road traffic system involves people, vehicles, impose elements, and is the traffic participants in road traffic system is the most active, most active factor, but also pay the safety of the most important factors. So security education to improve the whole society traffic safety consciousness, prevent, and reduce road traffic accident harm plays decisive role. In the current conditions, the traffic safety propaganda education is to improve the traffic people safety of the idea of a small, the effect lasting stability cost effective measures. Existing traffic safety education experience to our country has a high reference. The traditional transportation education methods such as paper preceding propaganda little account of manuals, etc. Pedagogue psychological characteristics; it is difficult to arouse the learning interest and attention, lack of dramatic effect, for different people also not using a targeted. The education mode, the effect is very limited. In order to improve the interest in learning, learning ring the construction of the territory is very important, video audio teach product has the appeal, the advantage of strong power, communicate content easy to be educated to accept, and subject welcome degree is high, the propaganda effect is good, facilitate promotion, and is very ideal the traffic safety propaganda way.

62.2 System Needs Analysis

Traffic safety education video audio system research and development needs in the investigation. Further analysis based on traffic safety education function requirements, through the existing system. The integrated application of technology is for development, preparing for system development. Tsinghai University institute of traffic safety is in two stages to Hangzhou city, Zhejiang province, Huizhou, Shoaling city traffic safety education. Remarkable achievements, the prominent the traffic police were field research. Research work if it understand the current mission of personnel teach product production mode, computer water flat, production efficiency and multimedia teaching product video audio production software functions. Need and

content. Investigation object including traffic policemen, traffic manager member is students' safety management personnel, education department personnel, etc. Through the investigation as can be seen, the present basic unit for traffic safety education video audio teach product. There is a great demand, but because of the traffic propaganda education personnel computer level is generally low, the existing commercial video audio editing software learning time is spent long and operation is more complex, difficult to promote the use of; but mission staff to grasp a lot of graphic material, provide the advertising company, film and TV making company the cost is high, mission of teaching personnel made little taste autonomy, contents to update efficiency high; at the same time mission personnel need convenient and effective way of management hand collection amount of material, can best video and audio editing the effective combination of the software function. According to the research content and analysis, the traffic mission personnel need to quickly into to teach product manufacture software of publicity, can save the publicity materials production room and cost, rich education means, but the grassroots no such technology, software and material database. Traffic mission and researchers to traffic safety video audio editing the function of the software needs and framework description as follows: (1) like cameras easy to use; (2) operation steps in the s to IO step inside can complete a depending on the operation of the product audio frequency teaching; (3) has the rich material database for the unity of the material management and storage. The existing commercial video audio editing software and can't completely to adapt to the needs of the traffic security education. Traffic safety education special system should have general video audio editing system of general function and apply to the traffic security education dedicated segment analysis function of traffic safety and special material database, in general function and market video audio editing software basic quite, to adapt to the characteristics of the system users, more simple easy, and the cost of a system make time are lower than other video audio editing system.

62.3 The System Framework and Function Module Design

In order to satisfy the users convenient is application and the actual demand, and maintain the system architecture of the linear and simplicity. The main functions of each part of the system are as follows:

62.3.1 Management Module

In order to facilitate the management and the users of the audio editing video processing use, according to the traffic safety education material data source the characteristics of large, widely [3], design a special access and management module, such as video, audio add classification according to the information and

classification and the key word to search references. The traffic security education number according to the design of the model is to be realized the whole video audio editing system basis and data source.

62.3.2 Piece of Degree Analysis Work Together

Use of traffic safety education data storage and management model can be a large number of days often street surveillance video [4], to extract useful to mission of illegal traffic line for, usually the way is by artificial watch splicing manual processing, is neither and cannot easily when to ensure that no gaps. The system analysis module can be fixed to pieces in the scene, in the abnormal situation dynamic analysis, or consecutive series of different scene the transformation between segmentation, let make user to quickly find for the great pieces of material.

62.3.3 Key Frame Processing Module

After the traffic security education data model and the analysis of the segment can be selected find the basic material production teach product. But will video audio material into can video clips of direct application also need to carry on some material contents in effect Richard [5], such as a lot of traffic accident video is bloody, despite the impact, but side effects is bigger also, should not be directly play, then can use key frames the special effects processing modules of the related functions. Key frame processing module contains video audio Ed The main function of the collection, including adding video effects, transition effects, and audio effect fruit, the movie titles out, characters, etc.

62.3.4 Nonlinear Editing Module

For the convenience of operation will nonlinear editing module and visual editing platform to close [6], after effects processing video clips can directly in visualization of time Axis and rail on the add, drag and deletion of operation, and available for real when the preview.

62.4 The Key Technology of System and its Implementation

The key technology of system and the method is as follows:

62.4.1 Based on XML and Ado.Net Data Access and Management

The existing traffic safety education data source complex diverse forms need expert a different classification and the key word to search and access, a data model more complex Miscellaneous, also may need to modify. The relationship between the complexes, more data media application requirements and system integration application can be in XML data model in solved. Extensible markup language (XML) is released by the W3C organization of data standards. XML data with flexible half structural characteristics and does not rely on any database system. Microsoft ActiveX data object (ADO) asp.net is.net in the Framework of the contains a powerful data access class library. As a Dataset ado.net is a core component, was designed to need not even meet can operate [7], so that whatever data from where to hold. This system uses data to the classification of all XML file save form store, use the.net Framework flow mode and the DOM and analytical model to deal with XML documents. The ado.net connection to recover Data Set is in memory the data, Data Set support XML programming object model, can XML data attributes to manage the classification of information search and selection. In the net Encapsulates the logic of application layer, the Tree View control as XML data. Traffic safety education video audio editing system is engineering documents the multimedia information through the same in the form of an XML file access and loading.

62.4.2 DirectShow

DirectShow setups are Microsoft provides a set of in Windows operation platform flow media processing programming interface. Program developers can direct application to provide overall application framework of DirectShow the bottom floor and finish the work a multimedia application development. DirectShow use Filter Graph model to manage the data flow the treatment process, Filter Graph will participate in data place [8]. The rationale of each functional module (Filter) in a certain order in collaborative work connected together as. DirectShow editing services (DES) as DirectShow based on the core framework programming interface to simplify the video editing task, based on the time line (Timeline) structure and rail button. Track reads changes corresponding concept makes the interface and more Media bottom model to the agreement, multimedia file organization, editing more straight View and efficient, and can support real-time preview. Another DES supports direct eye contact the effect of frequency, audio and video processing switch between transition handle, support the a tonal, brightness, RGB values or Alpha value the synthesis of image, to be automatic to source output video frame rate, audio sampling rate adjustment, direct team the video of the scale. DES provides and Microsoft IE bringing all kinds of audio and video effects, transition handle component can meet the basic video audio place Richard need.

Use Renderer Filter can achieve in the video to draw on the text the effect; use Sample Grabber Filter for the current frame grasp of the picture taking.

62.4.3 Piece of Degree Analysis

For video content analysis method of the main light flow method, background extraction and the time difference method [9]. Clips the basic process of analysis is: the first take a single frame or continuous multi frame video signals, graphic division, edge detection measurement, feature extraction, object tracking, discriminate decision and a series of video content analysis, so as to reasonably dividing segment time, and then to signal fragments division save. In the use of minus background method [10], the paper analyzes the background image, when prospects figure as the change of the value above a certain 17, the judge have new events. Use DirectShow image acquisition and clips segmentation preservation.

62.5 System Application Examples

This system development environment for Visual Studio 2008, development for language C#, to support the.net platform using the network in C# rewrite DirectShow asp.net version. After the system test and in traffic of basic education Preliminary trial, generally reflected system easy to operate [11], can significantly improve the teaching product production Efficiency, reduce the production cost of teach product, can effective rich mission means and teach product content. Using the traffic safety education data access and management system data search, reference to the traffic safety video audio editing system used to make teaching product, and can also add video effects, transition effects, and related audio words and so on, the compression and teach product production output finish.

62.6 Conclusions

Video audio teach product has the appeal, appeal, strong shock of optimal Potential, communicate content easy to be educated to accept, and popular degree is high, propaganda effect is good [12], easy communication promotion, is very ideal traffic safety propaganda way. Based on the research related video audio editing theory method and function realization developed on the base of the system for traffic mission departments to provide easy traffic safety education video audio editing way, can be used for different object oriented traffic safety propaganda education, rich mission means and teach product content, improving teaching

product production efficiency, reduce production cost of teach product. This paper established the traffic safety teaching Yukon data model, can go to the lavatory to existing and new add teach product is editor of the tube Richard.

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Chapter 63
Study on Pathway of Administrative Discretion Standard

Yang Yang

Abstract The justice was achieved in one case how to prevent the arbitrariness in the administrative discretion. It becomes current hot spot and core in practices of the social management and administrative. Based on the concept's interpretation, value direction, and rule deduction of the administrative discretion standard that are standardized the existing discretion power and as compact as possible the space of the existing discretion power, we study on its pathway. And it is pointed out that it is applied to dealing with the power's structure between individuals and societies on the micro side.

Keywords Administrative discretion standard · The justice of individual case · Concept's interpretation · Value direction · Rule deduction

63.1 Introduction

The justice was achieved in one case how to prevent the arbitrariness in the administrative discretion. It becomes current hot spot and core in the practices of the social management and administrative. All areas in our living world must be monitored in the law-ruled society. In this situation, the administrative discretion standard as a means that control administrative discretion emerge as the times require. It can be used to standardize the existing discretion power and as compact as possible the space of the existing discretion power. Laying down the

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administrative discretion standard, the executive authorities is as a framer that have "expert knowledge" and have secondary legislative powers, they should hold availably the pathway of "the concept's interpretation, the value direction and rules deduction" of the administrative discretion standard.

63.2 The Emergence and Concept's Interpretation of the Administrative Discretion Standard

What is the administrative discretion standard? In view of the form, it is to standardize the detailed standards of law enforcement in the administrative discretion's enforcement. It is the general normative documents as the carrier, and is the program, common, relatively uniform primary standard, rather than the personalized, experiential or even random decision of law enforcement officers. From the content, it is as a medium or bridge for communication between abstract law and specific facts, and is more nearly the "secondary legislation", "Subordinate legislation", "administrative legislation" in order to implement the law. Its range of effectiveness may only be involved into microcosmic administrative areas, and only be defined within a certain administrative region and a certain administrative departments [1]. It is not difficult to summarize that the administrative discretion standard refers to which is based on the legislative intention and discretionary authorization, under the guidance of certain objective value, that the executive authorities as subject did not provide the complete standard that required in dealing with the specific administrative cases in the laws and regulations of the social and administrative management, it is the administrative case judgment standard mainly presented in form of the normative documents and other, combined with law enforcement experience in the normative documents and other.

The next question is what a certain objective value is?

63.3 The Value Direction: Order, Justice, and Efficiency

First of all, the need in functional significance of the objective value. The standard itself is a tool, people can achieve a certain objective value through the tools. And then, the need on the standard significance of the objective value. What are the objective value to show the human ideal of "common good"? They should be order, justice and efficiency. The reason that the three values is the objective value of administrative discretion standard, on the one hand, is that they are the most basic needs of the rules for people, On the other hand, is that the primary purpose of setting a rule by people is in order to achieve these three values.

First, the administrative discretion standard have to meet people's need for order. First of all, order is the most basic needs of human beings. It is a certain

degree of consistency, continuity, and coherence that exist in the natural and social processes, is fixed form in man's mode of production and life style. For another, the discretion standard have no order value's guidance will inevitably lead to execute the law without order. The administrative discretion standard that have order will bring a series of the performance of social life, including the relationship stability, the processing continuity … during the period of executing the law.

Second, the administrative discretion standard must meet people need for justice. First of all, there is no human rights without justice, the human is no different from animals. The discretion standard that embodied as the spirit of the rule of administrative law is to control the power in form, in essence, it is to realize individual justice. For another, the pursuit of justice is a constant need for human. The administrative discretion as an effective tool of administrative law enforcement is a sharp double-edged sword. "In which the government have both of the rule of law and the rule of man, the part of rule of man is like a fatal cancer and tend to stifle that part of rule of law. The rule of man that part is like a fatal cancer, tend to stifle that part of the rule of law. Perhaps, 90 % of the injustice in our legal system is from the discretion, but only 10 % is from the rules" [2]. Its original intention and effect will be bound to nothing and it will lead to a series of dissimilation problems in practice, if the law enforcement within the discretion standard have no the guidance of justice value.

Third, the administrative discretion standard must meet people's needs for efficiency. First of all, it is required the efficient administrative law enforcement in the modern economic life. Second, people have the need for efficiently participating in the governance process of administrative law enforcement. At the lack of efficiency as the objective value for introducing the administrative discretion standard, there will be happened in practice that "the staffs' behavior of administrative law enforcement has not been effectively regulated and controlled, such as: some have a serious privilege idea, lack of awareness of service and inefficient, some abuse of power and even abuse the law and practice favoritism during law enforcement" [1]. It will cost the social resources, but is less enforcement effect.

Another problem is, although having the value direction, this subject is only defined within a certain administrative region and a certain administrative departments, its range of effectiveness may be only involve into the discretion standard of a microcosmic administrative areas. What kind of appearance should we face the public and efficiently achieve the rules' governance of discretion?

63.4 Rule Deduction: The Standard for Interpretation, Procedures, and "Requirements-Effect"

Which standards control can we truly needs to achieve the governance for the administrative discretion in practice? On one hand, we can try to locate something by following up a clue for rule deduction by adopting the concept of administrative

discretion standard as a starting point, the value as directions. On the other hand, from the practice of administrative law enforcement, the formation of discretion is mainly based on the following reasons: First is the polysemy of the concept and it will provide a very big power for discretion. Second is that the "requirements-effect" including procedures provisions, permission, or punishment is provided for laws and regulations, and even the administrative departments also introduced the corresponding regulations to refined. Therefore, by controlling the unnecessary discretion and reducing space to administrative discretion, so it was achieved a balance between rules and discretion, and eventually achieved "case justice", it is necessary to set the Standard for interpretation, procedures, and "requirements-effect"(such as permission or punishment etc.) [3].

The Disposal Specification of Public Security Organs for the Common Policing Alert was introduced by Chongqing Municipal Public Security Bureau to improve police the comprehensive ability in law and set the specific standard for law enforcement. The procedure of "the disposal for animal attacks" require as follow in the specification:

> 1 Animal owner should be ordered to be extra careful for his animals when animals are attacking people. 2 The polices should take effective measures to stop the attack behavior if the owner is not present, no owner or laisses-fair by owner… [4].

63.5 Conclusions

A contraction of instructions: First, the administrative discretion standard is as a standard and rules for administrative enforcement power, it is as far as possible for the executive authorities that reasonably execute law, and it is framed through the objective value direction and rule deduction. The main function of administrative discretion standard is for the interpretation, including the interpretation of the uncertain legal concepts, and explanation of procedures, requirements-effect. Second, the standard should also be accompanied by the obligation to make it well known, but also to set its update system of the authorization file. Usually, it is necessary to introduce the system that can flexibly apply the standard, rather than rigidly apply it under certain conditions. Third, furthermore, the administrative discretion standard can also be regarded as a kind of specification and self-supervision for the administrative power, the "discipline" punishing for power on the micro view, an applied technology for the defaulted social power that is based on the congenital equal theory. Generally speaking, the administrative discretion standard is applied in processing the structure of individual and social power on the micro side, but the law is applied in maintaining the social structure on the macro side.

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Chapter 64
Study of Occupational Stress and Influence Factor

Xinliang Ju and Xinming Qian

Abstract With the traditional biomedical model to the biological, psychological, social, and medical model of change, committed to occupational health researchers began to look by a single environmental impact factors be extended to the psychological field workers. Their current occupation tense situation, and such a tense situation on people's health has gradually become the researchers focus on the object. I try from the concept of health hazards, influencing factors, several aspects of the research methods and interventions on occupational stress in recent years progress are reviewed.

Keywords Job strain · Job demand · Job control · Effort-reward imbalance

64.1 The Concept of Occupational Stress

Occupational stress is defined as in academic research: social and psychological factors in the workplace beyond the body's ability to regulate, or work requirements and capabilities, resources, needs do not match the harmful physiological and psychological reactions [1]. The country was also suggested that occupational stress in certain occupational conditions, the objective requirements and the subjective ability to adapt to the imbalance between the physical and psychological pressure [2]. Past 30 years, with the deepening of China's economic reform and

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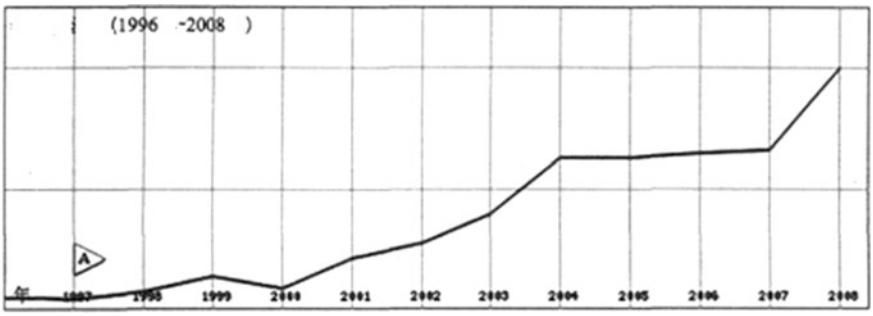

Fig. 64.1 Occupational stress academic attention

modernization process continues to progress, people's work and lifestyle to great changes in both organizations and individuals are exposed to the subjective motivation of the corresponding Misfits (personal aspirations and organizational environment to meet the gap, such as wages, benefits, status or physical, knowledge, experience or skills and job requirements, such as workload, complexity, and individuals responsible are incompatible) this suited to only hinder the improvement of organizational performance, and also increased the psychological pressure of the individual, occupational stress phenomenon is caused by this not suited to the serious consequences of one [3–5]. Therefore, occupational stress and the generation to have an adverse impact on economic development and personal health. In recent years, researchers have begun to invest more energy studies of occupational stress on people's health every year. According to the statistics of the China Knowledge Infrastructure (China National Knowledge Infrastructure, CNKI), as shown in Fig. 64.1. It can be seen, occupational stress and academic attention in recent years increased substantially, and the constant increase in the importance of the occupational stress.

64.2 Subjects and Methods

64.2.1 The Object of Study

Using a convenience sampling method, select a state-owned enterprises in the Shanghai district employees, the employees of a private enterprise, one secondary and two primary school teachers, three of the medical staff of the Community Health Center, a research institute researchers and a bus driver for the study [6, 7]. In addition to the bus company investigated only two team drivers, other units of occupational population survey rates were 81 and 89 % of the average survey rate of 83 %. The survey's length of service are more than 1 year. All of the subjects were informed consent, autonomy under the guidance of the investigating officers to fill out the questionnaire, survey was conducted from July 2008 to April 2009.

64.2.2 Research Methods

JCQ questionnaire occupational stress and the evaluation factors are: job requirements, job control, social support, job insecurity, job requirements, and job control score ratio (D/C) [8–10]; ERI Questionnaire score evaluation factors: pay and reward ratio (E/R), the inner drive. Textile of the stress-related evaluation factors are divided into high, medium and low three groups. Job requirements and job control model (job-demand the control, by JDC), job requirements and job control score ratio (D/C)> 1, defined as a high degree of work stress; pay and reward imbalance model of work effort and reward ratio (E/R)> 1, defined as a high degree of work stress.

64.2.3 Other Information Survey

Including socio-demographic characteristics and habits of individual behavior (such as smoking, drinking, sports and exercise, etc.). The definition of regular sports and exercise is the exercise once a week or more, each more than 20 min.

64.2.4 Statistical Methods

Using EpiData 3.0 to establish a database, using the SPSS 15.0 software package for analysis. The use of $\chi 2$ test was used to compare socio-demographic characteristics, nervous symptoms-positive differences in the rate of individual behavioral characteristics of the different levels of group, and the use of multivariate logistic regression model to analyze the different levels of each variable associated with nervous symptoms. Inspection level $\alpha = 0.05$.

64.3 Results

64.3.1 In General

This survey were distributed and survey assessment questionnaire 2,639 were audited in line with work experience and a questionnaire completed by 2,458, the effective response rate of 93 %. Males 1,130 and females 1,328. Male and female average age, respectively, (42.1 ± 11.6) years (39.1 ± 10.7) years. The survey population, the intense, the average score (16.1 ± 7.2) points, where men (15.3 ± 6.2) points, females (17.0 ± 8.6); nervous symptoms-positive rate was 44.0, 41.6 % for men and for women 46.8 %.

64.3.2 Socio-demographic and Behavioral Characteristics of Life on the Nervous Symptoms Affect the Single Factor Analysis

Seen from Table 64.1, the social demographic characteristics and factors that affect the nervous symptoms of gender, educational level, occupation, job, and weekly working time ($P < 0.05$ or $P < 0.01$). The personal lives of behavioral factors, smoking, and alcohol consumption affect the nervous symptoms ($P < 0.01$). Age, income, work at night, activity and exercise, body mass index (body mass index, BMI), no significant effect on the nervous symptoms.

64.3.3 Occupational Stress and Tension Affect the Multivariate Analysis

Occupational stress may affect depressive symptoms and other factors nonconditional logistic regression analysis. Logistic regression analysis showed that occupational stress-related variables, high work stress, low job control, low social support, high work effort and reward imbalance, high intrinsic drive are the symptoms of depression independent risk factors, the odds ratio (OR) were 1.84,1.24,1.46,1.30,1.51; socio-demographic factors, physical labor, undergraduate education, weekly working time is more than 40 h, the risk factors of depression, OR 1.53,1.58,1.31; personal life behavioral factors only current smoking 11 a day was statistically associated with depression, OR 1.37.

64.4 Discussion

Survey of occupational groups depression, tension average score of 16.1 points, where the average male score was 15.3 points and 17.0 for women. Nervous depression score with the national urban population norm of 13.4 points compared to this survey occupational groups depression, tension average score was significantly higher. The study also found that the occupational groups of nervous depression score in the lowest 35–44 year age group (15.4 points), and the city norm nervous depression score lowest results in 30–45 age group is consistent. Nervous symptoms of this survey occupational groups depression with a positive rate of 44.0 % males and 41.6 %, women 46.8 %, significantly higher than the 19.9 % level in a certain district in Shanghai in 1999. Chinese society is in a transition period, the social environment of the past 10 years there are more obvious change, which may be aggravated by the psychological demands of occupational groups. Previous findings of Zhejiang Province civil servants,

Table 64.1 Analysis of influence of socio-demographic and individual life behavior characteristics on occupational stress

Characteristic		Number	Percentage (%)	Case	Incidence rate (%)
Gender	Male	1,328	54	553	41.6
	Female	1,130	46	529	46.8
Age	<35	831	33.8	377	45.4
	34–44	503	20.5	207	41.2
	45–54	937	38.1	419	44.7
	>55	187	7.6	79	42.2
Occupation	SEE	302	12.3	131	43.4
	PEE	441	17.9	209	47.4
	SR	269	10.9	118	43.9
	SS	406	16.5	141	34.7
	T	243	9.9	98	40.3
	CHW	464	18.9	207	44.6
	BD	333	13.5	178	53.5
Length of server	<5	573	23.3	240	41.9
	5–9	462	18.8	187	40.5
	>9	1,423	57.9	655	46
Income	<2,000	761	31	324	42.6
	2,000–5,000	1,228	50	544	44.3
	>5,000	469	19.1	214	45.6
Education	JH	805	32.8	379	47.1
	SH	644	26.2	276	42.9
	ST&C	633	25.8	247	39
	U	376	15.3	180	47.9
Night shift	Yes	2,260	91.9	986	43.6
	No	198	8.1	96	48.5
Work hours per week	<40	1,391	56.6	569	40.9
	>40	1,067	43.4	513	48.1
Smoking	Never	1,822	74.1	766	42
	<10 years	272	11.1	119	43.8
	>10 years	364	14.8	197	51.1
Drinking	Never	1,549	63	653	42.2
	Occasion	707	28.8	327	46.3
	Often	202	8.2	102	50.5
Exercise	Never	1,851	75.3	826	44.6
	Little	355	14.4	148	41.7
	Often	252	10.3	108	42.9

teachers reported that nervous depression symptoms, positive rates were 41.56, 42.38 %, the positive rate of occupational groups in this study depression and tension symptoms similar to the above findings.

64.5 Occupational Stress Interventions

Studies suggest that occupational stress is often continuous, dynamic, multifaceted, complex phenomenon involving many fields, prevention and reduction of occupational stress measures must be integrated, Workers, managers, family, community participation to be effective.

Overall measures may have two aspects, first, tension management to increase labor to respond to stress the ability of, is appropriate training for workers, expanding the advanced needs of workers, improve their knowledge structure to improve their cognitive, self-efficacy, improve self-affirmation, in order to reduce or eliminate the sources of occupational stress generated. The other is the well-organized management system, and change measures. Organizational structure and source of tension in the production process by identifying companies to take targeted measures to deal with these tensions link, for example, the design environment, highlight the different workers' physical and mental needs, optimizing the organization of labor and the working environment, reduce staff workload.

Personally, believe that occupational stress in the discovery and concern, is a product of modern society. Modern society, the advancement of technology to promote the new technology replacement cycle is shortened, posed a challenge to the resilience of the majority of the people, and fierce competition for jobs, heavy family and social responsibilities but also increased the psychological pressure on people, make people more prone to occupational stress. However, on the other hand, the emergence of occupational stress also shows that the progress of our medical model—pay more attention to the psychological dimensions of people pay more attention to the needs of the human heart. More human medical model, must be able to better solve the problem in medicine, to ensure people's health. Departure from the social, psychological level, a fundamental measure to try to eliminate the source of tension in the production and working environment, improve the quality of working environment, workers adapt to the job requirements and control is to reduce occupational stress, and to ensure the health of employed persons, but also our response to occupational stress and the only way.

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Chapter 65
Two-Tier Quality Supervision Mechanism for Education of Military Academies Based on System and Relationship Arrangement in New Period

Yidong Ma, Xuehong Yuan and Dongxu Li

Abstract Quality Supervision for higher education is a frequently discussed topic, which makes it necessary in the new period to clarify the primary requirement, the function of college and university education quality supervision and its mechanism, and to make an attempt at a two-tier design based on system and relationship arrangement aimed at finding solutions to the problems in terms of military academy quality supervision in the new period.

Keywords System · Relation · Education quality · Supervision

65.1 Connotation of College and University Education Quality

It is true that we are in an Extensive Quality Era. It was thought that quality was intangible, indefinable, indistinct, and even that something had quality as long as it met some need or comply with some regularity, or that quality ought to be of multi-dimension, which combined diversify, expansibility, and reproducibility. However, such interpretation of higher education is always a complex quality system including school education, social influence, management, and even service. Social influence quality includes both higher education institutions' guidance to society and society's counteracting force on college and universities [1]. Meanwhile, market feedbacks quality include both the approbation of human resource market to the products, students and teachers, of higher education and the market shares and valuation of such products [2]. It is clear that higher education quality is directly pointing at the

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quality and standard of the teaching, management and service of a higher education institution, which also implies the expectation and demand for the college or university's management and service and its teachers' teaching ability and standard. As some scholars say, "In terms of the Connotation, higher education quality comprises the quality of people, of things, of system, and of culture", which is the kernel of higher education. So some scholars summarize higher education quality as two aspects [3]. One is a general requirement for quality and refers to that everything of higher education must be based on our nation's education aim, to cultivate special talents who bear both humanistic quality scientific quality, and have innovative spirit and practical ability, which is the basic requirement of education; the other is specific talent qualified standard and refers to the quality requirement based on specific cultivation aims of various types of higher education, which is the quality standard to measure the qualification of their cultivated talents. Therefore, it is evident that such a summary accords with most scholars' research habit and academic identity, that the aim of education is the source of the fundamental standard of education quality and "No sense does it make to take quality separate from aim".

65.2 The Mainstay of the Supervision of Higher Education Quality

Generally speaking, the mainstay of higher education refers to both parties. One is the acceptance party of higher education, that is, employers, social institutions, or education administrative departments; the other is the bearers of higher education, that is, educator and educatee, as well as educational institutions themselves. For a long time, our supervision on higher education lies largely in part of its acceptance, education administrators, which regulates and guides higher education institutions on policy aspects, such as school orientation, cultivation objectives and the needs of social service. In a similar way, due to administrative liability and reputation, higher educational institutions monitor their education quality spontaneously, which is more in the fact of attracting students and financial support. Despite this, present quality supervision is more selective than all-sided. Therefore, in terms of, total quality management (TQM), internal spontaneous quality supervision can't meet the needs of quality supervision in higher education any longer, which is also true to mere administrative act from education administrative departments. So supervision and control over whole process of higher education via independent third parties emerges, which must make differences from former results evaluation [4].

65.3 The Reasons for Establishing Supervision and Control System of Higher Education Quality

Why supervision and control system of higher education quality must be established is self-evident. Since the 1980s, the word quality has increasingly attracted widespread attention within higher education. Especially since late 1990s, people's question on higher education quality has been increasing, with the sharp extension and further adjustment of china's higher education followed by education resources per student and difficulty in employment market. In some eyes, declination of education quality hasn't gone with the expansions of colleges and universities, while in other eyes, not. So the core benefit of supervision and control system of higher education quality lies in making higher education satisfying the people and promoting the development of economy and society.

On one side, supervision and control system of higher education quality is able to unify the opinions of all the stakeholders together in terms of quality, and make education quality really meeting people's expectation. On the other side, the dam of to ensure higher education quality should be constructed by means of system design and quality supervision. There is some "practical vacuum of non-equivalent substitution of identity" in present supervision standard of higher education quality. So it is thought that quality supervision mechanism of higher education is created to avoid above practical vacuum. ISO 9000 is regarded as quality assurance model for enterprises and organizations, aimed at to increase their social recognition. The aim of the introduction of quality supervision mechanism to colleges and universities is to increase their recognition in competition, for which university ranking is one of the examples.

65.4 Weaknesses of Supervision and Control System of Education Quality in Military Academies

In every military academy, specialized agencies are established for the examination and evaluation over education quality, but in terms of the function of such agencies, their help for the improvement of education quality is more in Administrative statistical level than in practice, and such agencies haven't been at work fully in supervision, steer, evaluation and feedback. This lies in that teachers' career development is directly connected with technical title evaluating, rank promotion, teaching remuneration, instead of with supervision over education quality. Therefore, some departments intentionally sort those without urgent above needs in the last in order to protect and help those with needs. Consequently, the information we obtain from evaluation and supervision over teaching quality is inaccurate, even of fraud, which is less persuasive and results in misunderstanding and discontent on the education quality inside military academies.

65.4.1 The Means of Evaluation on Education Quality of Military Academies Lacks in Variation, Which is Always Undertaken in the Way of Sampling and Questionnaire

At present, in exterior aspect, supervisory system of education quality in military academies mainly adopts the form of questionnaire or survey, that is to say that direct supervision or that at the sport is scarce, while in interior aspect, supervision lies more on the evaluation of teachers' teaching attitude, content, efficiency, means and methods, rather than the intact structure of some curriculum, and the degree of its correspondence to the basic standard of cadets cultivation goal. So the credibility and validity of the evaluation of education quality, and is essential indication are intact in fact.

65.4.2 Education Process is Out of Control, Because Supervision on Education Quality Lays Too Much Emphasis on Result

Present evaluation system in military academies is similar to that in civilian college or universities, which is inclined to evaluate in the standard of a certain status of schooling and lacks in a systematic evaluation on the overall process of education, for example, every university ranking popular in present China regards matriculate quality which is represented by the results of entrance examinations as well as related ranking and graduate quality which is presented by the passing rate of College English Test and other national or local tests and one-time employment rate as two most important evaluation elements.

Apparently, such deficiency of attribution further causes the fuzzy evaluation on educating or teaching quality and is apt to arouse people's concern and care about the process of educating and teaching.

65.4.3 Deficiency in System Design Leads to Insufficiency for Detailed Evaluation Results to Support Each Other

There is always an emergence of volatile situation on current educating and teaching evaluation.

65.4.4 The Vacancy of Evaluation Leads to Distortion of Supervision Over Educating and Teaching Quality

As was talked above, evaluation over educating and teaching quality in military academies is mostly undertaken by themselves, and the feedback from military and civilian establishments on it is more than insufficient, so that it is difficult for military academies to improve their education quality pertinently in the way of taking satisfying achievement on education objectives, curriculums, majors and other aspects.

65.5 Two-Tier Based on System and Relationship Arrangement: a Theoretical Redesign on Education Quality Supervision Mechanism in Military Academies

System arrangement refers to motivating people's activeness and adjusting various mechanisms reasonably, so that every social factor properly runs. During the course of reestablishing quality supervision mechanism of military academies, it is necessary to take into account the social functions undertaken by military academies, which are also the mission of fostering military personnel of a new type who are high-quality both politically and professionally. Military academy education must be directed by strengthening armed forces with science and technology, and with informationalization, whose start point and essential destination is improving country with education and people's satisfaction. In order to make the start point of quality supervision in military academies match and interact well with the mission undertaken by these academies, military academy education must dedicates itself to the serve military modernization and high-caliber military personnel cultivation in the mission of knowledge inheritance, building strong military through science and technology, national defense and serve local development.

Relationship arrangement refers to put the whole process of education and teaching of military academies into the range of quality supervision, for the sake of a maximization of quality and benefit. Therefore, in our opinion, in order to maximize the revenue of the education quality of military academies, it is a must to regard the objective of military academies as starting point and ultimate reality. To be exact, it means to combine the essential functions of military academies with the approach to and the benefit of realizing those functions, and to combine the internal quality supervision mechanism of military academies with the external quality supervision mechanism including modernization of armed forces, the need of national defense and the superior department of military academies, and the credibility, validity and controllability of military academies themselves is

particularly important. So, education quality supervision becomes one of their internal need of military academies, and the important component of the reform and development of military academies. On this, our theoretical framework of education quality supervision of military academies is shown as below (Fig. 65.1).

It is supposed to say that the objective of higher education plays a central role in the whole of quality supervision system of higher education where the system design, work division, examination and evaluation of education quality are all based on the standard of expectation on their graduates and the orientation of their social functions. So, the dam of higher education quality is constructed with the joint efforts of the evaluation from employers and society, the evaluation from various education administrative departments, and evaluation from higher education institutions themselves. Firstly, as far as self-supervision of military academies, the synchronism of various elements such as that of teaching and learning,

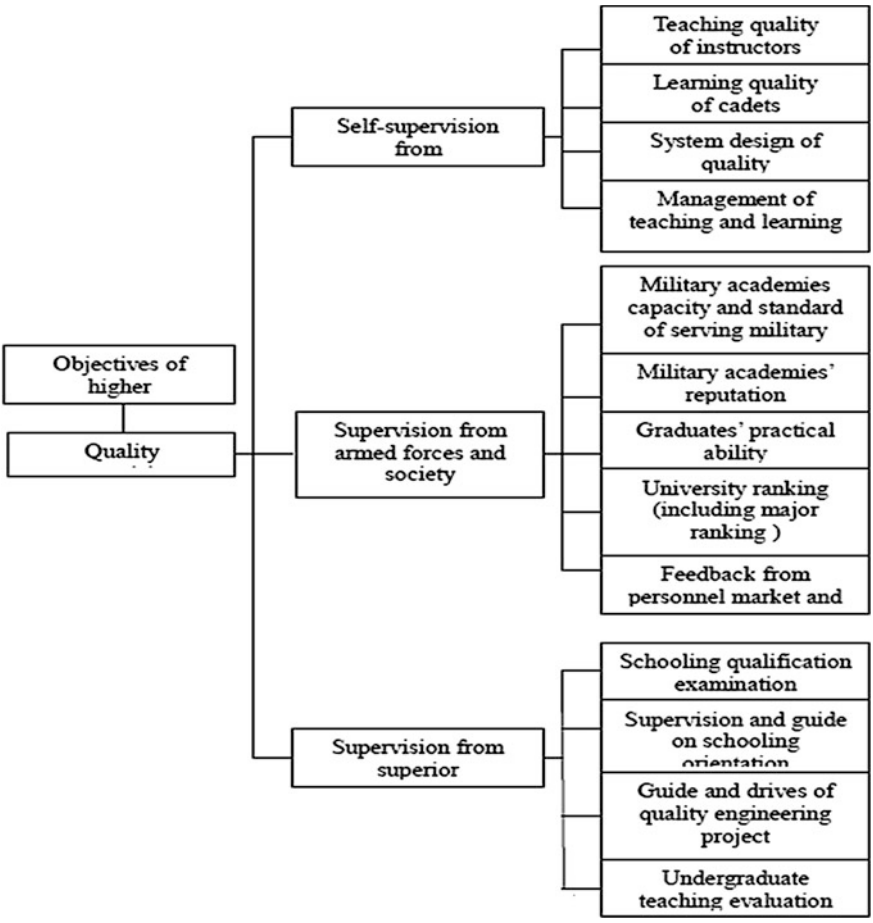

Fig. 65.1 Education quality supervision in military academies and main elements of it

of teachers and students, of teaching, learning and managing, and so on should be underlined, that is to say that it is very important for the education quality supervision of military academies to evaluate the degree of the mutual improvement of teachers and students, and to strengthen process supervision and periodic evaluation. Secondly, as far as employers and armed forces, education quality supervision of military academies should highlight their graduates' adaptability in their early period of serving armed forces and the recognition from those forces. Thirdly, for quality supervision from the superior departments in charge of military academies, comparison should be underlined not only with the own past of the academy but also with other higher education institutions, which should be regarded as the standard to judge whether the education quality of an academy improves or falls. Without the joint efforts from the above three aspects, the quality we have been expecting and seeking for would not be lived up to.

65.6 Conclusion

To sum up, education quality supervision of military has both the initiative exploration in the background of "the Great Reform, Great Development and Great Improvement" and the passive adaptation to the limitation of the background. The effectiveness of education quality supervision of military academies, so to speak, increases by the same percent as the degree of the coordination maintained between the three aspects, that is, education administrative departments, military academies, and armed forces. And predictably, fragmentation of any aspect is bound to kill lead the education quality supervision of military academies and their overall reform and development to a tortuous blind alley. Certainly, the latter is not what we expect. Thus, the design of a two-tier quality supervision mechanism for education in military academies based on system and relationship arrangement is probably a new proper attempt.

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Chapter 66
Study on Organization's Service Ability Based on Innovation Model of Colleges and Local Grass-Root Organizations

Yufeng Jiang and Zengliu Xu

Abstract In this paper, how to promote the improvement of organization's service ability through the innovation of the co-construction model of colleges and local grass-root organizations in the work innovation and excelling activities is emphatically discussed. Through the analysis on the significances of the innovation of the co-construction model of colleges and local grass-root organizations and in combination with practices, the basic practice and key points of the innovation of the co-construction model of colleges and local grass-root organizations are introduced, and also the tree interactive organizational operation model is discussed from organizational system, organizational carrier, organizational brand. That is, the previously single grass-root organizational construction synchronously circulates from inside to both inside and outside and also develop. The purpose of this paper is to make a better improvement to the party organization's service ability, realize the annual goal of the grass-root organizational construction, and further promote the in-depth development of the work innovation and excelling activities in the grass-root party organizations.

Keywords Work innovation and excelling activities · Grass-root organizations · Co-construction model · Service ability

66.1 Introduction

Grass-root organizations, as the party organizational terminals having a direct tie with all walks of life, are necessary to keep pace with the times and make an improvement to the quality and level of development. This plays a very important

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significance and role in further solidifying the ruling foundation of the party [1]. For colleges and local grass-roots organizations, how to make an improvement to the service ability and better play their roles in educating people, promoting development, serving for people, uniting people and impelling harmonious society by seizing the opportunity of carrying out work innovation and excelling activities and innovating the co-construction model is also a very important subject for realizing the annual goal of the grass-root organizational construction [2].

66.2 Significance of the Innovation of Co-construction Model of Colleges and Local Grass-Root Organizations

The innovation of co-construction model of colleges and local grass-root organizations means that the colleges and local grass-root organizations break through the traditional organizational pattern and make innovations on organizational system, expand and develop organizational carriers and construct organizational brands, and then develop from the single internal organizational construction to the inter-regional and inter-disciplinary interactive co-construction, for the ultimate purpose of realizing a sustainable and scientific development [3].

66.2.1 Practical Necessities for Local Organizations to Improve Service Ability, Adapt to the Change of Social Structure, and Realize the Practical Needs on Real Development

On the one hand, from the perspective of a series of changes in the grass-root social structure, in order to adapt to the changes in social structure and improve organizational service ability, it is necessary for the local grass-root organizations to break through the traditional party construction and development model (i.e. internal construction, and internal circulation), and also make full use of the advantageous resources within the administrative ranges. As a result, the supports in human resource, financial resource, material resource, and intelligence resource can be provided for the construction and development of the grass-root party organizations.

On the other hand, from the perspective of the long-term goal of the construction and development of the local grass-root party organizations, making an improvement to the construction and development model of the grass-root party organizations under the new situation is a need of realizing its own development goal.

However, seen from the effect of the pilot practice, the result of the co-construction model of colleges and local grass-root organizations is obvious to all.

For example, according to the increasingly more "two-innovation" organizations within the administrative ranges and the people in communities and countryside putting forward increasingly higher requirements on the spiritual culture, the Party Committee from the Qingbo Street of Hangzhou and the Party Committee from the Potan Township of Xianju County had co-constructed their party organizations with China Academy of Art. Through the co-construction, a great number of student party members in the tower of ivory go out of school and exert their own professional advantages for providing web page design and logo system design services for the "two-innovation" organizations. Therefore, when the difficulties in the demand on talented personnel are solved to some extent, the local grass-root organizations are assisted of making an enhancement to the spiritual civilization and creating a creative cultural atmosphere.

66.2.2 Objective Necessities for Colleges to Improve the Organizational Service Ability and Promote the Party Construction Among Students and its Own Development

There are a great number of subjects necessary to explore for colleges grass-root party constructions in the party construction among students, playing the advancement role of teacher party members, and constructing service-oriented grass-root party constructions.

On the one hand, the party construction has been vigorously implemented among college students in recent years. However, there are a lot of problems in the process as follows: (1) paying too much attention to daily affairs, but giving a cold shoulder to the studies of the party construction; (2) attaching too high importance to the organizational development of the party construction among students, but thinking lightly of the practice education of student party members, etc. The co-construction of colleges and local grass-root party organizations can make full use of the effective resources of both colleges and local places for training the party quality of college students, and hence provides a very good carrier for the party construction among college students. Meanwhile, local grass-root party organizations have the ability to provide many projects and opportunities for the student party members in colleges and those active in being a party member to play their professional advantages and serve for grass roots and society.

On the other hand, teacher party members in colleges have a double identity (i.e. the political identity of the party member, and the professional identity of teacher). Such a double social identity requires there should be an internal integration between the party spirit cultivation and the teacher's professional ethics. However, to prevent the separation between the party member identity and the teacher identity, it is necessary to establish a tightly close connection between the

professional ethics and political qualities of a teacher, combine ideal value education with knowledge impartation, and integrate the party member evaluation standards with the professional qualities.

66.3 Basic Practice of the Innovation of the Co-construction Model of Colleges and Local Grass-Root Organizations

To produce a good effect from the innovation of the co-construction model of colleges and local grass-root organizations, it is necessary to build up a grass-root party construction idea similar to the tree interactive development among the members of the grass-root party organizations. This organizational idea is like a big tree with flourishing leaves and branches, as shown in Fig. 66.1.

The basic practice is breaking through carriers to promote co-construction between each other under the guidance of tree structure design, and by using the organizational system as tree roots, the organizational carriers as tree trunks, and the organizational brand construction as leaves. That is, a single internal organizational circulation changes and develops towards synchronous internal and external circulations.

66.3.1 Laying a Solid Foundation for the Organizational System

In the horizontal construction, it is necessary for colleges and local grass-root organizations to share the human resources commonly. College grass-root organizations can select and send teachers and students through taking a temporary post, an internship position, or practice ways to participate in the work of the local grass-root organizations, and hence play the intelligence advantages of colleges and serve the construction of the economy and culture of the local places. At the same time, the real, and specific work experience and effective data, which are accumulated by the local grass-root organizations, can provide the first-hand information and material for the teachers and students of colleges to better know the actual national conditions and the people's livelihood. Thus, the knowledge elites in the tower of ivory are promoted to get an understanding of the actual social needs, and also the co-construction platform becomes a close link of college talented personnel and scientific research results with the creations in society.

In the longitudinal construction, it is necessary to build up a party member development structure, in which the elder Party members can help train the new. On the basis of the co-construction between college and local grass-root organizations, the teacher and student Party members in colleges can be promoted to cooperate with the members of the local grass-root organizations. Relying on the

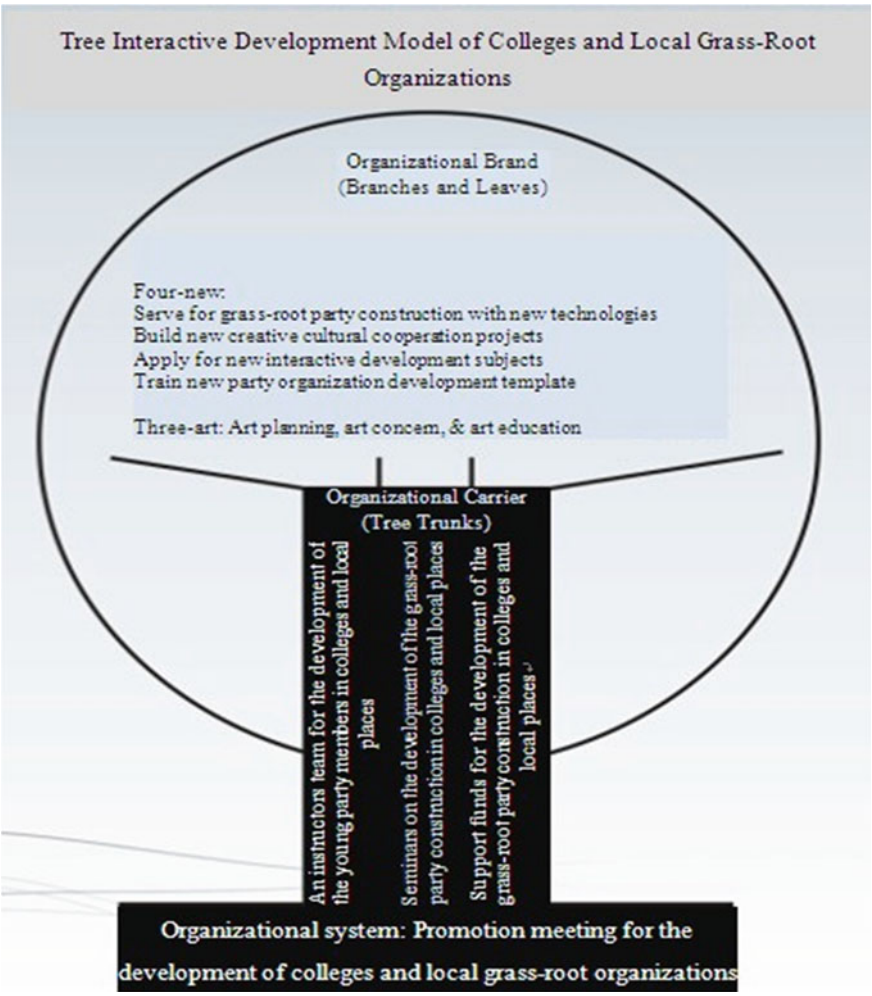

Fig. 66.1 This organizational idea is like a big tree with flourishing leaves and branches

elder Party members to train the new, the people active in being a party member and excellent young league members can be developed to be closer to the party organization, and hence change into the powerful driving force for promoting the young league members in colleges and local places to join the party organization.

66.3.2 Extending the Organizational Carrier Platform

The basic practice is making an extension from the common benefits of colleges and local grass-root organizations. For example, the seminars on the development

of the grass-root party construction in colleges and local places can be established, so as to promote the theoretical studies on the co-construction model and the exploration on the construction of theoretical system; the support funds for the development of the grass-root party construction in colleges and local places can be established, so as to commonly provide supports for the development of the party work and the party members; an instructors team for the development of the young party members in colleges and local places can be established, in which the members from the colleges and local grass-root organizations can commonly become instructors for commonly cultivating and development party members.

The extension of the tree interactive organizational carrier needs to have certain depth and breadth. For example, in "seminars on the development of the grass-root party construction", several special discussion groups can be built, and also the "seminars" can be dynamically combined with the learning of the central groups of colleges and local grass-root organizations; the professional skills and theoretical background advantages of all members of college and local grass-root organizations as well as the commanded internal and external resources can be played for serving for each other.

66.3.3 Playing the Organization Brand Effect

The organization brand, as tree branches and leaves, is the terminal that gives an expression to the effects of organizational system and organizational carrier, and has a direct tie with all walks of life in society. With the purpose of driving the organizational brand to produce benefits, it is necessary to make it develop oriented at projects, and also continuously refine, complete and develop projects. As long as the projects can facilitate the party members to receive education and help the mass people attain material benefits, they will naturally have good results, and also will be recognized by people in the society. For example, in the practice of the tree interactive development model of the Party Branch of Chinese Academy of Arts and the Party Committee on the Qingbo Street, an organizational brand (three-art and four-innovation) was proposed, and also several projects were listed for it.

In the new situation, introducing the concept of brand to the development of the grass-root organizations is a practice way required for exploring the work of the grass-root organizations and embodying a scientific development outlook. Work innovation and excelling activities have provided a great number of important opportunities for the construction of the grass-root organizational brands. The purpose of carrying out the creation of the grass-root organizational brands deeply, exerting the brand effect and deriving increasingly more party construction brands is to explore the effective ways for the grass-root organizations to serve for the party members and the mass people in the new situation. Also, the grass-root organizations at all levels can be guided to serve for the mass people, make self-discipline, and accept supervision with consciousness; the brand effect can be used

for improving the influence of the party construction works, and then society can be served better, and also the scientific development of the grass-root organizations can be driven.

66.4 Basic Key Points for Practicing the Innovation of the Co-construction Model of Colleges and Local Grass-Root Organizations

The implementation and result of the innovation of the co-construction model of colleges and local grass-root organizations rely on the dynamic combination between the co-construction model and the practices, as well as the effective operation. In the following, several basic key points are necessary to be noticed in the practices.

66.4.1 Grasping the Starting Point and the Foothold

The starting point and the foothold of the tree interactive development model of the colleges and local grass-root organizations are conductive not only to promoting the scientific researches, personnel training and social services in colleges, but also to driving the social economy and culture development in local places. Otherwise, there will be a blind operation, which does not accord with the actual conditions of colleges and local places and also can't effectively promote the development of the work of the organizational centers.

66.4.2 Following the Basic Principles

To produce a good effect from the innovation of the co-construction model of colleges and local grass-root organizations, it is necessary to follow four basic principles. First, it is necessary to follow the principle of cooperation. The two sides of co-construction should always look upon the co-construction from the global and strategic perspectives, overcome all possible difficulties and obstacles, give a full consideration to general goal and small targets, accurately find the breakthrough point, and do the practical work. Second, it is necessary to attach importance to the principle of actual effect. That is, it is necessary to seek the common bases and targets as well as proper forms, and correct the operation directions continuously through the mutual evaluation and feedback ways. Only in this way, the real interactive development between two sides can be realized. Third, it is necessary to follow the principle of mutual benefit and win–win. Specifically, a system for the

"complementing each other's advantages" and the "exchange of needed goods" can be established cooperatively by two sides, and hence the advantageous conditions and all aspects of resources can be learnt from the other side. Ultimately, the resources can be shared completely between two sides.

66.4.3 Paying Attention to Mechanism Guarantee

First, it is necessary to have a basis in thoughts. Unified cognition can be used for promoting the idea of combining production, learning, and research to serve for social economy and culture and the grass-root organizations and party members to develop comprehensively. Second, it is necessary to have a basis in actual conditions. The two sides of co-construction are necessary to keep consistent in management concept. Third, it is necessary to have the promotion from organizations. Under the unified leadership and support of the higher level party organizations of colleges and local places, the co-construction plan should be coordinated and implemented. Fourth, it is necessary to have an agreement for laying a sold foundation for the co-construction. The two sides of co-construction can make clear the co-construction goal, ways, and obligations through signing a co-construction agreement. If the mechanism is not sound, the practice of a model will be unconcerned gradually, thus making the construction brand of the grass-root party organizations not solid.

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Chapter 67
Study of China's Personal Income Tax Reform Chain Based on Balanced Scorecard Strategic Map

Tuanye Yu, Rui Chen and Qin Liu

Abstract Personal income tax reform has been difficult and is hard to promote, with the fundamental reason being the lack of the reform chain. Based on the comparison of the tax reform in strategic objectives, practical operation, and vision, according to the balanced scorecard thoughts, a strategic map is established to find the missing parts of chain factors. A data analysis is made on the lack caused problems and put forward some suggestions: enhance taxpayer management; speedup the wide tax base; simplify tax system reform; measures should be matched with strategy; use the balanced scorecard to push tax reform, etc.

Keywords Personal income tax · Balanced scorecard · Strategic map

67.1 Introduction

Personal income tax is a tax levied directly from personal income. It shoulders the responsibility of distributing social income. The readjustment of a tax policy in 2011 caused widespread discussion; the minimum income for taxing holds the concentration in this discussion. The past 10 years has witnessed changes in tax policies every three years. However, the suggestions of comprehensive collection of academic blitz system, floating threshold for taxing, local self-selected minimum income for taxing are still declined because of immature conditions.

Based on the assumptions that personal income tax system reform should require comprehensive planning, strategic management, decision-makers from vision and strategic objectives, through the establishment of KPI indicators and

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differentiated analysis of the chain missing, implement of the necessary measures in finding the cause of the problem, we provide our point of view from strategic level.

67.2 The Overall Outlook and Strategy Map of China's Personal Income Tax Reform

Personal income tax has three main functions, namely: to raise revenue, regulate personal income distribution, and stable economic development. Since the completion of a comprehensive collection system in the 1970s, Western countries generally took the methods of expanding the tax base, reducing class time, reducing tax rates, simplifying the tax system, to fill the loopholes in tax laws, strict collection, and then in particular economic environment, they would adjust tax rates to achieve its function. China's 2011 tax reform happened in the context of expanding domestic demand, it was taken under the guide of "to reduce the tax burden of low-income people, strengthen the collection and management of high-income groups", the progressive tax rates were cut from nine to seven, tax revenue was reduced by 120 billion Yuan, but the maximum rate was still 45 % [1]. It is not difficult to find that: the whole idea of China's tax reform is: to reduce the tax burden on low-income people, increase tax levied on high-income people; the strategies of taxing reforms are: "simple tax system, wide tax base, low taxes, strict collection". to shorten the gap between rich and poor in China, government policy shift from working on the supply side to the demand side, the Party's Thirteenth National Congress and Seventeenth Party Congress put forward policies of improving the personal income tax system, regulating excessively high-incomes, shortening the income gap to prevent the polarization, equity first between efficiency and equity, that's our vision for reform.

According to China's tax reform ideas and principles of taxing we can draw the mission of reforming: to raise revenue, regulate personal income distribution, stable economic development; fair over efficiency, and ensure steady improvement in revenue. The strategies are: simple tax system, wide base, low taxes, and strict administration. The "fairness over efficiency" should be considered during the process of taxing and the result should also be fair. "Simple tax, wide tax base, strict administration" reflected the fairness of process. The continued fair use of progressive tax rates, and adjusting tax rates and incentives reflected the fairness of the results; and realization of efficient was effected by the combined elements: the first time distribution generate a greater impact on the efficiency, (fair point), the second distribution should aim at improving efficiency, lower overall tax burden, reduce the tax level, make sure the process was fair. China's four strategic objectives in the efficiency of the low tax rate is more suitable to work, and it is achieved by operation of "appropriate to reduce the tax burden on low-income people, increase high-income people a tax levy". Strategy map drawn according to "simple tax system, a wide base, low taxes, strict administration".

67.3 Empirical Analysis of the Chain Missing on China's Personal Income Tax Reform

67.3.1 Ratio Personal Income Tax to Total Tax Revenue

China's 2009 personal income accounts for 6.64 and 5.76 % to total tax revenue and total revenue separately, accounting for slightly more than 1 % of GDP (Table 67.1), and it is significantly lower compared to international standards. Today, China's per capita gross domestic product has reached the level of middle-income countries, but the ratio of personal income tax revenue to total tax revenue and GDP remained at the level of low-income countries. Only determine from these two proportions, China's personal income tax revenue function has not been implemented. Last year, tax revenue increase by 22.5 %, but it is also lower than 23 % growth rate of total income tax revenue. The announced 2011 budget before tax reform was 520 billion Yuan, accounting for 6.6 % of tax revenue. Internationally, in the developed countries, tax revenue accounts for generally 30–50 % of total income tax, developing countries 8–12 % The total personal income tax revenue in China recent years is low, the growth is slow.

67.3.2 Taxpayer Satisfaction Model

To measure satisfaction with the taxpayer, we can use the satisfaction model. Taxpayer satisfaction factors can be divided into "hard" factors and "soft" factors, that is the objective external hardware conditions and human psychological perception. There is no specifically conducted satisfaction surveys on the personal income tax in China, but because personal income tax is implemented in the withholding method in China, the tax payer and tax levied is not the same, with a complex tax system, the general public has no clear idea about the tax they are

Table 67.1 Ratio personal income tax to total tax revenue

Years	Revenue (billion) (1)	Growth rate (%) (2)	Total tax revenue (billion) (3)	Total personal income tax (billion) (4)	(4)/(3) (%)	(4)/(1) (%)	(4)/GDP (%)
2000	13,395	17.0	12,582	660	5.24	4.92	0.66
2001	16,386	22.3	15,301	995	6.50	6.07	0.91
2002	18,904	15.4	17,636	1,212	6.87	6.41	1.01
2003	21,715	14.9	20,017	1,418	7.08	6.53	1.04
2004	26,396	21.6	24,166	1,737	7.19	6.58	1.09
2005	31,649	19.9	28,779	2,095	7.28	6.62	1.13
2006	38,760	22.5	34,804	2,454	7.05	6.33	1.13
2007	51,322	32.4	45,622	3,186	6.98	6.21	1.20
2008	61,330	19.5	54,224	3,722	6.86	6.07	1.19
2009	68,518	11.7	59,522	3,949	6.64	5.76	1.16

paying, since all should be involved in the investigation, there are certain difficulties in investigation. In contrast, the satisfaction survey for China's tax revenue showed 90 % satisfaction, there is a stark contrast to the feedback: according to the publicity draft of 2011 tax reform, 19,000 views were received in just 10 days, 70 % of adults show their dissatisfaction towards the threshold. In the tax adjustment of 2005, nearly 70 % adults were dissatisfied. This shows a lack of communication between tax payer and the person from who the tax is levied. According to the taxpayer model drawn by Tian Li hua, and compares the domestic situation, taxpayer satisfaction was reasonably judged to be in the level of 2–3, there is still much space for us to improve [2].

67.3.3 Jini Coefficient Before and After Tax

General principle of equity calculated using pre-tax and after tax Jini coefficient ratio. For the estimation of Gini coefficient we use area of law with the amendment to the law under the trapezoidal calculation (calculation omitted), the results are shown in Table 67.2.

As can be seen from Table 67.2, pre-tax and after tax coefficient changed little between 2002 and 2008, and continued to appear a negative and small fluctuations in the rate of change for many years, it did not show a large fluctuation in 2005 and 2008, that means an insignificant tax adjustment efficient for second distribution of revenues. And the impact on fairness is small, so tax adjustment played a limited role in filling the gap between rich and poor in China.

67.3.4 Tax Loss Rate

According to underground economy model estimated by Yi [3], the calculation of the Gini coefficient can be modified accordingly:

Table 67.2 Jini coefficient before and after tax

Years	Before tax	After tax	Difference	Rate of change (%)
2000	0.45058	0.4515	0.001	0.22
2001	0.45846	0.45867	0.0002	0.04
2002	0.49128	0.49007	−0.0012	−0.25
2003	0.49791	0.49643	−0.0015	−0.30
2004	0.50293	0.50114	−0.0018	−0.36
2005	0.50595	0.50420	−0.0017	−0.35
2006	0.50377	0.50218	−0.0016	−0.32
2007	0.50067	0.49967	−0.001	−0.20
2008	0.50524	0.50429	−0.001	−0.19
2009	0.50010	0.50083	0.0007	0.15

$$\bar{X} = P_1\overline{X_1} + P_2\overline{X_2} \tag{67.1}$$

$\overline{X_1}$ is the sample mean income of urban residents, $\overline{X_2}$ is rural residents' income for the sample mean, P_1 means the proportion of urban population to total population, P_2 indicates the proportion of rural population. $\overline{X_1}$ can be represented With "all urban per capita annual income", its value is 18,858.09 Yuan; $\overline{X_2}$ can be represented with "rural per capita income" instead of, its value is 7,115.57 Yuan; P_1 can be represented with the "urban proportion of the total population" instead of, its value to 46.59 %; P_2 can be represented with "the proportion of rural population" instead of a value of 53.41 % (Note: The above data are from "statistical Yearbook 2010"), there are:

$$\overline{X} = 18{,}858.09 \times 0.4659 + 7{,}115.57 \times 0.5341 = 12{,}586.41 \text{ (yuan)} \tag{67.2}$$

When calculating the principle of fairness, we have calculated Gini coefficient G = 0.500099 0.5001. In this paper, we use log-normal distribution, and assume that income is a random variable, represented with X, and In X is a normal distribution with mean μ, standard deviation σ then: Lognormal probability density function:

$$f(x) = \frac{1}{X\sigma\sqrt{2\pi}} e^{-\frac{(\mathrm{InX}-\mu)^2}{2\sigma^2}} \tag{67.3}$$

For $\overline{X_1} = 12{,}586.41, \mathrm{G} = 0.5001$ and $\overline{X} = e^{\mu+\frac{1}{2}\sigma^2}$ $G = 2\phi(\frac{\sigma}{\sqrt{2}}) - 1$

So: $\sigma = 0.9546$ $\mu = 8.9847$, and:

$$f_X(X) = \frac{1}{0.9546X\sqrt{2\pi}} e^{-\frac{(\mathrm{InX}-8.9847)^2}{1.823}} (X > 0) \tag{67.4}$$

In accordance with (*TC/D*), income is assumed as a random variable, represented with X, its probability density function $f_X(X)$, then any of the taxable income Y can be expressed as: $Y = kX$ (k is the taxable income proportion of total income), Then the probability density function of Y $F_Y(y)$ can be expressed as:

$$f_Y(Y) = \frac{1}{k} f_X\left(\frac{y}{k}\right) \tag{67.5}$$

So R can be showed as:

$$R = \int_T^{+\infty} (y - T)\, t f_Y(y)\, \mathrm{d}y \times N \tag{67.6}$$

T and t, respectively, the standard deduction and the applicable tax rate to taxable income Y, N represents the country's total population.

In the personal income tax, the wage and salary income (indicated by R_1), production and operation revenue of individual industrial and commercial households (indicated by R_2), interest, dividends, dividend income (indicated by R_3) accounts for

the majority (greater than 80 %), the personal income tax revenue capacity of *TC* is expressed as

$$TC \approx R_1 + R_2 + R_3 \tag{67.7}$$

Residents monthly wage and salary income represented by Y that is $Y = \frac{kX}{12}$ (k, wages and salaries of the total revenue, and $k = 0.5458$)

$$F_Y(y) = P(X \le y) = P\left(\frac{kX}{12} \le y\right) = P\left(X \le \frac{12y}{k}\right) = F_X\left(\frac{12y}{k}\right) \tag{67.8}$$

$$f_Y(y) = \frac{12y}{k} f_X\left(\frac{12y}{k}y\right), \quad f_X(X) = \frac{1}{0.9456X\sqrt{2\pi}} e^{-\frac{(\ln X - 8.9847)^2}{1.823}} (X > 0) \tag{67.9}$$

In 2009 China's wage and salary income minus the cost of the standard T is 2,000 Yuan/month, the country's total population N is 13.3474 million people, the wage and salary income tax revenue capacity of R_1 is:

$$R_1 = \int_T^{+\infty} (y - T)\, t f_Y(y) \mathrm{d}y \times 12 \times N = 3,104.23 \ (\text{million} \cdot \text{Yuan}) \tag{67.10}$$

Thus in 2009 China's population wages and salaries, income tax revenue capacity of R_1 is 310.423 billion. Similarly "the production of individual businesses, operating income" estimate value of R_2 is 1,080.67 (million), "Interest, dividends, dividend income" the estimate value of $R3$ is 480.47 (million).

$$TC = R_1 + \mathrm{R}_2 + \mathrm{R}_3 = 480.47 + 1{,}080.67 + 3{,}104.23 = 4{,}665.37(\text{million})$$

As a result, we estimate that our personal income tax revenue in 2009 *TC* is 466.537 billion Yuan, when compared to the actual state tax authorities levied storage of 394.9 billion Yuan, there is a 71.637 billion Yuan shortage. Model $R_1 + R_2 + R_3$ represents only about 80 % of total revenue, so the shortage should be greater than 71.637 billion Yuan, but loss rate calculated according to this data is 15.36 %, accounting for 18.14 % real income ratio, the loss rate remains high.

67.3.5 The Tax Rate

Theoretical tax rate in 2009 $t_1 = 4{,}665.37/(12{,}586.41 \times 13.3474) = 2.78\ \%$

$$\text{Actual tax rate } t_2 = 3{,}949/(12{,}586.41 \times 13.3474) = 2.35\,\%$$

Yu [4] found that a strong effect on the regulatory role of the progressive at tax of 20 and 25 %, but levels of classes don't achieve our aim of regulatory, this cannot achieve modest reduction in low-income people, and strict the tax of high-income people [4]. Note that the tax revenue for total wages accounts more than 70 % tax

revenue for many years, but the actual overall tax rate is not high. Therefore, our overall rate of tax showed low, but working-class, middle-income-oriented situation.

67.3.6 Labor Supply Reduction Due to Tax Rate

Learn from Yang's [5] equation for taxes and labor supply:

$$\varepsilon = \frac{VL/L}{V_W/W} = \frac{(L_1 - L_2)/L_1}{t} \Rightarrow \frac{L_1 - L_2}{L_1} = t\varepsilon \tag{67.11}$$

Of which: t: the actual tax burden in China in 2009, 2.35 %, ε: The calculation results of Zhou, Chen [6], the average of China's total labor supply elasticity is 0.7424, then $t\varepsilon = 0.7424 \times 0.0235 = 0.0174464$. The results are far less than 2/3; the main effect of tax effect is income effect, the substitution effect is less than the income effect, this time, if personal income tax is increased, the taxpayer is still to increase the labor supply in order to lessen economic efficiency loss. But the difference between the wages of labor-management collaborative mechanism for voluntary workers under the employment and wage labor-independent mechanism for voluntary workers under the employment, that is, the discrimination between non-private and private enterprises, is reflected increasingly. Overall, the tax designed for China's principle of efficiency did not play much role.

67.3.7 The Tax Loss Rate of Underground Economy

With assumptions based on the cash ratio method, the simplified model were:

$$Y_u = \frac{Y_0 \times (C - K_0 D)}{D(K_0 + 1)} \tag{67.12}$$

Notes: C is the cash balance, D is the actual balance of demand deposits, D_u: underground economic activities, Y_0: income for the open economy of scale, cash ratio $K_0 = C_0/D_0$; and V_0 is an open economy, turnover speed of income, that is, $V_0 = Y_0/(C_0 + D_0)$; tax began levied in 1980, 1979 was the base period, with $K_0 = (C/D)_{1979}$; use Y_0 instead of using GDP value, without accounting for the calculation of economic returns, the underground economy accounting for 65 %. As regards theoretical tax rate here, the potential earning capacity of underground economy of China's personal income tax in 2009 is shown in Table 67.3.

Economies of scale in 2009 indicate the potential personal income tax earning capacity was 32.61 billion Yuan, compared tax revenue in 2009, 394.9 billion Yuan, accounting for 8.26 %, the overall turnover rate is high.

Table 67.3 The tax loss rate of underground economy (unit: billion)

Year	GDP	*C*	*D*	The size of underground economy	Undeclared economy of scale	Tax rate	Potential earning capacity
2009	340,506.9	220,001.5	606,225.0	18,048.5	11,731.5	2.78 %	326.1

67.4 Conclusion

According to this theory and empirical analysis, we can draw the following conclusions:

1. Strategic objectives should be considered in the management of the taxpayer

In the analysis of the chain, because there is no special list of strategic level on "the taxpayer management process", and regional tax authorities are using these sub-strategic objectives, so there exist up and down inconsistency. There is redundant existed from the ideas of the Balanced Scorecard. This is clearly inconsistent with the spirit of national tax laws; more do not meet China's national conditions. Therefore, strategic objectives should be selected to join in, in order to achieve conductive upper management processes.

2. Strengthen the strategy of broad base, simple tax

In the strategy map, because the corresponding internal and external support measures are not complete, there is obstruction exist for achieving both goals. The weakening of the strategy map leads to big deviation in achieving low tax. The absence of Bottom-up factors in the chain, and the butterfly effect adjustment resulting in the failure of vision layer. Drivers in various factors do not match simply because the Executive did not follow strategic objectives. So at this stage we should give full consideration to the strategic objectives of the two, otherwise they cannot form a complete logic implementation of the objectives.

3. Vision, strategies, measures of consistency

The strategic objectives are Broad base, low tax rates, simple tax system, strict administration, but "appropriate to reduce the tax burden on low-income people, increase a tax levy high income groups" is reflected in the final implementation. It is not possible to achieve strategic objectives. Both strategic objectives should reflect the "fair over efficiency, and ensure slowly improvement of revenue". Although theory of the personal income tax and practice is very different, but considerations should not be paid only on environment. Vision of the target layer should be modified to make up and down in the same line. If only consider from integrated collection approach, the reform is in line with the strategic "wide tax base, simple tax system", from the perspective of strategic management, its implementation is beyond doubt.

4. The use of the Balanced Scorecard on a tax reform for the overall planning and strategic management

Tax reform is implemented once every three years, each time extensive discussion is aroused but the result does not always ideal. Comprehensive academic system, threshold CPI floating mechanism, self selected threshold could not be executed. So we can try to use the Balanced Scorecard on a tax reform for the overall planning and strategic management, in the case of time is ripe, the Balanced Scorecard can reflecting the dominant position of tax, reduce the tax burden, and promote the development of a tax reform.

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Chapter 68
Study of Optimal Allocation of China's Poverty Reduction Resources

Xiao Ye Shang

Abstract The 2011 annual national poverty reduction conference held in Beijing in November was held to help develop the economy in poor areas and poor households, the development of production, out of poverty as a social work, to assist poor households in poor areas to develop production, to change the poor outlook, and to raise or re-raise the poverty line standard. Due to historical and natural reasons, among regions and within regions, economic development is very uneven, the eastern and the western economic and technological levels are very different, especially development of productive forces is very slow in poor areas. Take measures to actively support the rich to help poor areas and poor households, to accelerate the economic development of poverty-stricken areas, the consolidation of national defense has an important role in enhancing social stability and unity, accelerate social construction, the proper handling of ethnic relations, and carry forward the revolutionary tradition. Poverty alleviation in the framework of a harmonious society, enhance the role and significance of the family and other aspects of urban and rural residents are more prominent.

Keywords Poverty alleviation · Resource allocation · Optimization

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68.1 Introductions

The State Council Leading Group Office of Poverty Alleviation and the 2011 National Conference on poverty reduction was held in Beijing on November 29, 2011. The meeting summed up the experience of the 2011 anti-poverty work, analysis of the current poverty alleviation situation, and in 2012 the poverty alleviation work to make the deployment [1]. Standard of poverty alleviation line adjustment has been one of the most attentions in the poverty alleviation work meeting. A certain stage of social and economic development, relative to people's needs, resources, always show the relative scarcity, the rational allocation of limited, the relative scarcity of resources, so that with the least resource-consuming production the most suitable goods and services, to obtain the best benefits. Resource allocation is reasonable or not, has an extremely important impact on the success or failure of a country's economic development.

68.2 Pro-Poor Allocation of Resources and Low Efficiency

Investment for poverty reduction comes mainly from the central government budget. Poverty alleviation funds, as a low-cost or no-cost resource in China's economic situation are clearly a high scarcity value of resources. But in our current system, the government is both the poverty alleviation resources providers, but also poverty reduction resource demand [2]. Therefore, how to regulate the government's behavior has become a fundamental issue in the pro-poor allocation of resources. However, China's laws and regulations only introduced in 1997, the National Poverty Alleviation Fund Management, not to mention the management approach has been out of touch with economic development, its provisions are also very macro, there is no issues related to refined, and its maneuverability is doubtful. In addition, the relevant local organizations carrying out effective supervision department are bare. These are the institutional factors that affect poverty alleviation efficiency of resource allocation.

Government in the national poverty reduction construction projects, both policy-makers, investors, implementers, but also a poverty alleviation project implementation monitoring and effectiveness of the main assessment. Take poverty the most important form of "food for work" for it, when the state relief program funds allocated to local governments, in fact, put the responsibility and authority oversee the use of these resources while giving local governments—county, township and an organization [3]. In the case of "referee" and "athletes" a shoulder double as agents of the State of national cadres, their objective function, from an economic point of view, is a very complex utility function. Precisely because of this, county, township-level supervisory agent, the unreliable nature has a natural. This lack of external oversight, often poverty alleviation of the phenomenon of loss and waste of funds, even the breeding of corruption, embezzlement and other corrupt practices.

In the anti-poverty action, the Government's main role should be advocacy function, legislation and law enforcement functions, functions led to publicize the demonstration function, coordination, evaluation and incentive function. "Political science" limited theory also tells us that the role of government is a boundary, some governments to discipline the tube bad things should be delegated to the market or intermediary organizations. Poverty counties now "bus corruption" phenomenon, it is the poverty alleviation work witch hunt, misappropriation of poverty relief funds, and even the consequences of corruption; it is the inefficient use of poverty alleviation resources. Therefore, poverty is not just a protection system to determine the legal basis for anti-poverty, but also need the introduction of market mechanisms in our poverty reduction strategy to market forces to balance the interests of the game pattern in the Poverty Alleviation Fund.

68.2.1 Science and Efficient Allocation of Poverty Alleviation Resources to the Needs of the Community

Poverty alleviation and development from the outset, in accordance with the essence of socialism requirements established starting point and normalized to shrink, to liberate the productive forces, the development of productive forces, eliminate exploitation, eliminate polarization, and ultimately achieve common prosperity as its guide to action Poverty alleviation and development work characteristics reflected the core requirements of building a socialist harmonious society, China's poverty alleviation and development from the outset, to solve the urban and rural, regional, economic and social development very uneven affecting their vital interests as their own work tasks and requirements. Supported by blood transfusion to the hematopoietic type shift; means of poverty alleviation and development, to take the social poverty alleviation, authorities designated, and the party leadership hanging aid, East and West collaboration measures; policy, continue to increase capital investment at the same time, in terms of materials, projects to these areas to implement the tilt [4]. These work initiatives and requirements, always around people-oriented that the main line will be people-centered philosophy throughout in all stages of the poverty alleviation and development, and its essence is the people-oriented in the specific work practice embodies, to fully reflect a harmonious socialist society the core requirements.

Constantly improve the implementation of mechanisms and measures to assist poor households out of poverty projects established incentives, more scientific and effective configuration of the poverty alleviation resources, give full play to the "blood" feature of the aid project. At the same time to add up poor households income and source of livelihood conditions, to understand the effect of poverty relief funds and put forward relevant guidance to ensure that poverty reduction efforts to achieve tangible results. A planned, focused efforts to the renovation of dilapidated buildings in the policy to reflect a fair and impartial. To take full

advantage of the immigration policy, and effective use of aid funds, giving priority to the good poor households housing security issues, and then gradually completed the task of renovation of dilapidated buildings in other households. Efforts to conduct village appearance remediation work, the country has fundamentally changed the new look. In addition to further efforts to make the engineering construction of roads with hard ground, but also promote the planning and construction of waste disposal, Cultural Square and other infrastructure, landscaping green countryside. Encourage the village labor force to actively participate in skills training, promotion of labor employment. Investigated thoroughly, and understand the fresh beginning of the village, the high school graduates, the appropriate reward for positive employment outside the home or attending technical school personnel.

68.3 Legal System Improve Poverty Alleviation Resource Allocation Rate

Notwithstanding the principal leaders of the poverty-stricken areas of rush to the barren land to artificially create a "bright spot" to attract the attention of leadership, laying the foundation for their own promotion; but does not reject some would like to expand its influence through this form of propaganda to attract foreign investors to carry out his construction. Alleviation resources in recent years are more and more, but fewer and fewer people out of poverty, helping the poor use of resources becoming less and less effective. Poverty alleviation resources are less than that of the original tenth. Poverty alleviation resources are configured by the cadres, who ran who gave ground. Went to the poverty alleviation resources to cost, resources has been a reduction by one level allocated. These resources to the project sites, to the community how to use or cadres have the final say. Many poverty-stricken areas to engage in the tender, the cadres presided over the right to participate in the bidding are a very small number of wealthy people. In many places, poor resources and the allocation of public resources has become the trading game of power and capital. If you use the legal system to configure the anti-poverty resources would surely be cadres' power configuration is more effective.

68.4 The Introduction of Market Mechanisms to Increase the Rate of Pro-Poor Allocation of Resources

Rural grassroots organizations as the most grass-roots anti-poverty organizer and leader directly face the rural poor, responsible for anti-poverty specific implementation tasks. However, due to the lack of external oversight, often the loss and waste of the poverty relief funds, and even breeding ground for corruption, embezzlement and other corrupt practices.

In this event, the local township government's failings are obvious, director of the Township financial regulation in place, they all "oversight". Present in grass-roots government to fulfill and to complete the process of rural anti-poverty duties and tasks, the management objectives are more focused on the economic and social development of part of primary jurisdiction and completed higher levels of government, a mandatory plan, the use of funds for poverty reduction, poverty alleviation project the choice is often difficult to poor households. It is also anti-poverty funds have been misappropriated, the local township government on this "seeing" the root cause. With the establishment of the socialist market economic system, on the one hand, the operation of the conventional poverty reduction strategies rely on the strong involvement of the Government, on the other hand, the autonomy of the impulse of the market economy and cost-consciousness and the configuration way too much emphasis on the role of government lot of friction. Poverty reduction market mechanisms and social mechanisms developmental lag, leading to low efficiency of pro-poor investment in some places, poverty alleviation and development limited effect of the important reasons.

In the anti-poverty action, the Government's main role should be advocacy function, legislation and law enforcement functions, functions led to publicize the demonstration function, coordination, evaluation and incentive function. To reverse this loss of anti-poverty funds, improve the utilization efficiency of poverty relief funds, should be adjusted to change the government's poverty alleviation functions, top-down reform and anti-poverty mechanism to break the pattern of single rely on government administrative organization helping the poor, government mechanisms, market mechanisms and the combination of social mechanisms.

68.5 Resources on Poverty Measurement and Poverty Configuration Mode

68.5.1 Estimates of the Poverty Alleviation Resources

Began to develop the county-level poverty reduction program, the first response to the county-level can be used for poverty alleviation, resource measurement and assessment, in order to make planning more tend to operability and can be implemented. Assessment of the resources for poverty reduction is actually estimates the number of human, material and financial resources actually spent on poverty alleviation and development activities in the next five years. The estimation method is mainly to review the past five years, come to a basic set of estimates, and then combined central and provincial authorities may be to the county anti-poverty funds budget, estimated resources available for poverty alleviation in the county the next five years. In addition to the above-mentioned human, financial resources, the poverty alleviation and development planning must also consider other resources, including natural resources, technology and social

resources. During planning the work, we need to allocate these resources to make it to maximize their effectiveness. When allocating them, we have to consider the balance of demand and supply, and time and regional balance in resource allocation.

68.5.2 The Allocation of Resources on Poverty

The size of the county-level poverty alleviation and development planning investment, on the one hand, according to the basic development needs of poor farmers and poor villages, on the other hand, raise the funds as a precondition. Too much planning done, make some of the projects cannot be implemented due to lack of funding sources; planning done too small, in the future we have to re-declare the project, two aspects will affect the accuracy of project planning. Project funding allocation is unreasonable is not conducive to mobilizing the enthusiasm of the various townships, villages, and it may also be a conflict.

As already stated earlier resource estimates, the main indicators in accordance with the provinces over the years assigned to the county, and then consider the adjustment factors of the new indicators, in order to speculate that the proportion of the size of the funds may be given in the next few years as well as the composition of funds In the allocation of village poverty funds index, the main is project will be transferred with the planning, funding as the project go. Priority package of poverty alleviation projects, poverty alleviation resources into priority order, priority to vote for the poorest households to meet the needs of its lowest levels; priority investment barriers project in order to make input quick; give priority to investment in those support measures projects to ensure project success rate; priority to investment in those projects have development potential and resources to support the force, in order to project income "iron rice bowl". The county poverty alleviation and development project arrangements can be initially identified on the basis of the priority order of the program, Priority funding for poverty alleviation programs, Poverty Alleviation funding priority order program is the breakdown of the Priority program of county-level poverty alleviation funds. Must form the maximum amount of investment per capita strength and minimum amount to prevent the base big phenomenon and part of the poor farmers due to lack of funds cannot be support in the planning stages of a typical village. The common practice is to a ceiling of no more than twice the strength of per capita investment of the project, taking care to determine the several grades, according to the farmers the extent of poverty and not simply size-fits-all approach. Investment per capita strength of the project two calibers, per capita investment per capita investment of all projects and farmers production projects to respectively grasp.

68.5.3 Planning and Implementation of Funding Arrangements

Poverty alleviation and development planning in the project package and project should make clear the arrangements for the fund-raising, and planning specific measures to protect the source of funds. Meanwhile, the use of funds should make the necessary arrangements in time, the use of funds to implement the project to ensure that the planning arrangements of the project package and project funding.

68.6 Pass Poverty Alleviation Models of Poverty Alleviation Resources

A poor household as the core of poverty alleviation trial is the key to support pro-poor resource delivery. By external resources to poor households put paid to pass test, highlighting the practice of human-centered society. If poor households the first place, the test behavior will be poverty alleviation activities in the process of conflict, not only weaken the pass test more attractive to poor households, they can not reflect the effect of pro-poor delivery of resources.

A true grasp of the basic situation and development needs of poor farmers and poor villages, county-level poverty alleviation and development planning. Poverty figure out the base and poverty alleviation object is relatively easy to identify and determine; the status quo of poverty, poverty alleviation and development issues and causes of poor farmers and poor villages development support needs to understand the proposed project will have a basis. If helping the poor protagonist poor farmers lack of participation, not even participation will inevitably lead to anti-counterfeiting battle; if the investigation does not in-depth, do not know will inevitably lead to play the confused battle, to help really poor, real poverty alleviation is difficult to achieve. Poverty alleviation and development planning process repeatedly emphasized the broad participation of the farmers, and work hard to grasp the end of the survey mode, in order to grasp the complete statistics of the poor villages and poor households, to select the right object, select the right projects and planning to lay a good foundation.

The passing of poverty alleviation resources most urgently needed, nurtured the ability of poor households to effectively undertake foreign poverty alleviation resources. Only with this ability, poor households effectively use foreign anti-poverty resources. Cultivate the ability to focus is the independent participation of the poor households, which is fundamental to the success of the protection of the pilot project. Allow poor households to their own participation, one depends on the effective demand factors to determine the key variables that can activate the poor households intrinsic motivation; the help of the appropriate mode of operation, so that poor households obtain the required elements to support the slave mode. Compensation for the transfer process itself, including the trust and

encouragement of the poverty alleviation of poor households, I believe that poor households in compensation for the use of poverty alleviation resources to achieve self-development and accumulation. Pass the tests, surveys show that poor households are often reluctant to free or unprincipled dependent on others. Therefore, according to poor households need to give one of the significant gains paid poverty alleviation resources to support is to promote poverty-stricken households to establish the inherent self-consciousness.

68.7 Summary

Legal system improve poverty alleviation resource allocation rate and market mechanisms improve the rate of pro-poor allocation of resources. Poor households out of poverty projects to improve poverty alleviation mechanism, the integration of poverty alleviation resources, is the focus of global poverty, and constantly improve the implementation of mechanisms and measures to assist the established incentives, more scientific and effective way to configure the anti-poverty resources and give full play to help the project "blood" function.

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Part VIII
Green Management Engineering and Applications

Chapter 69
Research on the Multiple Meanings of Multicultural Teaching Education Based on Conceptual Model

Yi Tang, Yuefei Deng and Xiaoqin Xu

Abstract Through researching on multicultural teaching education, teaching methods based on the conceptual model, and by using the establishment steps of conceptual model and combining the actual situation of students in the learning process, we can establish an education and teaching ring. At the same time, under the analysis of the multiple meanings of multicultural teaching education based on conceptual model and using the analytic hierarchy process and factors influence to establish a conceptual model of multicultural teaching education, we can obtain the results of impact factor. Finally, the relationship diagram of the impact factor obtained by regression analysis of the model will provide a guidance on the practice and development of multicultural teaching education.

Keywords Conceptual model · Multiculturalism · Multiple meanings · Factor analysis

69.1 Introduction

Multicultural teaching education is originated from the mainstream culture of assimilation activities that the national minority is against. With the support of other groups, it was viewed as education campaigns and got a continuous development. Its educational goals are: to provide equitable learning opportunities for

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all students from different ethnic, social class, gender and cultural organizations, to give they access across the socio-cultural knowledge, values, skills and beliefs in order to help to guide their core orientation. However, due to the different ethnic, national and other differences, as well as the professional level of teachers, all these limit to the level of students' education [1]. Meanwhile, diverse attitudes and the values of students are under the subtle influence of their teachers in the usual process of education. Therefore, teaching education played an important role in the growth process of the value and core orientation of students.

69.2 The Conceptual Models and Multicultural Teaching Education

The concept is the appliance of students in the process of thinking which connects learning and knowledge structure and becomes the important core of learning. But learning is a process from blurred concept to clear concept of the specific scientific. First, for the foundation of learning knowledge, the concept of states must be established. And gradually form the understanding and views of objective things through life practice and various ways, and then form their own ways of thinking. Model is a simplified characterization of a kind of system, which mainly displays in its specific circumstances [2]. It will be able to highlight the performance of complex events and objects, such as concrete or abstract product. The establishment of conceptual model closely combines the concepts of learning and organization. Building process is shown in Fig. 69.1.

The building process of multicultural teaching education model contains several steps: the misconception of activate tradition of multicultural teaching education; the cognitive conflict between multi-cultural and traditional cultural; to create a new situation conceptual model of multicultural teaching education; to use the new concept of education. The education ring based on the model of multicultural education is shown in Fig. 69.2.

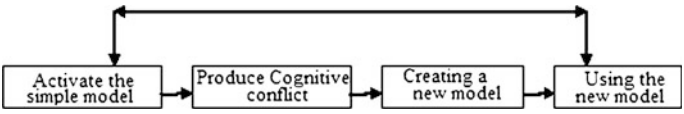

Fig. 69.1 The process of constructing model

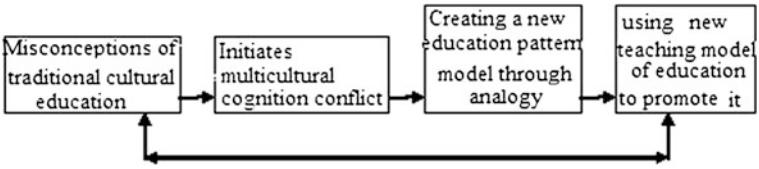

Fig. 69.2 The education loop based on the model of multicultural education

69.3 Analysis of the Multiple Meanings of Multicultural Teaching Education in the Conceptual Model

For students, in the psychological conceptual model of teaching, there are different degrees of difficulty in conceptual changes. But the conceptual changes of proposition level are relatively easy. The level of heart model is at the center position. For ontological category level, conceptual change is relatively difficult.

Three key steps of the conceptual changes can be obtained from the following table. First, according to the specific situation, the incompleteness of the mental concept models of students can be discovered, which can guide them to understand and face their errors in an educational point of view. Second is to establish this new conceptual model [3]. Through the creation of this new model, the characteristics of observed things can be explained and analyzed from the perspective of teaching at the same time; the last is through practice that is assumptions and test verification, to guide students to make better use, practice and learning (Table 69.1).

Based on the analytic hierarchy process and the conceptual model of factors influence, we divide multicultural teaching education into four parts: Target Layer X of multi-cultural impact factor, comprehensive impact factor Y, factor analysis layer Z and factor analysis level. According to the analysis model, conceptual model of the level impact factor of multicultural teaching education can be drawn. As shown in Fig. 69.3.

Multicultural education model includes not only the internal and external factors but unpredictable factors. The external factors are from surrounding environment, school image and National cultural and social policy. The Internal factors mainly focus on school cultural atmosphere, teaching quality, infrastructure and teaching strength. Unpredictable factor is mainly based on the satisfaction survey of students which depends on the student's cognition of teaching education.

According to this cultural education model, we can use the following regression model for quantitative analysis, in which Y represents comprehensive impact factor and Z represents the factor analysis layer.

Where, $P < 0.05$, P is significant, $P < 0.01$, is highly significant. Multicultural teaching education is based on the multivariate linear regression method.

Table 69.1 Three key steps of the conceptual changes

Project	Significance	Education content
Recognizing different situations	Recognizing the mental concept model of students is not complete	Allow students to directly face the misconceptions and lure cognitive conflicts
Establish a new concept model	Creating a new conceptual model to explain the observed things	Strengthen activities of creating new models and doing analogy
Practical new concept model	Using the new concept model to study the assuming things	Guide the students to verify the assumptions

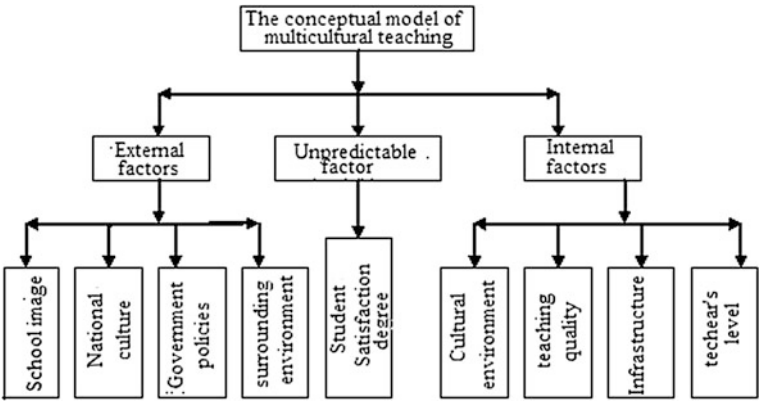

Fig. 69.3 The conceptual model of the level impact factors of multicultural teaching education

Multiple linear regression and linear regression can use statistic test with the significance of regression equation, can also use P value method (P Value) as a test. F Statistic is [4]:

$$F = \frac{\text{MSR}}{\text{MSE}} = \frac{\text{SSR}/p}{\text{SSE}/(n-p-1)} \tag{69.1}$$

On linear correlation conditions, two or more independent variables changes on a dependent variable quantity. It shows a relationship between numbers of mathematical formulas that is called the multivariate linear regression model. This article is based on multiple linear regression method to study multicultural teaching education. Established model is described as below:

Let y be an observable random variables, it is impacted by P non random factors $X_1, X_2, \cdots, X_P$. y and $X_1, X_2, \cdots, X_P$ has a linear relationship [5]:

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p + \varepsilon \tag{69.2}$$

where $\beta_1, \beta_2, \cdots, \beta_P$ is $P+1$ unknown parameters, ε is unmeasured random error, and it usually assumed $\varepsilon \sim N(0, \sigma^2)$. We call formula (69.2) is multiple linear regression model. y is known as explanatory variable (the dependent variable), $x_i (i = 1, 2, \cdots, p)$ is explanatory variable [6].

$$E(y) = \beta_0 + \beta_1 x_1 + \cdots + \beta_p x_p \tag{69.3}$$

According to the sports aesthetic education research, the multiple regression equation is established. Firstly, the unknown parameters $\beta_0, \beta_1, \cdots \beta_P$ are estimated. For which we have n independent observations for getting n group of sample data $(x_{i1}, x_{i2}, \cdots, x_{ip}; y_i)$. They meet formula (69.3) [7]

$$\begin{cases} y_1 = \beta_0 + \beta_1 x_{11} + \cdots + \beta_p x_{1p} + \varepsilon_1 \\ y_2 = \beta_0 + \beta_1 x_{21} + \cdots + \beta_p x_{2p} + \varepsilon_2 \\ \cdots \\ y_n = \beta_0 + \beta_1 x_{n1} + \cdots + \beta_p x_{np} + \varepsilon_n \end{cases} \tag{69.4}$$

where, $\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_n$ are independent of each other and are subject to $N(0, \sigma^2)$.

Formula (69.4) can be expressed in matrix form [8]:

$$Y = X\beta + \varepsilon \tag{69.5}$$

where, $Y = (y_1, y_2, \ldots, y_n)^T$, $\beta = (\beta_0, \beta_1, \ldots, \beta_p)^T$, $\varepsilon = (\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_n)^T$, $\varepsilon \sim N_n(0, \sigma^2 I_n)$, I_n is n order unit matrix [9].

$$X = \begin{bmatrix} 1 & x_{11} \cdots & x_{1p} \\ 1 & x_{21} \cdots & x_{2p} \\ \vdots & \vdots & \vdots \\ 1 & x_{n1} & x_{np} \end{bmatrix} \tag{69.6}$$

By the formula (69.5) and the properties of the multivariate normal distribution, Y obeys dimensional n normal distribution; its expectation vector is $X\beta$, variance and covariance matrix is $\sigma^2 I_n$, i.e. $Y \sim N_n(X\beta, \sigma^2 I_n)$.

Finally, by using of the Kendall coefficient matrix, School image, National culture, Government policies, The surrounding environment, Student satisfaction degree, Cultural environment, The quality of teaching, Infrastructure, teachers' level of the related factors of value are shown in the following formula [10]:

$$\begin{cases} \frac{\partial Q(\hat{\beta})}{\partial \beta_0} = -2\sum_{i=1}^{n}(y_i - \hat{\beta}_0 - \hat{\beta}_1 x_{i1} - \hat{\beta}_2 x_{i2} - \hat{\beta}_p x_{ip}) = 0 \\ \frac{\partial Q(\hat{\beta})}{\partial \beta_1} = -2\sum_{i=1}^{n}(y_i - \hat{\beta}_0 - \hat{\beta}_1 x_{i1} - \hat{\beta}_2 x_{i2} - \hat{\beta}_p x_{ip}) x_{i1} = 0 \\ \frac{\partial Q(\hat{\beta})}{\partial \beta_k} = -2\sum_{i=1}^{n}(y_i - \hat{\beta}_0 - \hat{\beta}_1 x_{i1} - \hat{\beta}_2 x_{i2} - \hat{\beta}_p x_{ip}) x_{ik} = 0 \\ \frac{\partial Q(\hat{\beta})}{\partial \beta_p} = -2\sum_{i=1}^{n}(y_i - \hat{\beta}_0 - \hat{\beta}_1 x_{i1} - \hat{\beta}_2 x_{i2} - \hat{\beta}_p x_{ip}) x_{ip} = 0 \end{cases} \tag{69.7}$$

Through a series of calculations, we can get the regression analysis table shown in Table 69.2.

Regression analysis from Table 69.2 and Fig. 69.4 shows that the regression analysis decision coefficient of the internal and external factors and unpredictable factors are above 0.9, but the largest regression analysis decision coefficient is external factor which is 0.9535, followed by internal factors as 0.9426. At last is the unpredictable factor.

According to Table 69.2 and Fig. 69.5, the regression analysis decision coefficient of multicultural education model are all above 0.9, indicating that these

Table 69.2 Regression analysis

Comprehensive impact factor Y	Regression analysis decision coefficient	Factor analysis layer Z	Regression analysis decision coefficient
External factors	0.9535	School image	0.9563
		National culture	0.9782
		Government policies	0.9367
		Surrounding environment	0.9125
Internal factor	0.9426	Cultural environment	0.9435
		The quality of teaching	0.9534
		Infrastructure	0.9325
		Level of teacher	0.9425
Unpredictable factor	0.9135	Student satisfaction	0.9817

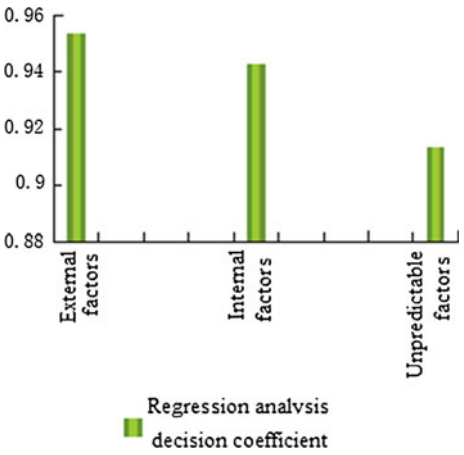

Fig. 69.4 Comparison chart of the regression analysis decision coefficient of comprehensive impact factors

factors have a great impact on multicultural education. But the influence degree of each factor is not the same, which means the extent of its impact on multicultural education is different.

Analysis from Figs. 69.5 and 69.6 the largest decision coefficient of student satisfaction is 0.9817, followed by the national culture which is 0.9782, on the third is school image which is 0.9563; the minimum decision coefficient is the surrounding environment, and then the infrastructure. This fully demonstrates that when conducting multicultural teaching education, students should be taken as the center and the student satisfaction of teaching be fully considered. Next is to improve the learning atmosphere, state support for multicultural education and to create cultural environment.

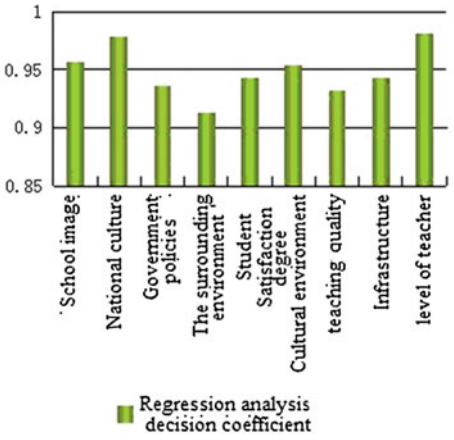

Fig. 69.5 Comparison chart of regression analysis decision coefficient of each factor

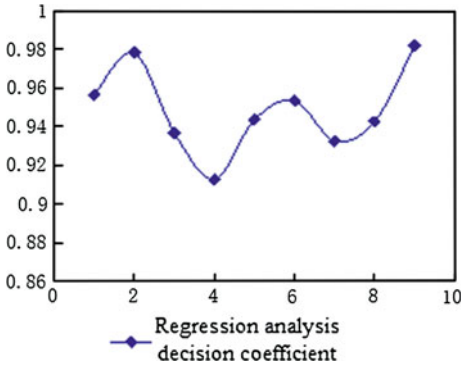

Fig. 69.6 The graph of regression analysis decision coefficient of each factor

69.4 Conclusion

With the rapid development of society, as well as the situation of international cooperation, the multi-teaching education is also stepping into an in-depth research and exploration stage. How to deeply understand the multiple meanings of multi-culture? We must face the social issues of cultural diversity under this situation, as well as education and teaching. Through the establishment of conceptual model of impact factor of multicultural teaching education level and regression analysis, the main Influence factors in the process of learning multi-culture can be obtained. And it can help to set correct concept in the treatment of multi-cultural attitudes and in the implementation process, to increase the needs of teaching education as well as teaching ability and to promote the development of multi-culture.

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Chapter 70
Research on Emerging Land Market Based on Surveying and Mapping

Qiquan Pan

Abstract Along with the social economy's development, security, environmental protection concept deepening, and requirements for emerging land redevelopment, sorting and recycling Survey and mapping technology is a new land development project, an important key link, which should increase the wealth of society, promote the protection of the ecological environment, and promote the social harmony, make sustainable development as the reference point, and make full use of Surveying and mapping technology for new land market development work to improve beneficial support. This paper summarizes the abundant use of surveying and mapping technology and work experience, uses the modern new surveying technology GPS real-time dynamic measurement system to measure and location the new land, and the establishment of management information system database. The surveying and mapping technology in emerging land market development projects play a superior effect and strong support.

Keywords Mapping technology · New land · GPS · Information management

70.1 Introduction

With the rapid development of modern society, the state and society for land utilization is of more and more concern, especially as attention of the emerging land market is increasing. Land is an important resource for human survival, especially today when people pay attention to economic benefits and environmental benefits of the request, efficient use is worthy of our consideration [1, 2].

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The community for the land market research is more, but for the emerging land market research is relatively lack of modern surveying and mapping technology, GPS real-time dynamic measuring system is the performance of the modern surveying and mapping technology informatization. In the information age of rapid development, the support of the research of the land market also needs to keep up with the demand for development of times, therefore this article is based on the surveying and mapping technology, according to the new characteristics of the land market, give the new land market actual accurate measurement and location, and accordingly set up management information system database, from the quantitative perspective on emerging land market condition undertakes an analysis, will also be better applied to the emerging technology of surveying and mapping of land market development and consolidation project, the new land market can be fully used, effective allocation of resources and environment resources planning to make the new land fully play its role to the relevant departments to market, the land market development and consolidation work has certain guiding significance.

70.2 Related Overview

In today's rapid development of science and technology under the background of the times, society needs human height to pay close attention to environment, and make full use of resources, protect the environment, and grasp these metrics needs we to use more accurate, more advanced technical means to measure, this is the surveying technology. While emerging land market is to be developed and make full use of land, the need for effective land consolidation, new land market accordingly no sound operation of the market mechanism, but the land resources is configured effectively and use are relatively low [3, 4]. Therefore, through the high-tech surveying technology adequately to the emerging land measurement, use its location characteristics and features reasonable distribution and utilization, improve the efficiency, and increase the emerging land value.

GPS–RTK technology is composed of base station and mobile station transmits two points were determined, which relates to a device includes not only the antenna, power source, receiver, the controller also includes a radio transmitting and receiving system, which could be seen above Fig. 70.1 the working principle diagram of GPS–RTK technology [5].

$$\begin{aligned}
&\left[(x_1-x)^2+(y_1-y)^2+(z_1-z)^2\right]^{1/2}+c(V_{t_1}-V_{t_a})=d_1\\
&\left[(x_2-x)^2+(y_2-y)^2+(z_2-z)^2\right]^{1/2}+c(V_{t_2}-V_{t_a})=d_2\\
&\left[(x_3-x)^2+(y_3-y)^2+(z_3-z)^2\right]^{1/2}+c(V_{t_3}-V_{t_a})=d_3\\
&\left[(x_4-x)^2+(y_4-y)^2+(z_4-z)^2\right]^{1/2}+c(V_{t_4}-V_{t_a})=d_4
\end{aligned} \tag{70.1}$$

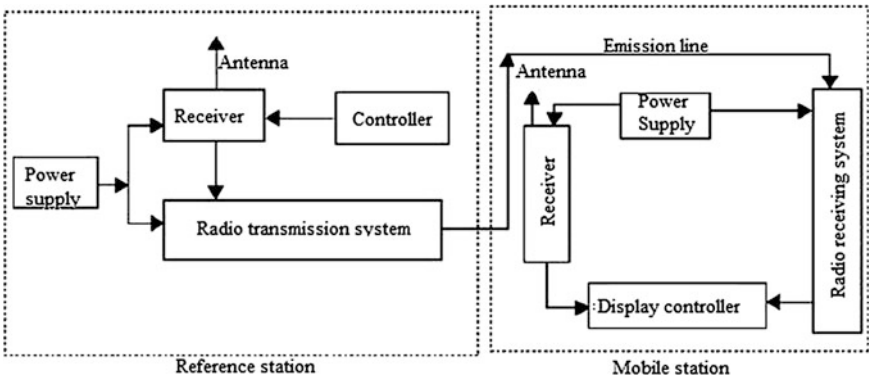

Fig. 70.1 The working principle diagram of GPS–RTK technology

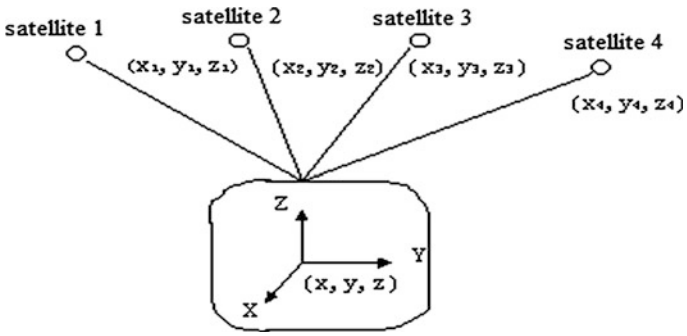

Fig. 70.2 Schematic diagram of GPS positioning technology

GPS technology is oriented to the high-speed movement of the satellite operation of the instantaneous position as the basis to determine the starting of known values, and the space distance and the rear intersection set are integrated with each other to define the required measuring point location. As shown in Fig. 70.2, the first hypothesis for the land to be tested in the t time installing GPS receiver, the GPS signal is transmitted to the receiver of the time were measured and recorded as Δt, at the same time, the satellite ephemeris as long as the receiver can receive other numerical data records, the last of these values can be used above four equations are expressed [6].

70.3 The Support Research for New Land Market of Mapping Techniques

Surveying and mapping is the use of optical, computer, network communication technology, and combined with the information theory and space theory of knowledge, make full use of core technology such as Global positioning system

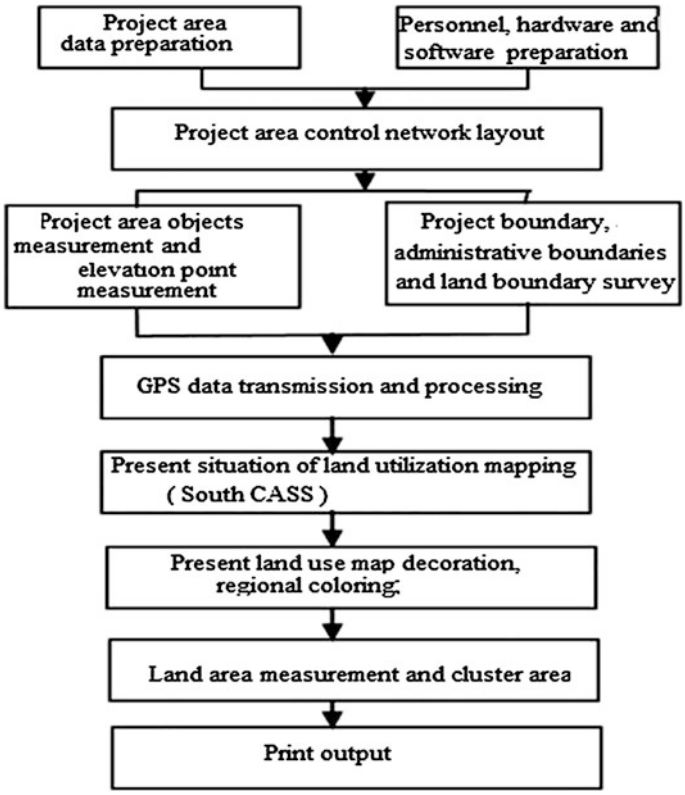

Fig. 70.3 Surveying and mapping the new land by using the GPS technology

(GPS), Geographic information system (GIS), Remote sensing (RS) to effectively obtain the ground has characteristics and boundary line, using the these advanced measurement means that feedback, the shape of the ground position and image information, convenient for construction, effective planning and resource utilization [7].

First choose a new land market determine the project area, this paper is mainly directed against a particular emerging land area determination, through surveying and mapping technology related to, such as the emerging land market project area information, personnel and hardware facilities to prepare, and the emerging land project layout control network, and then level from high to low, from whole to part of the terrain and elevation points and boundary, bounds measurement, determining the initial layout GPS E surveying control point position, while the GPS receiver is positioned flat position is ± 2.5 mm, height is 5 ppm, static positioning way, through the GPS technical data transmission. The last is through the associated mapping software such as south of CASS data, charts the finishing, modified, so as to establish new land market management information system database, as Fig. 70.3 shown [8].

Table 70.1 Observation data set

Satellite altitude angle	Through observing the effective number of satellites	Establishment of site mean repeat	The time length of the stage	The interval between data	PDOP
≥16°	≥5	≥1.7	≥46	11–30/s	<7

Table 70.2 Measured values and existing results, the GPS measured data

Measuring point	dx	dy	df
a 1	0.006	0.005	0.007
a 2	−0.002	0.003	0.005
b 522	0.005	−0.005	0.008
b 523	−0.004	−0.005	0.009
c 3	0.010	0.010	0.014
c 8	0.014	0.013	0.019
s 5	−0.007	−0.006	0.012
s 6	0.016	0.001	0.016

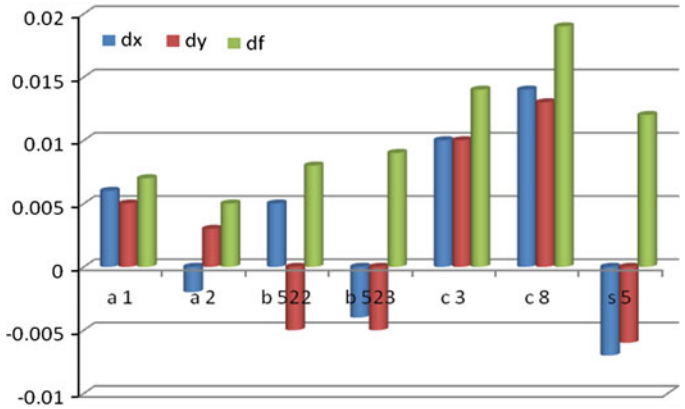

Fig. 70.4 The measurement value with existing results, the GPS measured data comparison chart

The emerging land project measurement data is shown in Table 70.1, the determination of synchronous observation data meet the time table setting, others such as point between the pitch and the condition can be properly adjusted and extended.

In this paper, the plane location determination accuracy is better than 3 mm, elevation data is more than 5 mm, select the level 5 control points, GPS test control and land ownership limit address point total is 12 test points, by comparing the measured values and the existing results, the GPS measured data, as seen in Table 70.2.

From Fig. 70.4 it can be seen that measured values are positive and negative, df data are positive, dx and dy measurements are the positive and negative numbers,

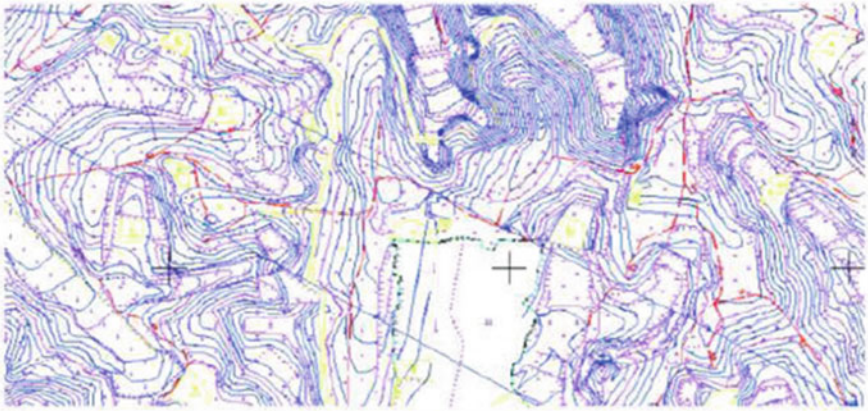

Fig. 70.5 The land project drawing

GPS measurements and dy is larger for the 1.3 cm in b 522. For b 523, GPS measurement data and dx and dy respectively, the difference between 1.3 and 1.4 cm. Of course, GPS measurement results compared with other measurement methods is a gap, but the data that are not big are cm data. In these measurements, the largest gap between the series of 5s value is 1.9 cm; some data are the same without gaps, such as the two test data of s6.

Finally is the measured data, through CASS software format conversion, importing data into image, and according to the measuring point of the terrain, landform and the accuracy of determining to check the image forming condition, finally draw the result diagram and output of the image processing, which can be seen in Fig. 70.5 [9].

70.4 Conclusion

New land markets will gradually rise, the land market for new services will increase, and so new land market research is necessary. Especially in modern surveying and mapping technology of GPS dynamic measurement system it is more and more a mature condition, making full use of this technology to the new land for more accurate determination of position and has a guiding significance in practice. GPS technology can not only meet the precision requirements and better reflect the actual accuracy for the emerging market, land development and consolidation work realized effectively upgrade, with new land market undertook GPS mapping and database technology and other related technology of measurement, the emerging of land use a situation to undertake survey the current situation, understanding, more intuitive feedback land market surveying and mapping results, better guidance to the relevant departments to implement new land market

the effective development and utilization, realize the effective configuration of resource, environment protection maximization, emerging land market value maximization.

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Chapter 71
Networking Integration of Enterprise Services System Based on Service-Oriented Architecture

Rong Deng

Abstract With the development of computer and enterprise in formalization, enterprises depend more and more on a physical platform to realize sharing information resource and business collaboration. In order to achieve business processes and data process automation, more and more enterprises come to study the contact between data flow. This paper mainly introduced an enterprise service system based on Internet SOA. It summarized enterprise networking integration technology in detail from system analysis to model establishment and the final language design. It reduced sensitivity of enterprise and greatly reduced investment cost of enterprises. It provided a new research direction for us to better realize the sharing of enterprise information resource and service.

Keywords Service-oriented architecture · Enterprise service · Internet · System design · Model

71.1 Introduction

The Internet of things used radio frequency technology and wireless communication technology to link services [1]. It developed on the basis of the computer networking and connected between different things, thereby forming a network management platform to realize resource integration and to meet customers' demand for services. The Internet of things technology platform construction often

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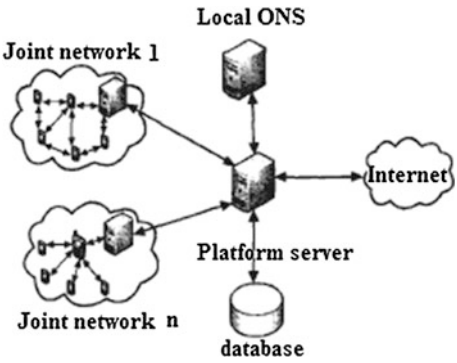

Fig. 71.1 Network structure diagram of networking platform

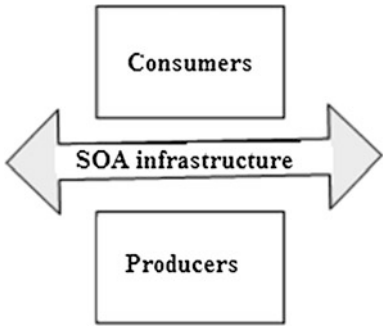

Fig. 71.2 SOA logic structure diagram

needed technical support services [2]. With the acceleration of global economic integration, the exchange and sharing of information and resources between the enterprises is more and more closely, and service integration is the development direction in the future. This paper mainly introduced an enterprise service system based on Internet SOA. It summarized enterprise networking integration technology in detail from system analysis to model establishment and the final language design. It reduced sensitivity of enterprise and greatly reduced investment cost of enterprises. It had great significance on the construction of Internet of things in our country. We used the service-oriented architecture (SOA) to achieve customer's service platform construction [3]. This platform mainly included the local online services, Internet technology, database, and a number of subnetwork, and thus accessed to networking platform server, which was shown in Fig. 71.1.

SOA was also called service oriented architecture. It belonged to a kind of assembly model; through the interface to link different services. SOA logic foundation consisted of three main parts. They were respectively consumers, producers, and SOA in restructures [4, 5]. As shown in Fig. 71.2.

A complete SOA networking enterprise integration platform mainly included three parts: consumers, SOA and producers, in which consumers belonging to the terminal user, formed by users and embedded devices. SOA was the focus of our research, which included service security platform, services, data security platform

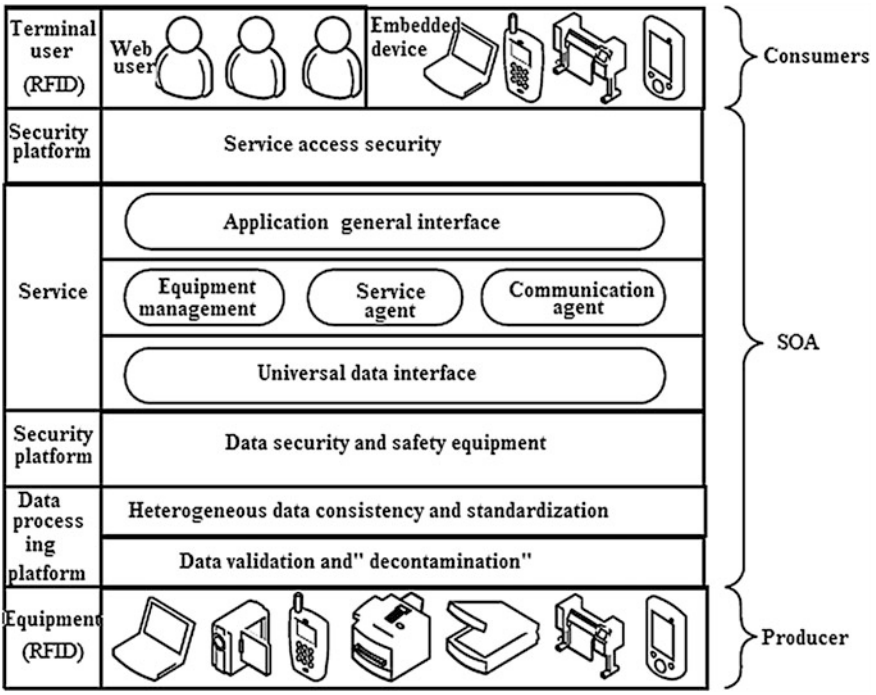

Fig. 71.3 Constitution diagram of SOA enterprise networking technology

and data processing platform. Web services security platform was mainly to make the service access security. Service platform mainly consisted of application of general interface, equipment management, service agent, communication agent, and universal data interface. Data security platform was mainly to make data security and safety equipment. In data processing platform, we used the heterogeneous data consistency and standardization, data validation and "decontamination" [6, 7]. The third part was producer, which was mainly the mobile terminal. As shown in Fig. 71.3.

71.2 Research System Analysis

We took things on the sensor node for technical support to solve the SOA business services framework structure. Its structure included five levels of structures: the application layer, service transmission layer, service model layer, data layer and physical layer [8]. As shown in Fig. 71.4.

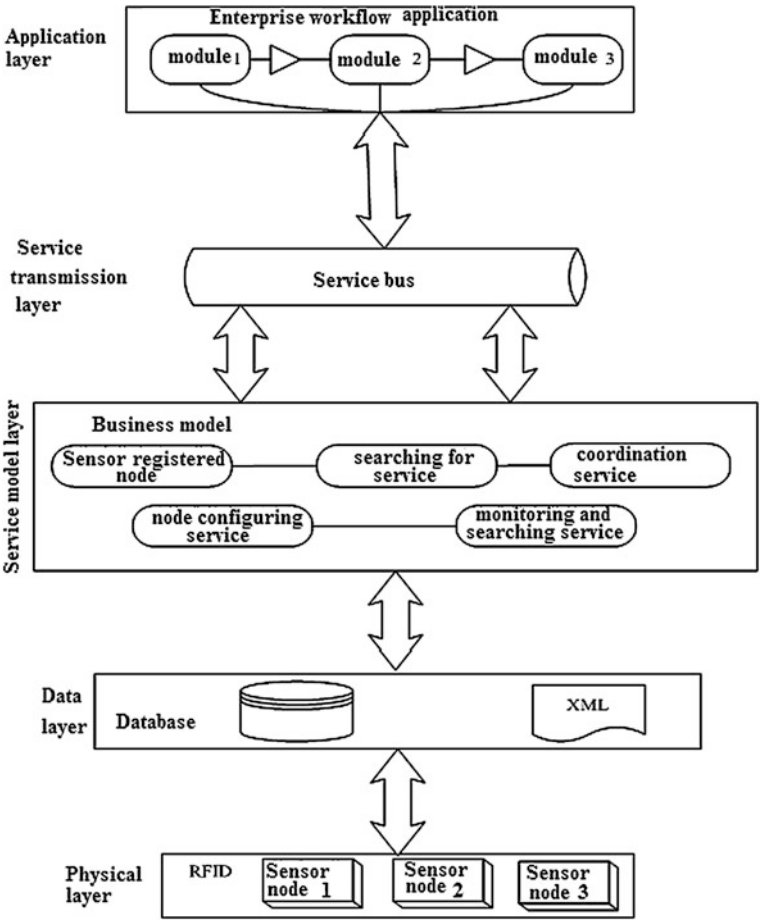

Fig. 71.4 Structure figure based on SOA networking service framework

1. Application layer: client sent service request through the server. In order to facilitate multiple service requests, an application layer contained several servers.
2. Service transmission layer: service transmission layer linked application layer and service model layer through service bus. Service transmission layer was mainly through the server's coordinated operation to achieve communication integration between different communications.
3. Service model layer: service model layer contained business model. Customers sent service requests; the sensor node registered and found, and began searching for the service request, and then collected data and began to merge data service. Service model layer was realized mainly by the coordination of services of sensor nodes.

4. Data layer: data layer was mainly collected sensor nodes of the physical layer, and then formed database, providing support for upper service layer.
5. Physical layer: physical layer was mainly sensors. It linked by sensor contact and it was physical device of the real world.

71.3 Model Establishment

As shown in Fig. 71.5, T was defined as the conversion from d to e. Given d, we could find corresponding e through r. It played connection role for the two. M represented an output quantity of d. LA represented finding corresponding e element from locator of D element. Q represented the number of e. L represented from element e linking to d', referred that after found the middle connection element E, through £ could again do its z conversion.

So XML can be formulated as follows:

$$\text{XML} = \begin{cases} T(p) \Rightarrow LA(p)\,\text{Triedonce} \\ T(p) \Rightarrow LA(p)\,\text{Repeatedusing} \end{cases} \tag{71.1}$$

Formula (71.1) described XML, according to the e R output to the definition of d' designated to find e element. There was no identification M in model diagram. We could see from the formula that repeated using e, model had a good expansibility.

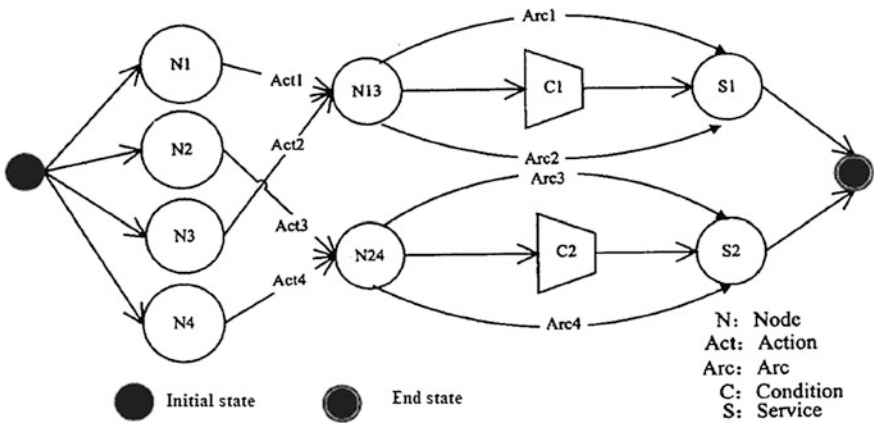

Fig. 71.5 Model establishment

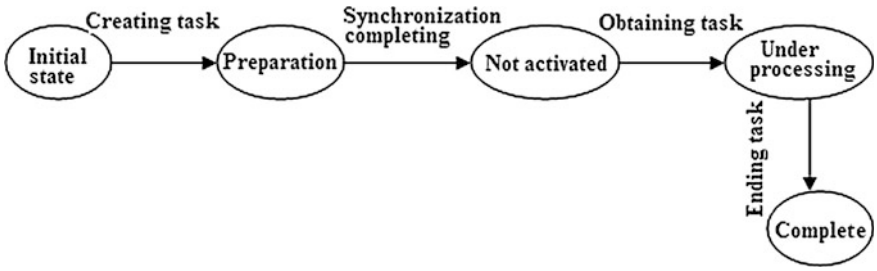

Fig. 71.6 Flow chart of program

71.4 The Flow Design of the Program

A complete flow of processing enterprise service should be creating task by the initial state, preparation stage, including aggregation synchronization, synchronization was completed into the activation state. And then obtained the task, processed task, including suspension and resetting then ended task, completing a service level system association as shown in Fig. 71.6.

In data exchanging and processing, external issued exchange request, then checked the data election in the total elemental data sheet finally exchanged data which had been founded.

In the business process, project manager submitted project plan and put project management plan into the project management data. Then did the plan approval, if it did not meet the conditions, it was not passed and returned to project management. If it had been passed, the design department projected. Finally output project and put the project plan in product data management.

71.5 Conclusion

With the acceleration of global economic integration, the exchange and sharing of information and resources between the enterprises is more and more closely, and service integration is the development direction of the future. This paper mainly introduced an enterprise service system based on Internet SOA. It summarized enterprise networking integration technology in detail from system analysis to model establishment and the final language design. It reduced sensitivity of enterprise and greatly reduced investment cost of enterprises. It had great significance on the construction of Internet of things in our country.

Acknowledgments The research was supported by the teaching reform program of Chongqing with the program number 103449 and the program name Research on the Construction of Practical Teaching System Based on the Construction of Model Vocational Colleges-Taking Chongqing Vocational Institute of Engineering as an example.

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Chapter 72
Study of Network Media on Art Design Education Based on Demand Model and Dynamics Theory

Jing Wang and Ning Song

Abstract The network media is being used more and more widely. The reform of professional education of art design was strongly influenced by the network media. Through the systematic research to the education mode of art design based on network media, it established the plane type media, the three-dimensional animation media, interactive media, and the budget design kinematics influence equation. Meanwhile, it analyzed the art design education mode system of network media, and established art design education pattern based on the network media. The structure of the system was four channel application structures which were to meet the needs of art design education.

Keywords Network media · Two-dimensional model equation · Kinetic theory · Demand model

72.1 Introduction

With the rapid development of computer network technology, education in Internet technology as the tool and art design has become the popular trend in university art design teaching. Network media art design education was adapted to the time and society as well as the demand of talented people in the art technology field [1]. The specialty of Network media of university art design is to combine the open network technology and art design organically thus forming the interdisciplinary professional teaching. The art design specialty was mainly to train more

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versatile professionals who were equipped with good design literacy and arts accomplishment. They should not only understand relevant professional skills but also have very good ideas of art, and be able to use the network media tools to design and create art works [2]. For art design students, they should be able to grasp the basic knowledge, theory, and design skills related to network science and network technology, and to manipulate various software of network media to do art work At the same time, they should be equipped with basic requirements of art design, namely the ability of arts appreciation and design, and apply software tools of network media into art design work.

72.2 The Establishment of Art Design Education Model and Kinematics Influence Equation from Network Media

At present, the main performances of the network media are: the plane-types media, the three-dimensional animation, interactive media, and other network media forms. At the same time, different transmission modes of network media included Internet graphics, network animation, or images and interactive network media content. In the performance form of network media, it required a big database of technology. Therefore, in the process of art design, network media tools became more and more important. So, for art design talents, they needed to have the systematic structure of art design knowledge and art design skills. The goal needed plane-type media, the three dimensional animation media, interactive media and other network media to establish. In order to achieve this, it must establish demand model of art design goal to the Internet media.

According to these characteristics, the establishment of the systematic model should include art design education target of the dynamics needs of plane type media, three-dimensional animation media and network interactive media. The two-dimensional model equations are shown as follows [3]:

$$F_{\mathrm{XYZ}} = \frac{1}{\mathrm{XY}} \int_0^Z F_{\mathrm{XY}}(Z)\mathrm{d}z \tag{72.1}$$

Among them, F_{XYZ} stand for art design education target; X stand for the demand degree of plane type media tools of network media; Y stand for the demand degree of the three dimensional animation media tools of network media; Z stand for the demand degrees of network interactive media tools of network media.

According to the simplified formula of the demand model of dynamics theory, the simplified formula is shown as follows [4]:

$$F_{\mathrm{XYZ}} = \int_0^Z F_X\left(\frac{Z}{Y}\right)\mathrm{d}F_Y(Y) = \int_0^Z F_Y\left(\frac{Z}{X}\right)\mathrm{d}F_X(X) \tag{72.2}$$

From the formula, it is known that the target of art design education needed network media tools necessarily; especially the interactive media tools of network media, namely art design needed a lot of interactive evaluation and directions in network media to pursue a perfect artistic design.

72.3 Systematic Research of Art Design Education Mode Influenced by Network Media

The given art design education model system of network media was mainly shown in three aspects [5, 6]:

1. The plane art design teaching mode of network media

The plane art design of network media needed to make different types or the same type into new artistic images in a two-dimensional graphic. Its basic form of the picture plane framework showed out a very strong flexibility according to different direction and conversion, and all kinds of permutation of different arrays and combination and finally showed out different art pictures. So the teaching process to the students of art design major could not only search one art picture for it did not conducive to develop students' thinking. The network media of graphic design software AutoCAD had a very strong drawing function of graphic art. It could not only accomplish 2D graphics rendering but also make 3D entity model at the same time. Therefore, in the teaching process of art design, using AutoCAD to coach the plane art design teaching could help students of art design major accurately render the needed art graphics work quickly. What's more important, this means was able to help students create a command changing image combination with copy, mirror and rotated tools, render different art graphic works of different effects, and improve the quality of the teaching effect.

2. The color art design teaching mode of network media

Cooler was very important for art design professional student. So to understand cooler of art work and create a unique art cooler was very vital. Artistic beauty of works was a collection of the forms, color and the simple sense of art works. The image processing software of Network media tools namely the Photoshop was very quick in the use of colors and the control of the whole beauty. The Photoshop software tool was applied in color composition teaching process. Students could master the original cooler collocation of art works through real color works. It simplified students' work and expanded the scope of practice with more options.

3. Three-dimensional art design teaching mode of network media

The three-dimensional perspective of art form needed the points of view of geometry: dot, line, face, body. As to the students who studied art animation works design, three-dimensional works of art were very difficult. The 3D modeling and model building technology of network media had a very big liquidity. Each detail of the artistic works was very vital. And the pilots in the space must also be constructed and decorated. The artistic design students could use the 3D MAX software of network media to do the rendering of the later stage. At the same time, 3D MAX tools of software system provided a huge material database for those who worked for art design and it could do the real simulation design with materials of art works.

72.4 The Technology Principle of the Teaching Platform of Art Design Education Based on Network Media

In order to meet the needs of art design education, it established the pattern of art design and education design based on network media. The system structure was a four channel application structure and it was as shown in Fig. 72.1.

In the user layer of art design teaching platform of network media, its mainly function was to help art design student go into the network media platform for service, and realize the background management of teaching network. In art design teaching platform, the major customers were network media manager, art design teachers and students. It realized the establishment of the analysis system of artistic design Angle and the implementation view [7, 8].

1. Administrators' view of network media platform: in administrators' elevation of the network media platform, they obtained the new dynamic of art design

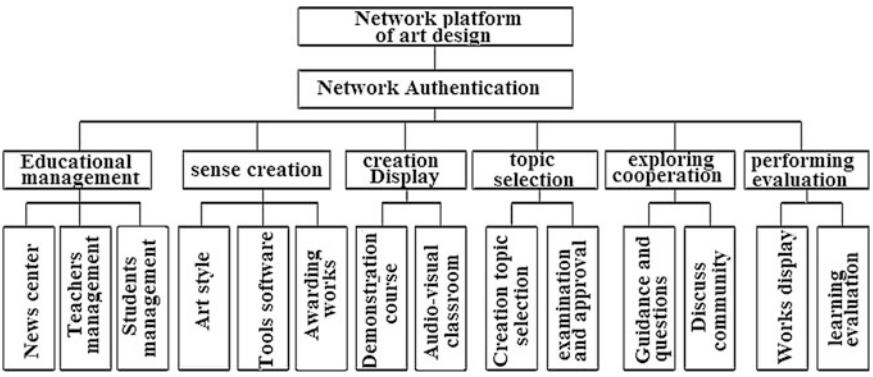

Fig. 72.1 The structure figure of network media platform of art design

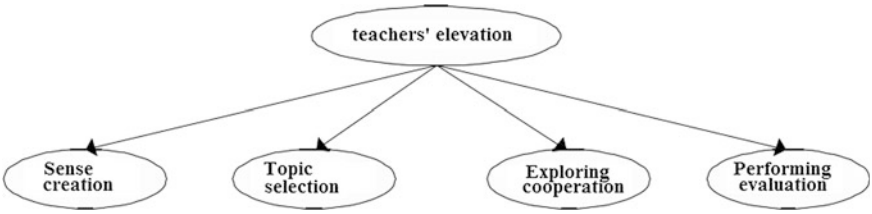

Fig. 72.2 Professional teachers' elevation of network media platform

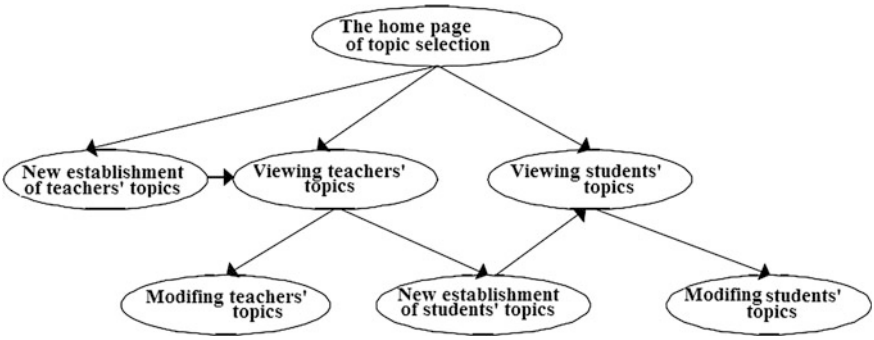

Fig. 72.3 Professional teachers' elevation of topic selection management in network media platform

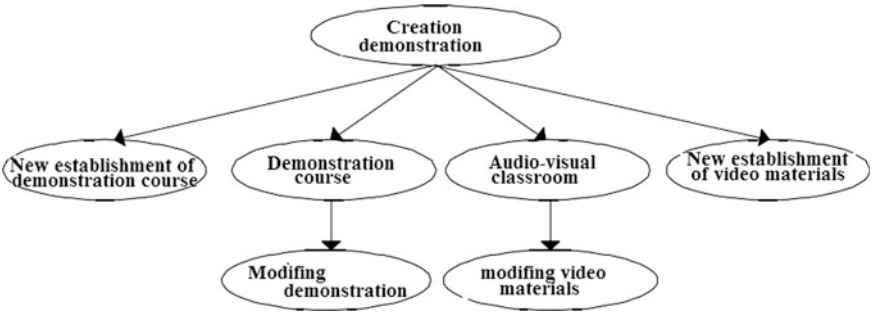

Fig. 72.4 Professional teachers' elevation of creation demonstration in network media platform

education and detailed information of art works mainly through checking the list of art design students and art works, etc.

2. Professional teachers' elevation of network media platform: they were to create the sense of art work, manage the topic selection of art work, explore and cola borate the color of artistic work, and evaluate the design works of art students. As shown in Fig. 72.2.
3. The professional teachers' elevation of topic selection management in network media platform was as shown in Fig. 72.3: mainly included: established new

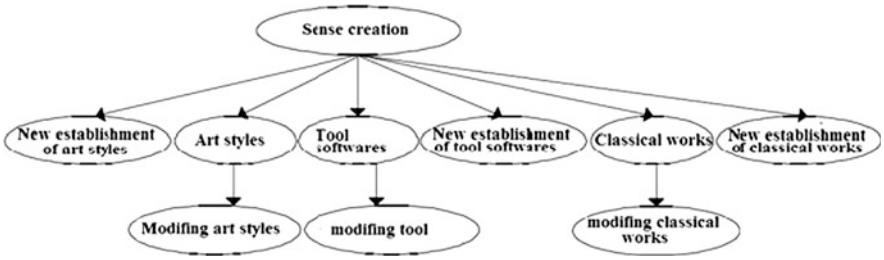

Fig. 72.5 Professional teachers' elevation of senses creation in network media platform

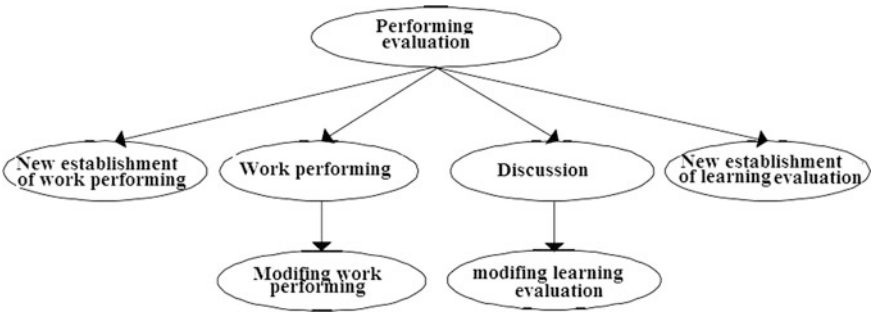

Fig. 72.6 The view structure of showing evaluation

topic selection of teachers' art works, viewed the topic selections of teachers' art works and students', and could do some changes.

4. The professional teachers' elevation of creation demonstration in network media platform was as shown in Fig. 72.4: mainly included: established new demonstration course ware, video classrooms of art design and video materials; modified demonstration course ware and video materials of art design.
5. In the demonstration Figure of creation, only professional teachers of art design could add, modify or upload course ware and teaching video. They chose related data files in view of course ware and then clicked to submit via network media platform to add components thus uploading teaching materials of art design to the education platform of network media. When viewing the materials of art design, teachers could modify, upload, and delete the teaching materials of art design while professional students of art design could only see and download teaching course wares and videos.
6. The professional teachers' elevation of senses creation in network media platform was as shown in Fig. 72.5: mainly included: the shows of art design works, the application of software of network media tools as well as displays of classic works.
7. The professional teachers' elevation of exhibition evaluation in network media platform was as shown in Fig. 72.6. The realization of the art works display

was similar to scene creation part, and it evaluated the theme of the art design. It established the evaluation system around the market need of art design professional talent and skillful specialties. The practical skills training of art design education with network media was always around the skills of the plane type media, the three dimensional animation media and the interactive network media.

72.5 Conclusion

Network media art design education is a necessity in the field of art design education and network communication making it more convenient and faster for teachers and students to communicate in the process of art design. Therefore, the influence of network media was very huge to art design education. The space of art design had established a interactive behavior on the Internet. The new situation of the relationship between teachers and students was based on the network media. The electronic teaching classroom which regarded network media as the medium would ignore the ages and different art design specialties, and combine their different design concepts and thoughts. Network media provided a very distinctive space which leaded to learning and inter-communication for art design education. At the same time, in the environment of a new era based on the network media, art design education would play a more potential role, accelerate and improve aesthetic ability of art design.

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Chapter 73
Study on Improved Teaching Quality of Undergraduate Education

Mengchun Yao and Min Dong

Abstract An emergency mission for universities has been how to ensure and improve educational quality during the age of popularized higher education. In undergraduate education, this article proposes approaches in terms of optimizing credit system, improving teaching method, establishing innovative credit, reforming grading and evaluating system, and strengthening academic staff to improve teaching quality of higher education.

Keywords Higher education · Popularization · Teaching quality · Self-development

73.1 Introduction

Since 1999, the increasing enrolment in institutes of higher learning promoted the leaping-over development of higher education. From 1999 to 2005, the numbers of students enrolled in institutes of higher learning increased from less than 8 million to 23 million and the gross enrolment rate of higher education enhanced from 9.8 to 21 %, higher education in China historically entered the stage of internationally recognized popularization [1]. However, as the expanding of scale, society paid more attention on quality of higher education, enhancement of teaching quality became more important and pressing. For this the Ministry of Education signed

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Proposals on Strengthening Teaching Work of Undergraduate Education and Improving Teaching Quality in Schools of Higher Learning, and explicit requirement on strengthening teaching work is put forward in this document. In December 2004, Ministry of Education held the Second Meeting on Teaching Work of Undergraduate Education in General Schools of Higher Learning with the theme of Strengthening Teaching Work Energetically, Enhancing Teaching Quality Substantially, this meeting discussed the further policies and measures aim at strengthening teaching work. In January 2005, Ministry of Education signed Proposals on Further Strengthening Teaching Work in Schools of Higher Learning, this document emphasized that higher education must adhere to scientific development view, accomplish the diversion of working focus, put improvement of teaching quality in a more important position as the expanding of enrolment. Though a lot of achievements have been made, most schools of higher learning are not yet fully able to meet the needs of society and economy development given their old-fashioned teaching conceptions, out-of-date teaching content, single teaching method, and the capabilities of teaching staff, innovative spirit and practice abilities of students needed to be promoted. Popularized education is a new stage after elite education, it is not a negation to elite education, and it would be a misunderstanding if holding the view that educational quality of popularized education stage should be lower than elite education stage [2, 3]. Popularized education is neither the synonym of low quality nor equal to extensive education. Then, how to guarantee educational quality after the enrolment expansion of higher education? In my own opinion, the following aspects are critical.

73.2 Further Optimizing Management of Credit System, Creating Free Developing Room for Students

Credit system which is helpful to students in terms of self-selection, self-design, and self-development is characterized by respecting individualities and interests of students during teaching process, exerting positivity, initiatives, and creativities of students, implementing flexible schooling system and free course-selection system. In practice, it should take the flexible schooling system as precondition, course-selection system as key, and competitive mechanism as dynamic; in educational process, it should highlight self-design of students; in management mode, it should emphasize on target management. Further improving management of credit system relies on developing potentials and creativities of students, transforming passive learning to positive learning [4]. In credit system, the regulated schooling period for undergraduate education is 4 years, the flexible schooling period can be 3–6 years; graduating ahead of schedule or delayed is permitted; interruption of schooling is permitted for those students who have special reasons, application for resumption of schooling can be accepted when the requirements are meet Encouraging multi-disciplinary and cross-grade course selection by students.

Firstly, common courses can be selected independently. Students can select common courses depending on their individualities, capabilities and interests; more and better courses should be offered to select by students, meet the requirements on quantity and quality both [5]. Secondly, basic courses of subject can be selected independently. Students can select courses beneficial to self-development under multiple subject-directions, thus to form the broad and substantial basis of subject. Thirdly, key courses of subject can be selected independently. Students can select key courses of subject with their own knowledge to subject under the precondition of accomplishing regulated credits. Fourthly, teachers can be selected independently. All the teachers should be listed, to offer more courses by each teacher or each course lectured by different teachers should be encouraged. Even one course should be lectured at different styles to meet the diversified requirements and interests of students. Furthermore, conditions of credit inter-admission between different universities should be created by collaborating with other universities, to expand room of course selection and resource of course [6].

In the process of making and implementing new Talent Cultivation Plan, Southwest Forestry University took the requirement of credit system into account. In-class teaching hours was reduced considerably, the total amount of in-class teaching hours does not exceed 2,200 contact hours and not exceed 24 contact hours on the weekly basis; compulsory courses were reduced and optional courses were increased, more distinctive courses were offered to students. Therefore, students have more free time to better improve their own knowledge structure, make their own decision on development.

73.3 Improving Teaching Method, Implementing Student-Oriented Teaching

Teaching method is an important aspect in improving teaching quality, we advocate heuristic and discussing teaching relative to cramming teaching, in which teachers play the guiding role while initiatives of students are respected. Initiatives, positivity and creativities of students should be exerted in learning process since the theme of universities is “cultivation but not production”, is “cultivating senior talent but not producing top machine”. Teachers should be good at mobilizing curiosities of students. Confucius said “no puzzled no elicitation, no wordless no elicitation”, it means do not enlighten students until they tried their best but puzzled still, do not enlighten students until they are not able to express their knowledge and experiences when they are learning. “No puzzled no elicitation, no wordless no elicitation” advocates heuristic teaching whose key is refining problems, creating practical situations of problems. Zhu Xi the educationist of Southern Song Dynasty said “if no doubt in studying, teaching should have; if there is doubt in studying, teaching should not have, and then it makes

progress". Be good at raising questions is the starting point of searing for knowledge. In teaching process, teachers should raise questions according to teaching content and schedule, lead students to consider and discuss actively, make students to enjoy joy of pursuing knowledge in the process of solving questions, experience sense of success after solving questions. Discussing Teaching aims at leading students to participate in teaching process which is a method to solve cramming teaching. Teachers should leave time and room for students to consider, make students to consider questions and acquire knowledge actively. Class is not only the stage of teachers but also the interactive place between teachers and students. Democratic way should be adopted to build an environment of academic equality and seeking for truth. Some teachers think what they lectured is proved by practice and no discussing needed, these teachers neglect what students care is the process of learning knowledge, while knowledge itself can be learned in anytime and anyplace. In teaching process, teachers can neither adjust teaching content depending on their own likes and dislikes, nor dominate students by their own subjective will. Student-oriented teaching should be adopted to lead students participate in and solve questions actively, make students to achieve mastery through a comprehensive study of the subject and draw inferences about other cases [6].

73.4 Establishing Innovative Credit, Encouraging Student's Autonomous Innovation

Personality development, creative spirit, self-study capability and operation ability can be improved and fostered by creative practice activities. Southwest Forestry University established innovative credit with the combination of in-class and after-class teaching, credit is admitted for those students who possess creative spirit and make achievements in practices. Innovative credit is composed of four parts as contest of subject knowledge, scientific research, certificate and social practice, which including awards from intelligence contests, technique and capability contests, cultural and sport activities; publications in official journals or experiences of participating in researches above school level; awards from scientific and technological activities; certificates of compute techniques, foreign languages, operation techniques etc. Students can make achievements on literature and art activities, social practices could submit the applications, admission group of extracurricular credit would identify and register the credit [7].

Southwest Forestry University established fund of scientific research for undergraduate students to create the opportunities of conducting researches under the guidance of professional teachers, public laboratories are open for students at any time. Teaching management should aim at target management and intensify result to encourage self-learning, promote positivity and initiative of learning, students who achieve learning goal depending on their own specialities and ways

should be allowed; while the supervision of teaching process should be strengthened since the present generation of university students are mostly from one-child families, they grew up with the excessive careful tending of parents and teachers, thus lacking the individuality and self-discipline, they will sacrifice more on way of becoming mature if measures are not taken to supervise the learning of them. There were cases in Southwest Forestry University that students were not qualified to graduate given they lacked the required credits or did not meet the required standards, which exerted a negative impact on their development. Therefore, in practical operation, the extremes of too strict so as to limit the development room of students or too relaxed so as to form the undisciplined way of learning must be avoided both.

73.5 Reforming Evaluation Method, Improving Student's Development

Grade point is the major criteria to evaluate student's performance. The disadvantage of this method is usually underestimated when students have strong motivation for learning during the period of elite education. Grade point also links to other encouragement; therefore, to obtain higher point became the main purpose for studying. Some students do not work hard and review during the term, but cramming course notes and teachers' syllabus for test. "Test is sour; point is all". Under this situation, some students choose to cheat for higher point. Therefore, a reforming for the present evaluation system is necessary [8].

We should keep knowledge, ability, and accomplishment all together to evaluate student. Knowledge is the base for ability and accomplishment. No such ability without knowledge. Ability is the power to use knowledge. Accomplishment is the higher level of knowledge and ability. It is present personal characteristics and potential ability. All these three aspects should be considered when evaluate students. Test subjects are from courses, 60–70 % for examining, and 30–40 % for investigating. Test can be various, such as assignment, middle term exam, final exam, oral presentation, course project, experiment, and other. And the question designing should focus on analysing, application, and less on multiple choices. As said by Mao Tse-tung, "if had 20 questions from Dream of the Red Chamber for students, some students finished half of them, but have creative answers. The answers should be marked perfect. Some finished all questions, but copied from textbook. These answers should be marked as half score." We should pay more attention to students' accomplishment, especially the ability of analysing and resolving problems. Teachers can manage the test, and not encourage mechanical memorizing, but making the question creative, comprehensive, and applicable. For technical course, examination will contain some real question for students, including methodology for thinking and planning. A good academic atmosphere is an important step for education. Students can establish a correct idea

for studying, achievement, and careers. For the testing subjects, we should have a strict regulation for testing and marking. Meanwhile we will encourage the honest testing and avoiding plagiarism.

Maybe the latent semantic indexing (LSI) model can be used in this research. Nineteen nineties, Deer ester put forward the LSI model. The mathematical model is described as follows:

Set R is an $m \times n$ n matrix, X is $m \times m$ matrix, and Z is an $n \times n$ matrix. Suppose there is a matrix Y; the following formula is valid.

R = XTYZ.

Where $Y = \text{diag}(\sigma(1), \sigma(2), \ldots, \sigma(t)), t = \min\{m, n\}$ $\sigma(1) \geq \sigma(2) \geq \cdots \geq \sigma(t)$ $\sigma(1), \sigma(2), \ldots, \sigma(t)$ are row vectors; the singular value of X is the left singular value of R; the singular value of Z is the right singular value of R Y is diagonal matrix.

73.6 Conclusion

The core of reforming is improving the quality of education, and the improvement relies on the quality of teachers. There is a saying "University is nothing about buildings but masters." Teacher is important for university education. Therefore, it is necessary to enhance the criteria of hiring teachers, change knowledge, education experience, age of teacher, introducing academic leaders. Furthermore, we should select some teachers to get Ph.D. education, or send them to top domestic or international universities/institutes. Let the academic leader play a role in research and course designing. The teacher should be encouraged to do more research work with teaching. Without researching and pursuing latest knowledge, there is no motivation for teaching and it is impossible to improve the quality of education.

The teacher should do more teaching while doing research; encourage professor to teach for undergraduate. Many teachers, after obtaining title of professor, do not teach undergraduates because of focusing on researching. Less and less professors teach undergraduates. Sometimes students have no chance to listen to professors' lectures. As young and middle-aged teachers are a majority, more racings, such as 'new start project', should be held to discover teachers who are skilful in teaching and research. In addition, young teachers should have more opportunity to be trained and guided, which will reduce the period to become experienced teachers. Training in foreign language and computer skills should be enhanced as well, which will be good for bilingual and multimedia teaching. Laboratory technicians also need to be enforced, and awareness of service should be improved. A feedback system for education quality should be set up. All leaders should obey the regulation to attend lectures, meanwhile teachers should be encouraged to attend other teachers' lectures, and exchange their opinions. Educational supervision should be more and buildup a network for feedback, ensuring information can reach to teach, department, and faculty in time, which will be the key criteria for educational evaluation.

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Chapter 74
Study of Demonstration Center for Driving Interest Based on Independent Experiment and Exploring Innovation

Peiyun Luo, Shuying Qu, Cuiling Li and Fanbo Meng

Abstract To improve students' innovative thinking and practical ability, this work bases on the constructional platform of demonstration center for driving interest, independent experiment, and exploring innovation. And through the implementation of the experiment curriculum continuum beyond the subject and the class border, this paper focuses on the innovative test platform in civil and mechanical fields. The management platform includes six parts of experimental teaching platform carrying out practical activities of undergraduate research in four of the trinity; school Dean's Office, Youth League Committee, College, Center, experimental instructors and group leaders. And further, the experimental teaching platform formed featured by Holographic perspective of "center-college-school-enterprise" four layers to facilitate undergraduates' interaction. The platform system gives full play to the role of the experiment teaching in developing innovative ability for a better adaption to the requirements of cultivating the advanced application talents.

Keywords Way of inquiry · Teaching system · Subject boundaries · Holographic vision

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74.1 Introduction

With the progress of science and rapid development of economical globalization, the world market economical system has basically formed. Human being goes into a society of economy and learning. Facing this times change, many countries reexamine the idea of higher education. They carried out a series of education reforms named "training of learning ability", "cultivation of innovative talents", and "CDIO engineering education" [1]. Our country has entered into a new period toward the overall modernization and building the innovation. A country becomes prosperous and strong only if he owns a multitude of high quality talents and changes the traditional training mode by exploring the new personnel training mode.

Experimental teaching is essential in engineering undergraduate teaching and also an important way in consolidating theoretical knowledge, in training students' practical ability and in developing the students' innovative thinking [2]. With the deepening of the reform in China's higher education development, the expanding recruitment of students scale, the broadening of professional content, and the gradually perfecting of course system, the original experimental teaching system, content, method, and conditions cannot meet the requirement of modern engineering teaching and talents training anymore. It also restricts the teaching reform and the further development, which have a direct impact on the quality of teaching and talent training. The program treats "enhance experimental teaching and strengthen practice teaching, promote theory instruction, emphasize ability training, improve teaching quality" as the goal. Through the construction of the center focusing on students and the experimental system and platform centering on training students' ability, including system, content devices (hardware platform), teaching materials and evaluation system, change the old way of passive acceptance through doing a large number of exercises and advocate the new way of actively participating in inquiry [3]. Above all are aimed at changing the traditional concept of the experimental teaching attaching to the teaching theory, forming atmosphere of complementary between theory teaching and experiment teaching. The most fundamental essential is to guide students learning actively and improve their comprehensive quality on innovative thinking.

74.2 Construction of Mechanical Experimental System and Platform Featured by the Way of Inquiry and Innovation

Based on the progressive relationship among the discipline knowledge system, the experiment teaching content and resources are integrated, which is designed to reform the technology experiment attached to the theory course experiment. This will take the lead the experiments combination of "theoretical mechanics",

"material mechanics", "fluid mechanics", "engineering mechanics", "architectural mechanics" experiments, and "structure vibration test analysis" in the national civil and mechanical field. It also opened the independent comprehensive experimental course named Engineering Mechanics Comprehensive Innovation Experiment. This course would not need to rely on theory course entirely any more. Students can choose experiment contents and schedule. They can also set experimental design freely.

The comprehensive experimental course reflects a reasonable structure for the engineering technology experiment content in civil and mechanical field. It acts the application of fundamental mechanics concept, the theory, method in the daily life, and the engineering practice as the guidance, involving civil engineering, the manufacturing of machinery, electricity, aerospace, supplies, toys magic, fashion acrobatics, and many other fields. The key of progressive experiment systems is that students design the experimental schedule independently and have their own test actively [4]. So this can not only cultivate the students' practice ability in integrated application, but can also practice their holographic ideas and views by promoting their understanding and application in class content. The system belongs to continuum form on experiment course.

Comprehensive experimental course goes beyond the border line between subject and curriculum, which gives students more autonomy and sense of responsibility. The system allows the students to select and organize experiment according to their own interests, requirements, and specialty. The institution bases on self control and self guidance, which provide a good environment for fostering innovative ability in experimental activities [5].

74.3 Expanding Innovation Experimental Project Through the Innovation Idea to Construct the Multi-Level Experimental Teaching System

The system aims to set up different levels on experiment content, which will gradually guide students to learn autonomously, cooperatively, and inquire actively. The experiment topic is given in the way of theory and homework [6]. This allows students to choose experiment content according to their own interests, requirements as well as their goodness. Meanwhile, they can also carry out experiments according to characteristics of the experiments. It is believed that the system guide students to grasp the methods to design and research practical problems. It will lead the student to research and innovate based on practical problems from simple to difficult level through the stratified experiment settings, especially for the design of innovative experimental subject. And also it realizes the optimization on experimental system including of basic experiment, technical experiment, and professional experiments) and structure type consisting of demo test, verification test, designative test, and researching test). The result of this

setting is to broaden the students' view and roads to acquire knowledge actively and further to raise the students' comprehensive quality.

The center of mechanics laboratory (Fig. 74.1) gathered the applications of basic mechanics theory and method in daily life and engineering practice under one roof. It layout the experimental contents in the following five modules, such as the statics, the kinematics, the dynamics, the strength theory as well as the dynamic test analysis, which involved civil engineering, manufacturing of machinery and electricity, aerospace, supplies, toys magic, fashion acrobatics, and many other fields [7]. Such classification demonstrates not only the diversity of practical problems but also the huge effects on the theoretical applications in practical problems [8].

For students of liberal arts, science, and engineering, they should make use of different vivid forms to analyze the innovated application of modeling, composition, color, calculation, experiment, applications, video, and text. The new platform provides all these sources to enlighten students of the lower grades. It tried to reveal that innovative pyramid is attainable as long as someone observe carefully and learn using his heart by many kinds of common cases. This approach will inspire learning interest of these students and provide them with a basic platform of the talent.

For the senior students, the system encourage them to carry out the practice of entrepreneurship education through some simple operation named "training project". In addition, the innovation laboratory is open any time and is available for students who are interested in researching subjects and researching on colleague students' innovation fund projects.

For the selected subjects of postgraduates, the system brighten their vision and supply more rich and colorful contents for local services. Meanwhile, it indicates that profound mechanics knowledge and the keen insight is very important to solve problems in engineering. Nowadays the accumulated experience to solve practical

Fig. 74.1 Mechanics laboratory

problems is also a great treasure in the circumstances of the new materials, technology, system and application, methods emerging endlessly.

This open mode broke the border of traditional subject, and formed the holographic vision system of experimental and practical teaching. So students' have an unprecedented enthusiasm to participate in the experimental learning. Their learning ability, team cooperation ability, expression ability, creative ability, and other comprehensive ability take a good exercise by identifying and solving problems.

74.4 Perfect Management System

The reform of management system and operation mechanism is the organizational safeguard of the experiment teaching. So researching and implementing the scientific and practical management system and operation mechanism will ensure the normal business operates smoothly. These research contents are connected and interdependent. They promote and coordinate each other in their implementation. The experimental center realized the teaching by network and established laboratory platform of information management covering hardware and software. And it also created personal learning environment for the students' independent experiment. The management system includes six parts of experimental teaching platform. They are School Dean's Office, Youth League Committee, College, Center, experimental instructors, and group leaders. For example, the school dean's office issued the Teaching Opening Laboratory Management Method of the Yantai University and the Laboratory Open Fund Management Method of Yantai University. The ministry of public works announced the Planning Implementation Scheme on Traction Target of Yantai University. The Youth League Committee released the colleagues' innovation fund management method of Yantai University. The mechanics experimental center implied the mechanics experimental center open management method. These formed the experimental teaching platform of "students-center-college-school" highlighted holographic vision, which can give full play to the dynamic role of experimental teaching in the innovation ability training. The measure can make the experiment teaching better adaption to the requirements of advanced application talents.

74.5 Playing a Model Radiation by School-Enterprise Cooperation and Officer-Officer Interaction

Because the system focused on the concept of independent design to provide the experimental resources based on specific problems and not on the verification of some certain knowledge, it realized that teaching and scientific research promote

each other by the way of operation mechanism and management. These improved efficiency of teaching and score great successes in recent years. For example, the multifunctional experimental machines and structure mechanics experiment machine that the center has the independent intellectual property rights have been awarded three national invention patents, four patents for utility model. The results still extend the application to other 37 universities; for instance, Tongji University and Harbin Industrial University (Weihai district) besides completing our own experimental teaching tasks (Fig. 74.2).

The colleagues took part in all kinds of activities in science and technology and rewarding fruitfully. For example, one team won the special award (the second place) for Group Corporation in the First National Basic Mechanics Competition in 2010; three special award for individual; seven prizes for personality. Then they participate in the Zhou Peiyuan Mechanics Competition and earned the first place for four years among the universities in Shandong province. And they won the first prize for one item and two second prizes when joined in the three-dimensional national contest on digitizing innovation design and the national college students' advanced graphics skills and innovation contest. Our students took part in the National College Students' Contest on energy conservation and emission reduction getting the first prize and honorable mention. Recently, they awarded the first prize and a second prize in the contest of national college students' innovative mechanical design as well.

The significance of scientific research cannot be neglected. It promotes the teaching level and raises the quality of experimental research. It also cultivated many outstanding teachers from the platform in recent years; for instance, the national outstanding teachers, mechanical excellent teachers, teaching masters from Shandong province, young and middle-aged expert with outstanding contribution Yantai, excellent teachers of Yantai University, and so on. These teachers' works also made a great amount of achievements. For example, they won the first prize for one item in Shandong province excellent teaching achievements; won a second prize for one item, the third prize for six items. The teaching achievement of postgraduate education achieved the second prize for one item as well as the third prize for two items. The center was awarded the demonstration

Fig. 74.2 Multifunctional experimental machines

center of engineering mechanics in Shandong province and the team in charge of the center was named the provincial innovation teaching team on the construction mechanics. The curriculums series including of theoretical mechanics, material mechanics, and engineering mechanics taught by these members was awarded classic curriculum at the provincial level.

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Chapter 75
Study on Personnel Training for Public Administration in Local Universities

Yanping Li and Huan Li

Abstract To accommodate social development and rapidly response to the social requirements of the professional administrative management personnel, this thesis conducts a study on the training measures about the administrative management personnel in local colleges. Through the empirical investigation and comparative study and by choosing the samples of four local colleges which have advantageous administrative management majors for analysis, it comes to the conclusion that the local colleges should train the professional administrative management personnel by strengthening the professional consciousness of students, improving the teachers construction, fusing other superior resources of school, and enhancing the teaching practice. These study results are generally applicable to the training for the administrative management personnel in local colleges.

Keywords Local universities and colleges · Public administration · Personnel training

75.1 Introduction

Public Administration as an independent discipline first came into being in western countries. Chinese universities and colleges reestablished this discipline for undergraduates in 1984. Since then, many universities and colleges have opened this course. There are 253 universities and colleges providing this course with

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local universities and colleges taking a large proportion. Professional education for Public Administration began to take shape.

The establishment of the major synchronous with the beginning of Chinese economic reforms. Government departments, like other organs, were facing the transform and innovation to adapt the new environment. Every department form the central authority to local governments desiderates professional administrative personnel with new mindset to meet the new trend. Local universities and colleges have played an important role in providing such kind of talents to the governments and contributing to the improvement of public services and transformation of the governments function, which have fulfilled the needs for development of economics and society. However, each period has its unique political and economical environment, which challenges the local government to constantly improve their administrative function to satisfy the new demands. Local universities and colleges just follow the lead of key universities, which result in the facts that the training system is not complete; the idea of constructing this subject is immature; the teaching methods and materials are insufficient; the training for professional administrator still needs to improve.

Thus, local universities and colleges should break all kinds of restrictions. With the awareness of its own insufficiency, local universities, and colleges draw lessons from other universities and colleges that have great experiences and outcomes while taking a series of measures, including fostering students' professional awareness, enhancing teaching staff through interdisciplinary combination; highlighting the localism; emphasizing the practical training, etc. Those measures aim to cultivate administration professionals with mastery of theory and practical ability and establish a typical major in local universities and colleges.

According to Wu' book On How to Choose University and Major 2011 [1], we chose to analyze five local universities which have obvious advantages in developing the public administration major in China. They are: Xiangtan University, Zhejiang Normal University, Zhejiang University of Finance and Economics, Yunnan University, and Guangzhou University. Other universities may use their model as references (Table 75.1).

Table 75.1 University ranking

Name of university	Comprehensive ranking	Administration specialty ranking
Xiangtan university	83	8
Zhejiang normal university	100	10
Zhejiang university of finance and economics	262	16
Yunnan university	76	21
Guangzhou university	154	24

75.2 Fostering Students' Professional Awareness

Under the influence of the popular belief—official rank standard, many students simply equal public administration to governance. Many senior high school students choose this major with the belief that they can be an official when they graduate and for them, which means to be powerful. They totally ignore that the public have the right to know and to involve in public affairs. What's more, the public's needs are the guidance of public administration. If the students build the wrong awareness of their major, they fail to be qualified administrators for the new trend of the institutionalized, democratized, and scientific public administration [2].

The administration and the public should be equal. More precisely, the former serves the latter. So the equation of administration and governance are not appropriate in modern market economics. Local universities and colleges should make every effort to develop students' awareness of public service, public supreme and public responsibility so that they would learn quintessence of public administration and apply their knowledge and ability properly. Obviously, the correct insight on this major is the priority of training the personnel [3].

The correct awareness is acknowledged mostly after entering the universities. Teachers should fully take advantage of all the resources and opportunities to help students to be aware of their professional identities and make sure it will be carried out through the undergraduate phase. Only with the clear and proper awareness of the major can they become qualified public administrators.

Zhejiang Normal University organizes the information meetings (held by professors) and exchange meetings (held by seniors) on enrollment. With the Internet resources, the faculty and every student use micro blogs to communicate the latest information related which are covering from the authority trend of affairs to measures recently taken by the school and deeds of advanced individuals. Every student access to the discussion and gives his own arguments and ideas. The Undergraduate Professional Directory and Professional Presentations (1998) issued by Ministry of Education states that: the major aims to cultivate the management and scientific research professionals working in the party and government offices, enterprise and public institutions, and public organizations with mastery of the art of administration, management, politics, and jurisprudence. It specifies nine abilities of the public servants in National Public Servants General Ability Standard Framework (Trial) which include political resolving ability, administration ipso jure, public service ability, investigation ability, learning ability, social and coordinating ability, and innovative ability, ability to cope with emergency, and psychological adjust ability. The school constantly supervises the students to improve themselves with the correct awareness of their profession to be comprehensive administrating talents.

75.3 Enhancing Teaching Staff

Public administration grows rapidly as a new major. Local universities and colleges cannot meet the demand of professional teachers in such a short time. The common solution is to "transform" those teachers originally teaching politics, philosophy, or history. As a result, it is unavoidable that the teachers might flavor a lot of other disciplines' attachment to this subject. The teachers are still on their way to learn the new discipline and with little or no practice experience. Thus, the teachers need to involve in the practice besides learning the theory [4].

It plays a vital part in the development of universities and colleges to optimize the teaching staff. The top-ranking teachers can develop top-ranking students. The newborn major desperately needs to build a qualified teaching staff. It not only influence the speed but also the height of the development to invite specialists, senior professors and masters in this field. The improvement of the teaching staff guarantees the quality of education. At the same time, teachers are encouraged to be academic pacesetters to ensure the benign development. On the one hand, the university brings in masters and PhDs in this field to enhance the teaching staff; on the other hand, encourage the existing staff to go on their study and get their own degrees in this field. Meanwhile, parts of young and middle-aged teachers are sent to local government offices to join in practice in order to get more experiences. There are other forms to practice the theory like cooperation scientific research items with the government. Besides, it is a good way to invite famous guest professors to give lectures periodically. Xiangtan University is among the best with this major. There are 10 professors, 11 associate professors, and six lecturers on this subject. 20 of them are PhDs. There are several academic pacesetters, Professor Peng Guopu, and Professor Yan Jiahua, who lead the teaching staff rigorously doing scholarly research and making remarkable academic achievements (Fig. 75.1).

75.4 Relying on the Advantages of Professional Resources

The start-up administrative professional college in different places, universities, schools, and so on, is very different whether it is mostly identical in curriculum and teaching methods, etc., [5]. So advantages of professional resources could be completely ignored. Curriculum, for example, the current administration curriculum

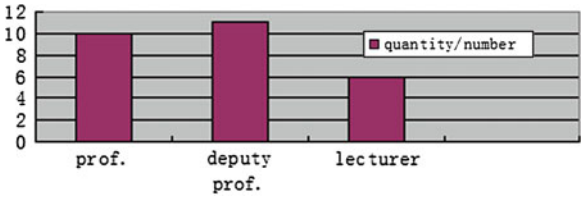

Fig. 75.1 Teachers proportion

is basically divided into four modules, namely, the political class (the courses offered are: political science, contemporary Chinese political system, in the Western political system, political history, the History of Western Politics), public administration and policy analysis classes (courses: Principles of Management, administrative management, organizational behavior, business management, financial management, administrative decision making, public policy analysis, etc.), law classes (courses: Introduction to Law, Administrative Law, Constitutional Law, etc.), and basic skills classes (courses: writing skills, social survey methods, statistics, basic computer, office automation, etc.). It cannot reflect the school advantages of professional superiority [6] (Fig. 75.2).

Different parts of the colleges and universities have its own characteristics of professional or superior resources, professional integration of these advantages, resources and administrative management. Selecting the appropriate direction and focus will be able to develop its own distinctive administrative professional to serve the local government and economic development. The fusion here is the adding up among different professions, but selecting the advantages of professional as a tool for administrative applications, or as a learning knowledge of the administrative professional background so as to contribute to the administration the rapid development of the professional in a particular area. Combined with the advantages and features of the financial disciplines such as Zhejiang University of Finance and Economics, they combined the discipline of the administration, economics, and law in order to determine the three major research directions of the administrative professional: government control studies, public organizations financial management, and administration theory and policy.

In particular, government control of the direction is on the leading positioning China. Schools of the professional creation of economics and law of the financial management of public organizations, Administrative Law and Administrative Procedure Law, and other related subjects courses require students to master the basic theory of economics and law disciplines, pay attention to administrative and economic from the object of study, research methods and content and law professional mutual penetration, select the economic behavior of government and other public organizations such as the research object, draw on the economic model of economic assumptions and how to use the financial means of control to prevent, control of government corruption research, and through legal means and

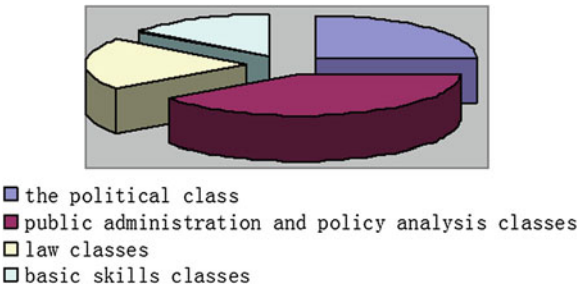

Fig. 75.2 Classes proportion

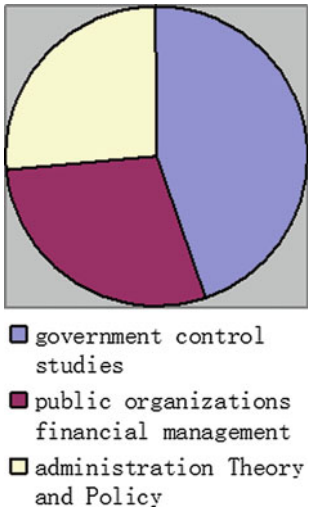

Fig. 75.3 Ability proportion

corresponding regulations. The professional schools of local government, especially planning, economy, trade, taxation, auditing, prices, and other economic sector have foster a culture of good administrative expertise to boost local development in Zhejiang (Fig. 75.3).

75.5 Highlight the Local Characteristics

Different universities have different growth conditions and environment for the development of different living environment for different local colleges to create space for development and favorable conditions. However, many local colleges and universities follow the trend of setting administrative professionals, without its own characteristics of the professional features, copying the training model from other colleges and universities. It has become one of a "copy" that cannot to highlight its own characteristics. Conditions of the local university, such as teachers, teaching facilities, and so on, cannot be comparable with the "985" or "211" key universities. However, local colleges and universities with their own geography of survival, the unique growth soil, the natural environment and economic conditions, local colleges, and universities develop their own characteristics on administration [7]. Local colleges and universities should make full use of advantage of local resources; rely on the human habitat in its features to develop administration. Seizing distinctive local characteristics, taking all advantages of resources and focusing on the development in the field of one or several researches, innovating and forming the foundation of our development of the administration, it is the basic rule for development. The specific local situation, trained in a specific environment, specific areas of administrative expertise will be more

targeted to serve the local economic and social development. As an example, Yunnan University, the administration development highlights the strong local specialties. Yunnan is the province that makes China's national cultural diversity most and it is one of the most abundant provinces as well with 26 nationalities relatively inhabited straggle to live together, creating colorful culture. Yunnan University administration has combined with many of Yunnan Minority to be a location advantage as it is bordering with Vietnam, Laos, and Myanmar. In cooperation with national research institutions, the Bureau of Religious Affairs carries out targeted teaching, and form their own advantages and characteristics. Setting up special schools for border smuggling, it has trained specialized management personnel of fight against smuggling, drug trafficking, which accommodate the special needs of the local development.

75.6 Emphasis on Practice Teaching

The professional administration is a very practical subject. Truly outstanding administration is not only to have a solid theoretical foundation, but also is required to have strong practical ability of using them as well. But till now, the professional colleges and universities in our country have left the administrative prevalence in which the theory combines with practice, partly because of the teaching facilities, teaching resources, performance and the particularly of the local colleges and universities [8]. And partly because of local colleges and universities practice teaching system and practice of the supervisory system are not perfect. According to teaching practice and ancillary facilities that are not enough, there is no corresponding social practice of supporting facilities such as specialized research centers, research institutes, practice, and teaching laboratories. In local colleges and universities, at the same time, arrangements for the teaching practice are rare, some universities even arrange the practical units which cursory, or arrange for the mismatch, or arrangement is termed a "featherbed". Students can't have practical internship. On the other hand, students don't have correct attitude. Many students consider practice as an "entertainment", Internet chat or play games during internship, and even some students go straight home for vacation. As a result, the social practice of school arrangements is in a mere formality and students without substantial exercise of administration have no chance to promote themselves and put theory to practice.

Therefore, in order to meet social development needs of administration local colleges should improve the administration of professional teaching and practicing system, which is required to develop a comprehensive system of theoretical knowledge and practice of excellent administrative ability of professional expertise. In order to start practical education of the local university meticulous arrangements, careful planning, the implementation of internships for students need to ensure students a good first lesson in social practice, take full advantage of the winter and summer vacation time, and actively practice the "countryside"

focus on research, complete the practice report; innovate graduation internship, contact the local levels of government and enterprises, allow students to work in the community of practice, test in the corresponding post, and internalize the theoretical knowledge. Innovation in practice to their senses is needed. Also personnel engaged in the administration may be invited to come to the school for special lectures, knowledge, theory of teaching, and management practice. Yunnan University, School of Public Administration is one of the main support unit of the Yunnan Provincial Party Committee Organization Department and the Office of Personnel education of party for government cadres, Kunming, awarding the civil service education and training base, complete teaching-practice in cooperation with government department's mutual penetration. Guangzhou University of administration is relying on the "Independent Research Centre" of school and out-of-school social practice base to complete the combination of theoretical teaching and social practice. Zhejiang University of Finance and administration sets up student societies-Administrative Management Society, personal experience of government work process, learn how to work the process of solving problems, and coordinate with other departments to ensure orderly conduct of the work of the government.

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Chapter 76
Research on Wide-Area Mal-Operation Prevention in Power Network Based on the GPRS

Hong Yang

Abstract In this paper, the importance of the ant-misoperation locking of electrical equipments and the requirements of the modern power network on the application of wide-area anti-misoperation locking are analyzed, and then a wide-area mal-operation prevention system in power network based on the GPRS is proposed, and finally the general design idea of the system is introduced. Also, the designs of the software and hardware (important components of the system) of field controller as well as anti-jamming performance are discussed in detail, and simultaneously the designing method of the mal-operation prevention monitoring center (another important component) is introduced. The wide-area mal-operation is judged by using GPRS wireless Internet to interact field switch state and management monitoring center in real-time. Therefore, it features simple logic judgment, easy-to-implement, and low cost, etc.

Keywords Power network · Wide-area operation · Anti-misoperation locking · GPRS

76.1 Introduction

The security and stable operation of power system are the goals of power enterprises, and correct operation of electrical equipments in power network is the premise of ensuring the security and stability of power system. Although various measures are taken, mal-operation accidents still occur in power system. Currently, power enterprises, by combining the operational experience at home and abroad, propose a

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requirement on the anti-misoperation locking of electrical equipments and provide the principles of operation, management, design, and use of mal-operation prevention for electrical equipments.

According to the requirement and principle of the anti-misoperation locking, a large quantity of researches have been made by people on the anti-misoperation locking in converting stations and power stations, and hence a comprehensive mal-operation system combining the microcomputer five-protection system and the electric locking is formed [1–3]. The application of such a mal-operation prevention system can makes field operations necessarily ensured in security, but its limitations are also very outstanding. In recent years, this has been researched by domestic and foreign scholars from different levels [4]. In this paper, based on existing researches, a wide-area anti-misoperation locking system in power network based on the GPRS is proposed. In the system, the states of all switches in wide-area power network are collected with several field controllers, and then are transferred to the mal-operation prevention monitoring center through the GPRS wireless communication technology. Then, according to the changes of all switch states, the mal-operation prevention monitoring center generates unlocking and locking commands and then transfers to the spot controller, and then the spot controller carries out the unlocking or locking according to the received command. As a result, the wide-area anti-misoperation locking is reliably realized in interconnection between converting stations, and power network, etc.

76.2 Overall Designing Plan of the Wide-Area Anti-Misoperation Locking System

The wide-area anti-misoperation locking system in power network mainly comprises of the anti-misoperation monitoring center and several field controllers, as shown in Fig. 76.1. The anti-misoperation monitoring center comprises of PC or industrial control computers, and is a centralized control center). Monitoring software is responsible for the management and monitoring of the whole power system. GPRS wireless communication network is the communication media of the whole system; the high-speed wireless TCP/IP protocol, and the APN communication model with high security and real-time are applied in this system so that the real-time and security of the system's communication are ensured; at the same time, GSM short message way will be enabled for data transmission if there is a fault in wireless network communication. The anti-misoperation host and locksets are connected by GPRS wireless communication network and field controller distribution anti-misoperation control network for realizing the information interaction between anti-misoperation host and field control equipment; the one-time location state of equipment and the locking and unlocking states of locksets can be transferred to the anti-misoperation monitoring host in real-time. Based on this, equipment state in the system diagram is updated by anti-misoperation main control software, and also locking or unlocking control command is sent through

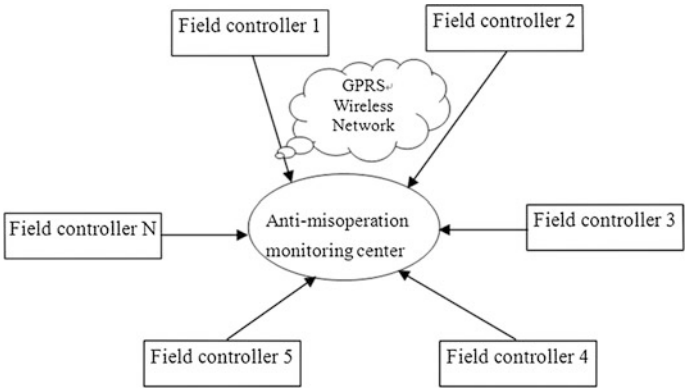

Fig. 76.1 The structure of the wide-area anti-misoperation locking system

network for completing the anti-misoperation function of the whole transfer switching process. Therefore, the whole control network is not only an independent system but also an open system, which can be connected to converting station, microcomputer five-protection system, and other third parties for realizing information sharing [5].

76.3 Design of Field Controller

76.3.1 Hardware Design

Field controller mainly comprises of central processor LPC2368, power management module, power-down memory module, GPRS wireless communication module, audible and visual alarm, switch quantity acquisition module, switch quantity output module, as shown in Fig. 76.2. GPRS wireless communication module is responsible for keeping communication with anti-misoperation monitoring center, sending switch state information back to monitoring center, and receiving the unlocking or locking command from monitoring center. The working process of the field controller is briefly described as follows.

After controller is started up, it can login the anti-misoperation monitoring center through the GPRS wireless network. After the successful login, switch quantity input signals begin to be collected by relevant modules. If switch quantity signal changes in location, switch state change information is sent to the anti-misoperation monitoring center through wireless network. When field controller receives the unlocking or locking command processed by the anti-misoperation monitoring center, relevant exit relays are driven for unlocking or locking operation. To increase the working stability of system, field controller regularly sends collected switch input state to the monitoring center and will automatically enable GSM to communicate with the monitoring center [6, 7] for ensuring smooth

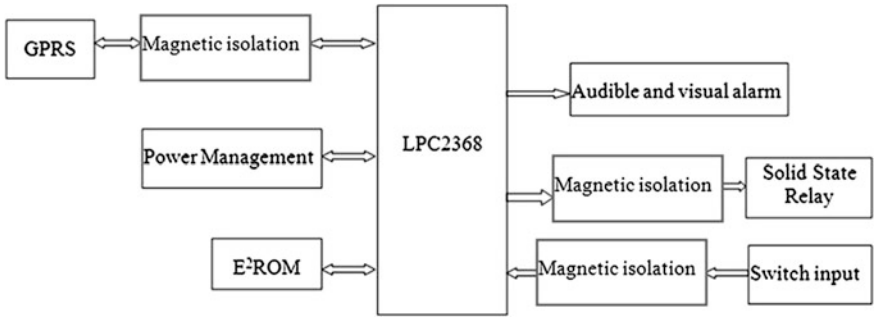

Fig. 76.2 Structure of field controller

communication once a fault occurs in wireless network transmission, and simultaneously switch states and unlocking/locking commands are transferred with encryption and coding methods.

76.3.2 Software Design

The main program of field controller is the main framework of the whole terminal monitoring software. A circle structure and functional modular scheme are applied in the coding of main program; a flag is set for each sub-function; through continuously judging flags in circulation, a functional module necessary to be accessed for executing tasks can be suggested. The flow chart of main program of field units is shown in Fig. 76.3.

In the main program of field controller, the initialization of system software and hardware is implemented first, and then the circulation of the main program is started. In the main circulation, functional modules necessary to be executed are as follows: confirming the sending and receiving of GPRS module information, switch input changing, and unlocking/locking states, etc. In the circulation of main program, all functional modules can be executed only if conditions are fulfilled, and otherwise next functional module will be immediately judged.

76.3.3 Anti-Jamming Design

In this system, a series of anti-jamming measures are applied, so as to ensure its secured and reliable operation.

76.3.3.1 Anti-Jamming Hardware Technology

First, according to the overall design requirement of a complete machine, circuit units are divided and also the circuit of designed printed board is confirmed, and

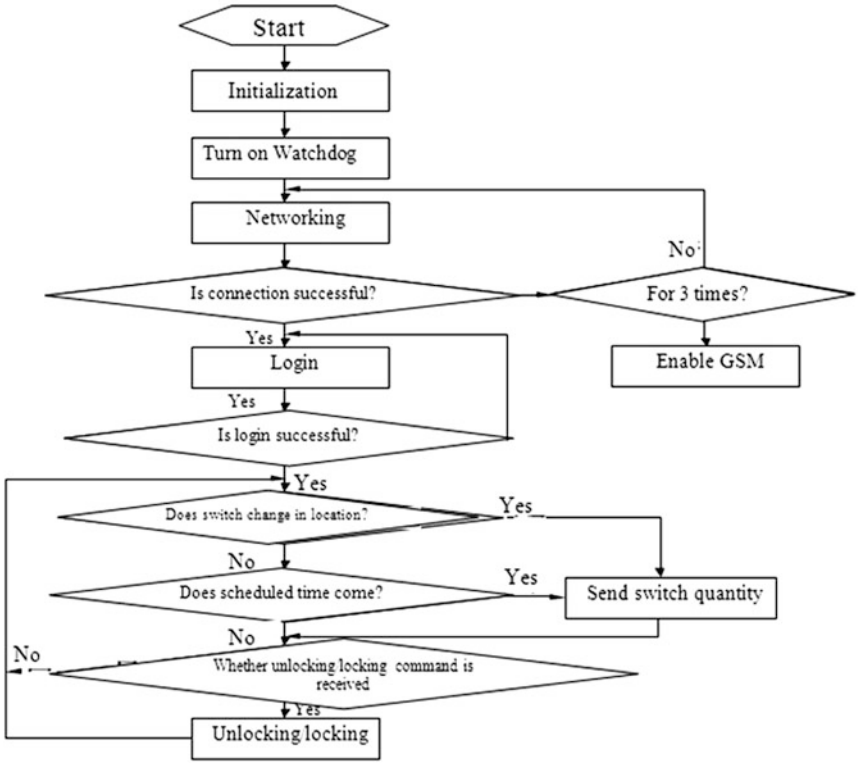

Fig. 76.3 The flow of the main program of field controller

then circuit components are selected (Surface Mount components should be selected as much as possible).

Second, special requirements of components, necessarily-shielded, regularly-adjusted or changed components, necessarily-shielded wires, working frequency and working voltage, and environmental conditions in working of circuit are confirmed.

Third, a high frequency capacitor of 0.01–0.1 μF is joined to the pin of each IC power supply of circuit board in parallel, so as to reduce the affect of IC on power. It is worth noting that high frequency capacitor should be closer to the location of power pin as much as possible, and also the wires should be thick and short as much as possible and otherwise filtering effect can be affected.

Fourth, magnetic isolation chip is added in the process of signal transfer, so as to cut off the electromagnetic contact of signals.

Fifth, in the wiring of crystal oscillator, it is necessary to make crystal oscillator closer to the pin of SCM as much as possible, and also isolate clock zone with ground wire. Therefore, the shell of crystal oscillator is grounding and fixed.

Sixth, digital zone and simulation zone are isolated with ground wire. It is necessary to confirm the sending and receiving of digital ground and block messages, switch input displacement, and unlocking/locking states, etc.

Seventh, anti-jamming components such as magnetic beads, magnetic rings, power supply filter, and shield are applied in the key positions such as the I/O out let, power line, and circuit board wires of ARM processor. This method can make the anti-jamming performance of circuit significantly improved.

Eighth, to guarantee the reliability of communication, communication module encapsulated with stainless steel is applied in the design of the system, and also the receiving ability of wireless signals can be improved with external GPRS antennae.

76.3.3.2 Anti-Jamming Software Technology

First, monitoring and tracking timer is set, and the running state of program is monitored with timing interrupt.

Second, abnormal interrupt is set. If ARM is out of control and makes program fly disorderly and enter nonprogram zone continuously, it automatically enters the abnormal interrupt processing program and recovers the running of program in the abnormal interrupt processing program.

Third, port is refreshed based on a period, so as to prevent port entering an unknown state because it has not been refreshed for a long time [8, 9].

76.4 Design of Anti-Misoperation Monitoring Center

Anti-misoperation monitoring center refers to a computer and monitoring software installed in power administrative department. It comprises of backend database and front-end service program. The converting station numbers, field controller numbers and switch states corresponding to each converting station are stored with database. The front-end service program is responsible for initializing system parameters, reading current machine IP, and setting port number, serial communication baud rate, duty personnel's basic information, inspection personnel's numbers, and simultaneously provide message and network data group sending functions. Inspection command is regularly sent to all field controllers: if a reply is not received from the field monitoring end to the inspection command in the stipulated time, equipment maintenance personnel are noticed to check and maintain equipment on site. The main program flow of the monitoring center is shown in Fig. 76.4.

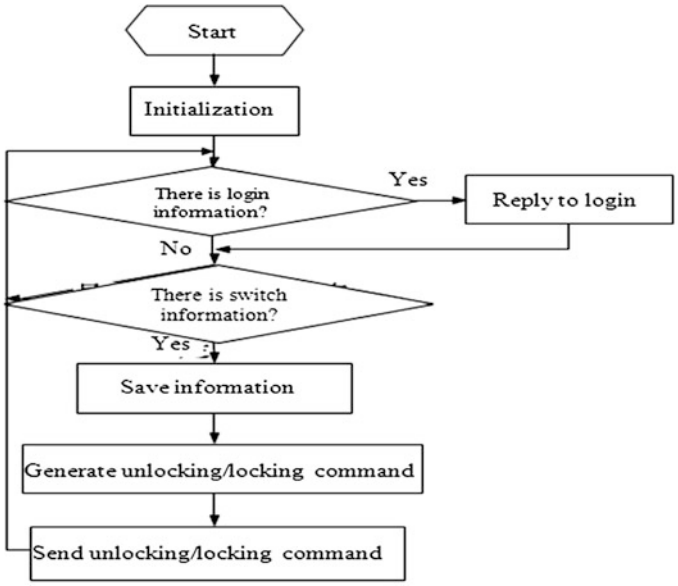

Fig. 76.4 The main program flow of the monitoring center

76.5 Conclusion

According to the demands of power system on the wide-area anti-disoperation locking and in combination of the GPRS communication technology, a wide-area anti-disoperation locking system in power system is researched and proposed. This scheme, through the interaction between GPRS and management center, can reliably realize the wide-area anti-misoperation locking in the interconnections between converting stations, power system, etc. Also, the wide-area anti-misoperation locking system, researched in this paper, features low cost, small volume, convenient operation, easy-to-operation, unnecessary networking, and maintenance, low communication fee, etc.

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Chapter 77
Study on Training of Application-Oriented Customs Declaration Personnel

Liping Sun

Abstract Along with the growth of the import and export trades, the demands of the enterprises on the customs declaration personnel rise without a stop, and simultaneously higher requirements are proposed on the quality of the customs declaration personnel. Therefore, how to train a great number of application-oriented customs talents who can meet the needs of the market and possess solid foundation, powerful practice ability, and high comprehensive quality has proven to be one of the most important issues in front of teachers in the modern times. In this chapter, by taking the Guanghua College of Changchun University for example, the author makes an introduction on how to improve the practical operational ability of students from the teaching content adjustment, teaching method improvement, and teaching method diversification of the course Practice of Import and Export Customs Declaration, for the purpose of realizing the objective of training the application-oriented customs declaration personnel.

Keywords: Customs declaration personnel · Practice of customs declaration · Teaching contents · Teaching methods

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77.1 Training Application-Oriented Customs Declaration Personnel through Adjusting Teaching Contents

77.1.1 Selection of Teaching Materials

Teaching materials are the materials that are applied not only by the teachers in teaching, but also by the students in learning [1]. With the purpose of making a good teaching effect at classroom, the selection of teaching materials plays a very important role.

In the selection of the teaching materials for the teaching of practice of import and export customs declaration, the textbook Practice of Import and Export Customs Declaration, which was chiefly edited by the teachers of Guanghua College of Changchun University and published by Chinese Business Press, is selected currently. This teaching material is based on the teaching materials of the examination for customs declaration personnel and in combination with the actual conditions of multiple customs such as Changchun customs, Dalian customs, Tianjin customs, Qinhuangdao customs, and Shanghai Gaoqiao free trade zone. In this teaching material, through the way of combining written narratives, flow chart, figure comparison and cases, and a great number of inserted images, the customs declaration flow is vividly and visually demonstrated, the characteristics of systemic and detailed theories and practice applications, and also a summary and a lot of after-class exercises are prepared for each teaching lesson, so as to facilitate students to understand and consolidate what they have learnt [2, 3].

77.1.2 Integrating the Contents of the Examination for the Qualification of Customs Declaration Personnel

With the purpose of helping students to attain this qualification certificate, the teachers in the process of teaching the course Practice of Import and Export Customs Declaration of Guanghua College of Changchun University, use the latest books such as the Textbook of the Unified National Examination for the Qualification of Customs Declaration Personnel, the Names and Codes of Import and Export Commodities and its supporting guidance materials (Comprehensive Exercise of Single Choice, Multiple Choice and True/False, Comprehensive Practice, Commodity Classification and Customs Strengthening Exercise, Simulation Test Papers and Answers before Exam, and New Interpretation on the Unified National Examination Papers for the Qualification of Customs Declaration Personnel) as references, and integrate the contents of examination in teaching contents. Therefore, the teaching contents give a reflection to the principle of aiming at employment and highlighting application [4].

77.2 Improving the Practical Operational Skills of Students Through the Improvement of Teaching Methods

In the teaching of the Practice of Import and Export Customs Declaration, the different teaching methods are applied according to the difference of the teaching contents for training the innovation ability, practical operational ability, and problem-solving ability.

77.2.1 Including "Three-Real" Teaching in Teaching Contents

"Three-real" teaching refers to "real cases" teaching, "real documents" teaching, and "real business flow" teaching. The purpose of the "three-real" teaching is to improve the ability of students to solve the practical problems with what they have learnt and the ability to adapt to practical positions in the future.

77.2.2 Applying Heuristic, Discussion, and Participatory Teaching Methods and Paying Attention to the Combination of Learning and Thinking and the Cultivation of Students' Innovation Ability

The heuristic, discussion, and participatory teaching methods have been applied by many teachers at present. Here, how to apply these teaching methods is introduced in combination with the classification of the import and export commodities in the course Practice of Import and Export Customs Declaration.

The inquiry of the HS codes of commodities is one of the most important parts of the course Practice of Import and Export Customs Declaration and also a difficulty in the teaching. Before the inquiry of the HS codes of commodities is introduced, it is necessary to allow students to know well the reason why they need to learn the HS codes of commodities and the role of the HS codes.

After the studying goal is clearly defined, the students can be led to learn how to inquire the HS codes by using six classification rules. This part can be easily understood by the students if the real cases in life can be combined. For example, the second classification about the confirmation on mixtures and compositions can be clearly explained by taking the salt containing iodine as an example: although there is iodine in the salt, the salt still plays a decisive role in the whole product, and therefore this kind of mixture should ultimately be classified into salt.

77.2.3 Combining Case Teaching and Flow Chart and Improving the Problem-Solving Ability of Students

The customs declaration procedure of bonded processing products in the Chap. 3 of the Practice of Import and Export Customs Declaration is always the difficulty and also important point in the teaching, and touches upon a great number of concepts and a series of complex details. Therefore, according to the characteristics of this chapter, teachers can give students explanation by using case teaching and providing auxiliary business flow charts, and then assign some classroom exercises, thus helping students to make a differentiation among remote processing, outward processing, and deep processing transfer concepts and also solve the practical problems with what they have learnt.

77.2.4 Changing Teaching Methods by Applying the Five-Step (Explaining, Exercising, Evaluating, Asking, and Answering) Teaching Model, Deepening the Understanding and Remembering of Students on Professional Contents, and Exercising the Ability of Students in Independent Thinking, Independent Operation, and Correct Application of Knowledge

With the purpose of allowing students to really understand the standards for filling documents, teachers can make use of the five-step strategy, namely explaining, exercising, evaluating, asking, and answering. Also, teachers can distribute a blank customs declaration document before giving a lesson, and then give students explanation to the standards for filling customs declaration documents according to the contents of all items and also combine cases for giving demonstration through writing on the blackboard, and then allow students to exercise filling and provide comments for the filling. In the process of providing comments, teachers can give answers to the questions that are raised by students. Such a practical training not only make students to get a deeper understanding of the theoretical knowledge they have learnt, but also help to improve the practical ability of students, thus laying a solid foundation on their employment in the future.

77.2.5 Simulating Training, Paying Attention the Integration of Knowing and Doing, and Improving the Ability of Students in Practical Operation

The teachers in teaching the course Practice of Import and Export Customs Declaration of Guanghua College of Changchun University used to work in import and export companies, and thus are teachers with double-quality. The teachers, by using the advantage of having work experience in customs declaration and combining the materials collected from the learning and inspection in customs, make simulation training materials in which students are required to make a design on customs declaration procedures and filling customs declaration documents according to the customs declaration requirements of different commodities. Then, students are allowed to make an explanation and raise questions at classroom. Finally, the teachers can draw up a conclusion and give an analysis as well as comments to students.

In the real training process, labor division and cooperation are designed for students of all groups at the same time. Once there are problems to emerge, students of each group can positively think, consult, and discuss with each other, and also can be provided with the heuristic guidance of teachers.

In the design of the course Practice of Import and Export Customs Declaration, the students are required to complete the following tasks.

(1) Concluding the import goods into the appropriate duty paragraph according to the total classification rules
(2) Searching the supervision conditions of customs and also clearly providing the names of relevant certificates
(3) Confirming the tax rate that is applicable to the taxable goods according to the rules of origin and the rules of application tax rate
(4) Confirming the CIF prices of the taxable goods according to the relevant rules in the duty-paid value verification methods
(5) Calculating the customs duty, consumption tax, and value-added tax that the imported goods should pay
(6) If a transport tool was applied to customs for entry since March 14, 2010, but the import company actually applied it to customs on April 25, do the company need to pay a fee for the delayed declaration to customs and how much should the company pay?
(7) Customs issued the special payment certificates of relevant taxes on April 26, 2010 (Friday), but the company paid the expenses of taxation to the customs on May 21, 2010. Therefore, please calculate the overdue fine that the company was necessary to pay.
(8) Filling import customs declaration documents according to the attached invoice, packing list and bill of lading, and other related information

Therefore, it can be seen that the teachers establish a connection among the inquires of the HS codes, the foreign trade control policy, the confirmation of

duty-paid value, the application of the rules of origin, the calculation of expenses of taxation, and the filling of customs declaration documents, making these contents integrated into a complete system and helping students know well all contents in the book and lay a solid foundation for the practical work in the future.

77.3 The Diversity of Teaching Means is Helpful for Training Customs Declaration Personnel

77.3.1 Combining Multiple Teaching Means

The implementations of teaching methods cannot be separated from teaching means. The teachers in teaching the course Practice of Import and Export Customs Declaration attach especial attention to the reform of the teaching means, and carry out the combination of multimedia teaching, graphic teaching, object teaching, video teaching, interactive teaching, and simulation-based training and theory teaching. The multimedia courseware, which is made by the teachers personally in combination with teaching contents, includes not only text introductions, but also a lot of newly added pictures, charts, case studies, and video materials.

77.3.2 Strengthening the Practice Teaching with Software

In order to improve the practical ability of students, it is necessary for the teachers to make full use of the existing faculty advantages and the training teaching software of the customs declaration bases, and then combine teaching contents and practices together. In the process, not only theory knowledge can be learnt but also practices can be made. Then, a comprehensive simulated operation can be conducted by applying the teaching platforms of the customs declaration training bases, so as to promote students to really grasp the operational skills of the import and export declaration procedures through listening to the explanation from teachers, watching video materials, thinking problems in real case, and practicing simulation training with hands. As a result, the purpose of putting the learnt into practice can be achieved, and thus a good foundation can be laid for the future.

77.3.3 Providing Students with Timely Guidance and Question-Answering

The guidance and question-answering in the process of teaching the course Practice of Import and Export Customs Declaration mainly comprise of course structure, classroom questioning, and classroom discussion; there are some

targeted class exercise works for students at the end of each chapter, etc. In the mean time, the ways for teachers to provide students with guidance are diversified. The teachers can not only provide answers for the questions that are raised by students at classroom, but also help solve questions through telephones, short messages, and the network. Therefore, the telephone number, email address, and QQ number of the teachers can be open to all students, and the students are allowed to ask questions for the teachers with regard to their doubts anytime and anywhere, and also the teachers will provide students with answers in time. In addition, the teachers not only answer the questions that are met by the students during the period of school, but also give guidance to the problems that are encountered by the students having graduated from school and worked in enterprises, helping them solve the practical problems in employment.

77.4 Conclusion

From above analysis, in the teaching of the course Practice of Import and Export Customs Declaration, the customs declaration personnel, who can meet the needs of the employing units, can be trained only if the teaching contents and methods are changed without a stop, the practice teaching is strengthened, and the practical operational ability of students is improved.

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Part IX
Computer Graphics and Image Processing

Chapter 78
Image Enhancement Algorithm Using Brightness Preserving Multiple-Interval Histogram Equalization

Haifeng Wang and Yi Zhang

Abstract For the low illumination image (such as the X light medical image) enhancement processing, proposed one kind of image enhancement method of multiple section histogram equalization for brightness preservation. Using the cumulative function to calculate the average brightness value, the 0–255 gray interval would be divided into four intervals; the histogram equalization algorithm was performed on each interval. The experimental results showed the algorithm which enhanced the image visual effect is good, and a good solution to the traditional histogram equalization overfull-enhancing phenomenon.

Keywords Brightness preservation · Multiple-interval histogram · Average brightness · Histogram equalization

78.1 Introduction

The purpose of image enhancement is to make an enhancement to image visual effect and provide intuitional, clear, and analyzable images. In many image enhancement algorithms, histogram equalization is one of the classic and effective methods of image enhancement [1]. It based on probability theory, revises the histogram of an image with a gray transform function, making the image trend to be uniformly distributed and increasing the dynamic range of image grayscale. Thus, the purpose of image enhancement can be achieved. Although histogram

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equalization algorithm features fast calculation speed and significant enhancement effect, there remain some shortcomings in it; (1) the actual value of the gray distribution histogram of output image is possible to be greatly different from its ideal value and is not the optimal value, although the histogram are approximate to uniform distribution; (2) when the quality of the original image is poor, gray dynamic range is narrow and histogram distribution is extremely nonuniform, the layering effect of the image operated and transformed by the traditional histogram equalization is worse; (3) when the gray range in an image is close to zero, the result is that a bright but diluted image will be obtained if a very narrow dark-pixel interval is mapped to output image in the implementation of equalization algorithm, and this is called as overfull-enhancing phenomenon in the Refs [1, 2].

An image with a gray range of [0, 255] will be too bright after enhanced by histogram equalization algorithm (i.e., after transformation, the bright pixels will be more bright but the dark pixels will be darker), and the basic characteristics of image such as average brightness changes and details lost affect the enhanced image visual effect, thus making the application scope of histogram algorithm limited [3, 4]. According to this, a simple and effective image enhancement algorithm using brightness preserving multiple-interval histogram equalization is proposed. The experimental simulation result shows that the overfull-enhancing phenomenon of the traditional histogram equalization is solved well by this algorithm [5].

78.2 Traditional Histogram Equalization Algorithm

Image enhancement methods include the gray transform, histogram equalization, image filtering, and image sharpening, and so on. The author chooses the histogram equalization algorithm that is classic in air space to be compared with the algorithm in this paper. The basic idea of the traditional histogram equalization is to transform the disequilibrium histograms of the original image to be uniformly distributed. That is, the input image is transformed to have the same number of pixel points at each gray level (i.e., the output histograms are flat and its distribution is uniform) [1]. Histogram equalization processing is a histogram modification based on cumulative distribution function transformation, and the transformation function is assumed to be as follows.

$$s = T(r) = \int_0^r p_r(w)\mathrm{d}w \tag{78.1}$$

In Eq. (78.1), w is an integral variable; $\int_0^r p_r(w)\mathrm{d}w$ is the cumulative distribution function of r [3] and increases from 0 to 1 monotonically; the transformation function $T(r)$ monotonically increases within $0 \le r \le 1$ and also meets $0 \le T(r) \le 1$. Equation (78.1) is applicable to continuous signal processing; in

processing discrete digital image, frequency can be approximately used for replacing probability value, namely

$$p_r(r_k) = n_k/n, \quad (0 \le r_k \le 1, \quad k = 0, 1, 2, \ldots, L-1) \tag{78.2}$$

In Eq. (78.2), L is the total number of gray levels; $p_r(r_k)$ is the probability for attaining the value of the kth gray; n_k is the number of the times for the appearance of the kth gray; n is the total number of the pixels in the image. Therefore, the Eq. (78.1) under discrete circumstances can be transformed as follows.

$$s_k = T(r_k) = \sum_{j=0}^{k} n_j/n = \sum_{j=0}^{k} p_r(r_j), \quad (0 \le r_j \le 1, \quad k = 0, 1, 2, \ldots, L-1) \tag{78.3}$$

Through digital image, each gray value is obtained by using Eq. (78.3) to calculate each pixel in the image, and the original gray value is replaced with new gray value. And this is the processing of the traditional histogram equalization [2].

78.3 Multilateral Histogram and Evaluation Indexes Based on Brightness Preserving

78.3.1 Multilateral Histogram Based on Brightness Preserving

Traditional histogram image processing speed is fast, but its effect is poor. Especially, it is easy for low-bright image to be too bright in processing, and also visual effect is reduced. Multilateral histogram algorithm based on brightness preserving is to divide 0–255 gray interval into four intervals according to average brightness and then implement equalization processing on them respectively, and the average brightness formulas is as follows.

$$Y = \mathrm{INT}\left(\sum_{k=0}^{k=255} kp(k)\right) \tag{78.4}$$

In Eq. (78.4), $k \in [0, 255]$ is established; $p(k)$ is the probability for pixel k to appear in the whole image; $\mathrm{INT}(\bullet)$ is a round-off integral function. The histogram equalization formula is as follows.

$$F(i,j) = \mathrm{INT}[(M_{\max} - M_{\min}) \times cdf(f(i,j))/N + M_{\min} + 0.5] \tag{78.5}$$

In Eq. (78.5), $M_{\max}$ and $M_{\min}$ are the upper bound and lower bound of the gray range of the subimage, respectively; N is the total number of the pixels in the corresponding subimage gray range; $cdf(f(i,j))$ is the cumulative function of the number of pixels in the corresponding subimage gray range; i, j are variables of

the x-ordinate and y-ordinate of the original image $f(m, n)$. Algorithm implementation steps are as follows.

(1) Calculating the average brightness of the image $f(m, n)$ with Eq. (78.4).
(2) Calculating the maximum $K_{\max}$ and minimum $K_{\min}$ of the pixels of the $f(m, n)$.
(3) Dividing the original image into two subimages with gray ranges $[K_{\min}, Y]$ and $[Y, K_{\min}]$, respectively, according to the maximum $K_{\min}$, minimum $K_{\min}$ and average brightness Y of the pixels of image $f(m, n)$, and the solving the average brightness Y_1 and Y_2 of the gray ranges $[K_{\min}, Y]$ and $[Y, K_{\max}]$, respectively, according to step 1 ($Y_1 = \mathrm{INT}\left(\sum_{k=k_{\min}}^{k=Y} kp(k)\right)$, $Y_2 = \mathrm{INT}\left(\sum_{k=Y}^{k=K_{\max}} kp(k)\right)$ and ultimately the gray ranges of the original image $f(m, n)$ is divided into $[K_{\min}, Y_1]$, $[Y_1, Y]$, $[Y, Y_2]$, and $[Y_2, K_{\max}]$.
(4) Implementing a histogram equalization within the four gray ranges on the position $f(i,j)$ of each pixel according to the original image $f(m, n)$, and then outputting the enhancement image $F(m,n)$ with brightness preserving.

78.3.2 Image Evaluation Indexes

Image is evaluated objectively with average brightness difference (ΔY) and contrast increment (ΔC) for this algorithm [3, 4], and the calculation formula is as follows.

Average brightness difference:

$$\Delta Y = Y_F - Y_f = \sum_{k_F=0}^{k_F=255} k_F p(k_F) - \sum_{k_f=0}^{k_f=255} k_f p(k_f) \tag{78.6}$$

Contrast increment:

$$\Delta C = C_F / C_f \tag{78.7}$$

In Eq. (78.6), Y_F is the average brightness of the original image; Y_f is the image after enhancement; ΔY is the difference between the two sides. If the difference is smaller, the brightness of the enhanced image is much closer to the original image, suggesting the image brightness enhanced by the algorithm is preserved better. Otherwise, it is poorer [6].

In Eq. (78.7), C_F is the local contrast mean value of the enhanced image; C_f is the local contrast mean value of the original image; contrast increment ΔC is the local contrast ratio between the original image and the enhanced image. Local contrast is in a sliding window of 3×3, and then the local contrast of each window is calculated according to $(x_{\max} - x_{\min})/(x_{\max} + x_{\min})$, and then their mean value is taken. It is suggested that the enhancement effect is better if contrast increment is larger [1, 7, 8].

78.4 Experimental Results and Analysis

Using MATLAB as experimental research tool, the algorithm of this paper and the classic histogram equalization algorithm are experimentally compared and simulated through writing programs, and the experimental object is standard Lena image. The experimental results are as shown in Fig. 78.1. To illustrate the advantages of the algorithm of this paper in enhancing X-ray medical image, the foot images of the X-ray medical images (pixels are closer to 0 and also gray range is narrow) are used as experimental objects and the experimental results are as shown in Fig. 78.2.

From Fig. 78.1, it can be seen that too-bright or too-dark phenomenon appears in the images enhanced by histogram equalization algorithm, making images too bright and dark, or lose some details, or unnatural and unclear. This shortcoming is especially obvious in the enhancement process of X-ray foot image in Fig. 78.2, making foot bones too bright and going against the judgment of the illness.

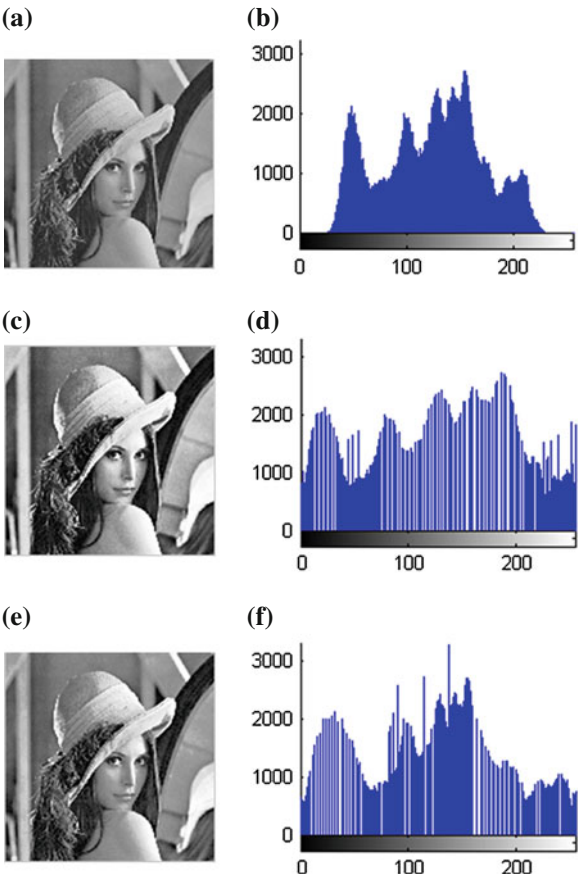

Fig. 78.1 Experimental results of lena images. **a** Original image. **b** The histogram of original image. **c** Classic histogram. **d** The histogram of classic histogram. **e** Algorithm of this paper. **f** The histogram of the algorithm of this paper

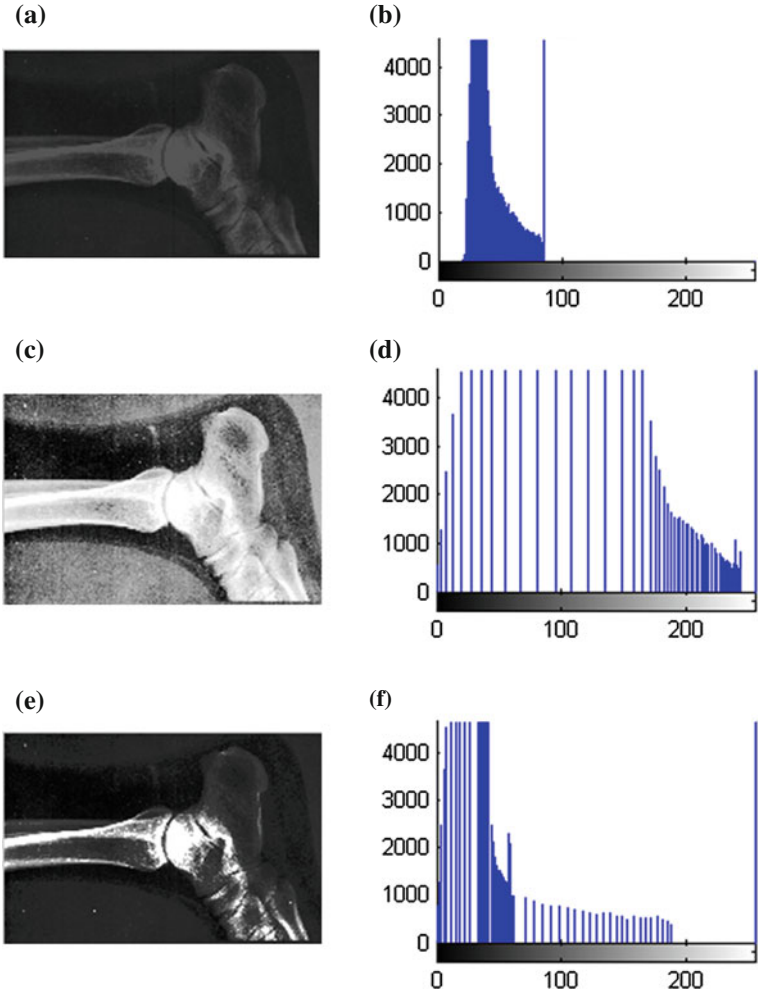

Fig. 78.2 Experimental results of x-ray foot images. **a** Original image. **b** The histogram of original image. **c** Enhancement image of histogram equalization. **d** The histogram of enhancement image of histogram equalization. **e** Enhancement image of the algorithm. **f** The histogram of enhancement of this paper image of this paper

However, in Fig. 78.1, the Lena image after an enhancement process by the algorithm of this paper is clear and nature, the details in the dark part of hair are rich, and also overall brightness remains consistent with that of the original image. In Fig. 78.2, the X-ray foot image processing by the algorithm of this paper is more conducive for doctors to judge than the traditional histogram equalization from the visual effect, and also the image is clearer.

In the above, the advantages of the algorithm of this paper are subjectively analyzed. In the following, average brightness difference (ΔY) and contrast

Table 78.1 Calculation results of average brightness difference (ΔY) and contrast increment (ΔC)

Performance index	Histogram equalization algorithm	Algorithm of this paper
Average brightness difference (ΔY)	5.17	2.28
Contrast increment (ΔC)	2.09	1.79

increment (ΔC) are used for objectively evaluating the algorithm of this paper, and the calculation results are shown in Table 78.1.

From Table 78.1, it can be seen that the algorithm of this paper is smaller than the traditional histogram equalization algorithm in average brightness difference, suggesting the algorithm of this paper is better than the traditional histogram equalization algorithm in brightness preserving. In contrast increment, the traditional histogram equalization algorithm is slightly bigger than the algorithm of this paper in average brightness difference, but the visual effects of the two sides are greatly different. From Figs. 78.1 and 78.2, it can also be seen that the enhancement image by traditional histogram equalization is bigger than that by the algorithm of this paper in contrast stretch, but too big contrast makes the enhanced image nonuniform in brightness, poor in visual effect, and also lose some details. However, the brightness of the image processed by the algorithm of this paper is closer to the original image, and also the visual effect is good.

78.5 Conclusion

According to the gray image enhancement processing, the average brightness value is solved with cumulative function in this paper, and also a multilateral histogram equalization image enhancement method is proposed. Through a comprehensive comparison with the histogram equalization that is classic in air space, the algorithm of this paper is superior to classic histogram algorithm in image enhancement.

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Chapter 79
A New Image Segmentation Algorithm Based on Additive Operator Splitting

Jin-Ping Song, Zhan-Jiang Zhi and Yu-Xia Liu

Abstract Image segmentation is an active research area in the image processing field. Aiming at images with texture and noise, this paper proposes a new image segmentation algorithm based on additive operator splitting on the basis of the Mumford-Shah with decomposition (MSWD) model. By using the AOS method, the numerical solution expands the range of the time-step adjustment to improve the stability of the algorithm. The experimental results show that the algorithm proposed in this paper can process the topology of image, avoid the effect of the texture or noise on the segmentation results and have a high computational efficiency in the segmentation process.

Keywords Image segmentation · Additive operator splitting · Mumford-Shah model

79.1 Introduction

As an active research area in the image processing field, image segmentation has been the subject of a considerable number of studies. The PDE and variation based methods, which express image segmentation as the minimization of a functional, have resulted in the most effective algorithms [1–3]. This is mainly because they are amenable to the introduction of constraints on the solution. Conformity of region data to statistical models and smoothness of region boundaries are typical constraints. The Mumford-Shah model is fundamental [4]. The Chan-Vase model

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has been the focus of most studies and applications because the ensuing algorithms reduce to iterations of computationally simple updates of segmentation regions and their model parameters [5]. Texture images are familiar image pattern in computer vision. Image of real objects are always covered by unsupervised texture, but not piecewise constant and smooth. Texture (noise) will disturb the result of image segmentation. Extracting texture part from origin images by using Mumford-Shah with decomposition (MSWD) model, we can attain geometric part [6]. Indeed the separation of the textural part and geometric part will help us to segment the meaningful regions which are constant in every regions, it can also avoid the influence of texture or noise.

This paper proposes a new image segmentation algorithm based on additive operator splitting on the basis of the Mumford-Shah model and variation approach. By using the additive operator splitting method, the numerical solution expands the range of the time-step adjustment to improve the stability of the algorithm. The experimental results show that the algorithm proposed in this paper can process the topology of image, avoid the effect of the texture or noise on the segmentation results and have a high computational efficiency in the segmentation process.

The rest part of the paper is organized as follows. In Sect. 79.2, we first review the additive operator splitting briefly. In Sect. 79.3, we propose a new image segmentation model based on additive operator splitting. Then we analyze and describe the numerical results of the proposed model for image segmentation. Experimental results are shown in Sect. 79.4. Our work is summarized in Sect. 79.5.

79.2 Additive Operator Splitting

In this section, we review the additive operator splitting briefly. The AOS scheme splits the m-dimensional spatial operator into a sum of m one-dimensional space discrete nations [7, 8]. The update of each grid point involves only two neighbors in each dimension, thus reducing the system to a set of trading nail equations. The Thomas algorithm is used to solve the underlying trading nail system, resulting in a very fast and parallelizable algorithm [9]. This is possible since the data for each trading nail system is completely independent.

Assume that V is a given function space, A is linear or nonlinear operator defined on V. Then problem (79.1) can be transformed into one-dimensional linear problem solving.

$$\begin{cases} \frac{\partial \phi}{\partial t} + A(\phi) = f(t) \\ \phi(0) = \hat{\phi} \in \mathrm{V} \end{cases} \quad [\in, 0]\mathrm{T} \tag{79.1}$$

Let A and t represent operator and time, respectively. A and f accordance with the following way to split:

$$A = A_1 + A_2 + \ldots A_m, \quad f = f_1 + f_2 + \ldots f_m \tag{79.2}$$

We assume that τ is the time step, $\phi_0 = \phi$, $t_j = j\tau$. If ϕ^j was given, it is easy to parallel computing $\phi^{j+\frac{i}{2m}}(i = 1, 2, \cdots, m)$ by formula (79.3).

$$\frac{\phi^{j+\frac{i}{2m}} - \phi^j}{m\tau} + A_i\left(\phi^{j+\frac{i}{2m}}\right) = f_i(t_j) \tag{79.3}$$

It is clear that obtained the solution of problem (79.1) by iteration of formula (79.4).

$$\phi^{j+1} = \frac{1}{m}\sum_{i=1}^{m}\phi^{j+\frac{i}{2m}} \tag{79.4}$$

79.3 Model and Numerical Implementation

79.3.1 Additive Operator Splitting Model

Our method is based on the MSWD model, where the energy functional involves three terms, written as

$$\min_{\substack{c,\phi,v \\ K(\phi)=0}} \left\{ F(c,\phi,v) = \frac{1}{2\alpha}\int_{\Omega} |u-(u_0-v)|^2 \mathrm{d}x + \sum_{i=1}^{n}\int_{\Omega} |\nabla\psi_i|\mathrm{d}x + \gamma\int_{\Omega}|v|\mathrm{d}x \right\} \tag{79.5}$$

where u_0 is the original image, u represents geometric part of the original image, v represent the texture or noise of the original image. Let $K(\phi) = (\phi-1)(\phi-2)\cdots(\phi-N)$, solve (79.5) includes the following steps:

Assume that c is given, ϕ is constant, we need to find v by minimizing $F(c,\phi,v)$;

Let v is constant, and $K(\phi) = 0$, we need to find ϕ by minimizing $F(c,\phi,v)$;

Get segmentation result u by ϕ aid $u = \sum_{i=1}^{i=N} c_i\psi_i(\phi)$.

Let us discuss the steps (79.2). In fact, (79.5) can be written as

$$\min_{\substack{c,\phi \\ K(\phi)=0}} \left\{ F(c,\phi) = \frac{1}{2\alpha}\int_{\Omega} |u-(u_0-v)|^2 \mathrm{d}x + \sum_{i=1}^{n}\int_{\Omega} |\nabla\psi_i|\mathrm{d}x \right\} \tag{79.6}$$

The steepest descent equation for $F(c,\phi,v)$ is given by

$$\phi_t = \beta \sum_{i=1}^{N} \nabla \cdot \left(\frac{\nabla \psi_i}{|\nabla \psi_i|} \right) \frac{\partial \psi_i}{\partial \phi} - \frac{1}{\alpha}[u - (u_0 - v)] \frac{\partial u}{\partial \phi} - \lambda \frac{\partial K}{\partial \phi} - \mu K(\phi) K^{'}(\phi) \tag{79.7}$$

Let $f = -\frac{1}{\alpha}[u - (u_0 - v)] \frac{\partial u}{\partial \phi} - \lambda \frac{\partial K}{\partial \varphi} - \mu K(\phi) K^{'}(\phi)$, ϕ_t, can be written as

$$\phi_t = \beta \sum_{i=1}^{N} \nabla \cdot \left(\frac{\nabla \psi_i}{|\nabla \psi_i|} \right) \frac{\partial \psi_i}{\partial \phi} + f \tag{79.8}$$

The first term of ϕ_t can be simplified, as follows:

$$\beta \sum_{i=1}^{N} \nabla \cdot \left(\frac{\nabla \psi_i}{|\nabla \psi_i|} \right) \frac{\partial \psi_i}{\partial \phi} = r \nabla \cdot \left(\frac{\nabla \phi}{|\nabla \phi|} \right) \tag{79.9}$$

where

$$r = \beta \sum_{i=1}^{N} \frac{\psi_i^{'}}{|\psi_i^{'}|} \frac{\partial \psi_i}{\partial \phi} \tag{79.10}$$

As the result, the additive operator splitting model of (3.4) as follows:

$$\phi_t = r \left[D_x \left(\frac{D_x \phi}{|\nabla \phi|} \right) + D_y \left(\frac{D_y \phi}{|\nabla \phi|} \right) \right] + f \tag{79.11}$$

79.3.2 Numerical Implementation

Application of additive operator splitting to the Eq. (79.11), the iteration is divided into two substeps. When calculation of the rows and columns ϕ^k, at each of grid point, the one-dimensional semi-implicit discrimination of Eq. (79.11) is

$$\frac{\phi^{k+\frac{1}{4}} - \phi^k}{2\tau} = r D_x \left(\frac{D_x \phi^{k+\frac{1}{4}}}{|\nabla \phi^k|} \right) + \frac{1}{2} f \tag{79.12}$$

$$\frac{\phi^{k+\frac{2}{4}} - \phi^k}{2\tau} = r D_y \left(\frac{D_y \phi^{k+\frac{2}{4}}}{|\nabla \phi^k|} \right) + \frac{1}{2} f \tag{79.13}$$

Moreover, (79.11) can be rewritten as

$$\phi^{k+1} = \frac{1}{2} \left(\phi^{k+\frac{1}{4}} + \phi^{k+\frac{2}{4}} \right) \tag{79.14}$$

A new operator is defined as $A_i = D_i \cdot (a(x)D_i)$, where $a(x) = \frac{1}{|\nabla \phi^k|}$. So, (79.12) and (79.13) can be rewritten as

$$(I - 2\tau r A_i)\widehat{\phi} = \phi^k + \tau f \tag{79.15}$$

Here ϕ represent $\phi^{k+\frac{1}{4}}$ and $\phi^{k+\frac{2}{4}}$, I represent unit matrix, $I - 2\tau r A_i\,(i = 1, 2, \ldots)$ is trading nail matrix. We can obtain ϕ by solving $\widehat{\phi}$ with pursue method.

79.4 Experiment

In this section, we compare the proposed model with other traditional algorithm. We shall concentrate on Two-phase and Three-phase segmentation. In Fig. 79.1, the first image is the original industrial image, and the second displays the magnetic resonance (MR) image.

In the first example, we consider the proposed model to deal with the industrial image for three-phase. The results are displayed in Fig. 79.2, parameter is $k = 15$, $\mu = 2 \times 10^5$, $\tau = 1 \times 10^{-3}$. The experimental result show that the algorithm proposed in this paper avoids the effect of the texture (or noise) on the segmentation results.

In the next example we will show the result of medical image for Two-phase segmentation with proposed model and traditional explicit scheme, parameter is $\mu = 0.25 \times 10^4$, $\tau = 5 \times 10^{-3}$. We take the MRI Fig. 79.1b as the example. Our motivation is finding the gray matter and white matter from MRI. Figure 79.3 shows the segmentation results by the traditional explicit scheme. Figure 79.4 shows the segmentation results by the proposed AOS scheme. As shown in

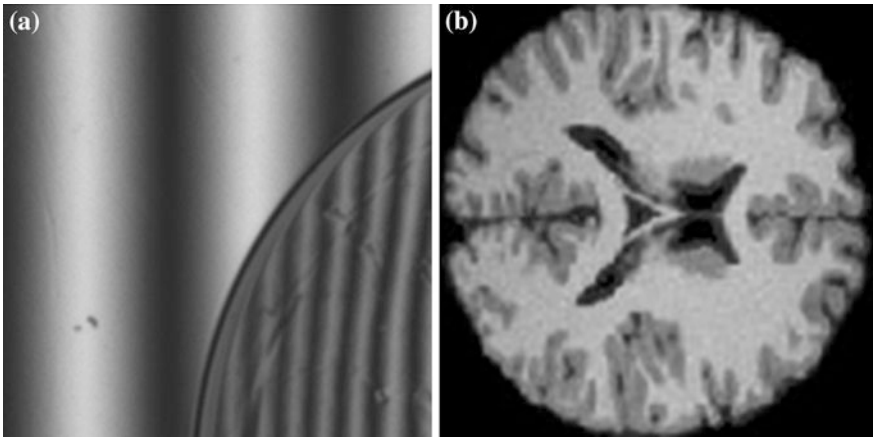

Fig. 79.1 The original image **a** industrial image; **b** magnetic resonance image

Fig. 79.2 Three-phase segmentation by AOS scheme

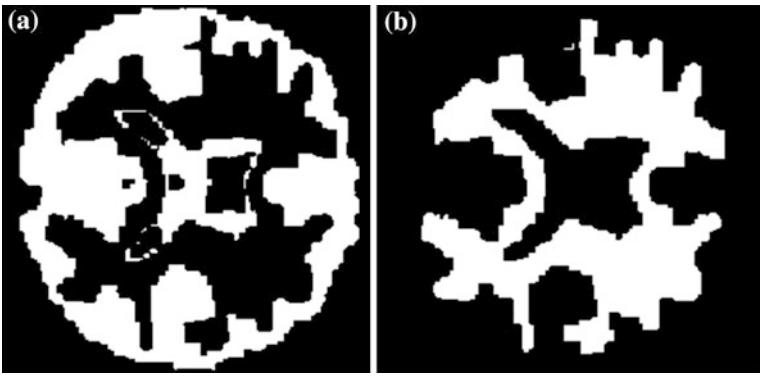

Fig. 79.3 Segmentation results by explicit scheme

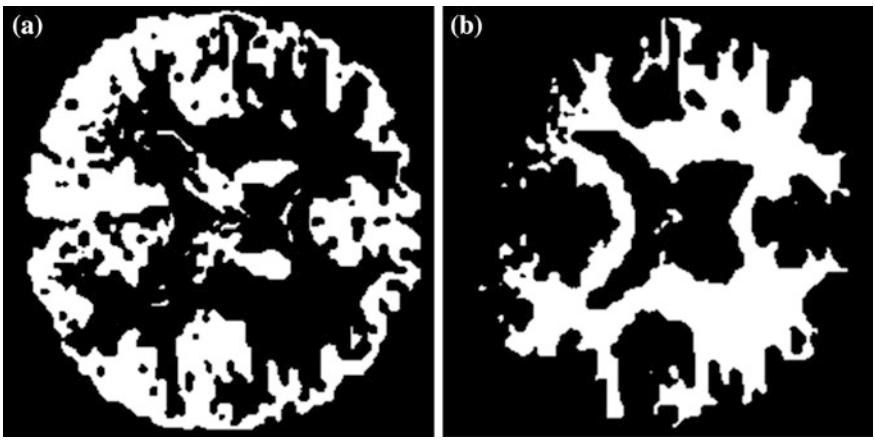

Fig. 79.4 Segmentation results by AOS scheme

Figs. 79.3 and 79.4, we can see the results of the proposed AOS scheme are better than the traditional explicit scheme, because the algorithm proposed in this paper can process the topology of image.

79.5 Conclusion

In this paper, we have presented a new image segmentation algorithm based on additive operator splitting. By using the AOS method, the numerical solution expands the range of the time-step adjustment to improve the stability of the algorithm. Experimental results demonstrate the high ability of the proposed model in dealing with the image segmentation.

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Chapter 80
Remote Visualization System Technology in the Plan Approval in the Project Design

Lisun Zhang

Abstract With the rapid development of information construction, the project design to rely on traditional video conferencing, conference calls, e-mail between joint trials cannot meet the needs of people to communicate. This chapter describes the presentation of this new technology of remote visualization for plan approval system and operating practices fully comply with the approval needs of the design process in the drawings, the real feasible project design industry's high-tech plan approval mode, give water conservancy the design of communication of the design industry to bring new changes.

Keywords Remote visualization for plan approval · System · Project design

80.1 Introduction

In general, it is necessary for the flow of the water conservancy project design to undergo six major stages (discussion on plan → demonstration on plan → drawing design → discussion on drawing → reviewing drawing → examination and verification on drawing). In the whole design process, the largest trouble is the process in which a large amount of communication and discussion are necessary. In the process, there is not only the communication between different designers, between designer and general project leader, or between design institute and project owner, but also the communication between local and remote places [1].

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After the 1990s, along with the popularization of computer, telephone and Internet, the frequency of business trips is reduced to some extent. In the meantime, however, along with the rapid development of economy, the engineering industry has attained a swift development and expansion, and increasingly more large and complex projects undertaking heavy tasks unceasingly emerge. Therefore, a great amount of communication is needed . In addition, the needs of people on communication cannot be satisfied by the traditional video conference, call conference, and email, etc.

80.2 Remote Visualization System for Plan Approval

Because most communications about the water conservancy project designs are carried out by the personnel together in the form of holding a conference, they mainly rely on a white board or PC and projector. However, the disadvantages of this way are (1) the participants in the conference cannot directly write, amend, and annotate the drawings on the projection curtains, making the description not enough intuitive; (2) annotation and punctuation cannot be realized, the participants in the conference need a note for recording amendments suggestion, and therefore the information cannot be recorded in time and also they cannot actively participate in communication and exchange, etc.

However, the large electronic board and drawing reviewing system are skillfully and creatively combined together by the remote visualization system for plan approval, and thus an intuitive, practical and easy solution is provided for a great number of project designers. Besides, the user terminal is a mobile terminal, in which the large-size white board, audio and video system, and drawing sharing software are integrated together. Mobile design can be easily promoted in a conference room in which no professional equipments are available, and therefore local conference and Internet accessing can be realized with the insertion of power line. That is, the remote conferences can be realized [2].

With the remote visualization system for plan approval, the traditional plan approval model in the project design industry is changed, the communication cost becomes lower, the errors of design personnel are reduced, and energy consumption is saved. Therefore, the remote visualization system for plan approval accords with the concept of the low-carbon environmental protection in the modern times.

80.3 Application of the Remote Visualization System for Plan Approval

The advantages for the water conservancy project design industry to apply the remote visualization system for plan approval can be concluded as follows: (1) the remote visualization system can be greatly used in the local discussions; (2) large-amplitude

drawings can be rapidly shown, and thus the printing of the undecided manuscripts of drawings can be abandoned; (3) plan writing and showing can be shown directly, including the labeling, modification and saving of office documents, and CAD drawings, etc.; (4) all above work can be quickly completed if to have a necessary remote communication.

80.3.1 Local Plan Approval

This can be used in a large number of local discussions. Through a large and touchable electronic board, large-amplitude drawings can be rapidly shown. Therefore, the printing of the drawings can be abandoned. In the meantime, plan writing on board, plan demonstration, CAD drawings labeling, and modification can also be realized, etc. [3]. Also, a powerful drawing presentation system can be available, and simultaneously multiple drawings and white boards can be opened. This is very important for the smooth communications.

80.3.2 Remote Joint Plan Approval

When it is necessary to make use of a remote communication, all the work can be quickly completed with the same methods. The working personnel in the remote place can complete the work synchronously through the system, like discussing the real drawings in a conference room. The shared drawings are stored in the sharing end, and also it is unnecessary for the participants in the remote end to acquire the real drawing files. Therefore, not only the needs on communication can be satisfied, but also the outflow of the drawing files can be efficiently controlled and prevented.

In addition, with the remote visualization system for plan approval, the communication functions of the remote video conferences can be implemented, and simultaneously the collaborative browsing and labeling, remote joint plan approval and remote joint plan verification can be shared.

80.3.3 Management of Plan Approval Records

In the remote visualization system for plan approval, the drawing amending records can be saved according to the usernames and labeling time of the conference's participants signing in the system, and all amendments suggestions can be inquired according to persons [4]. If the name of a relevant person is clicked, the amendment and handwriting records of the person will be immediately flashing on the drawing, and therefore the traceability is realized.

80.3.4 Freehand Plan Approval

A function is developed for displaying the traditional hand-drawn images in the system through an entity drawing platform. This provides a great easy-to-use feature for the engineers who have got used to using an entity drawing. The drawings can be labeled randomly with water pencils through laminating as long as the drawings are moved on the exhibition stand, but the original drawings will not be altered.

Especially, it is very troublesome to remake the electronic versions for some early design drawings. However, this difficulty can be solved with an entity platform. Certainly, the images of entity drawings can also be displayed on the displayer with their electronic versions, and thus the plan approval comparison, design drawing modification, and other functions can be realized [5].

80.3.5 Remote Video Conference

Video conference is the most fundamental application of this system. It is very practical for the daily work and discussion. In the meantime, the cost is low. Therefore, it has been extensively applied in all kinds of meetings.

80.3.6 Collaboratively-Designed Plan Approval

By relying on the remote visualization system for plan approval, work flow and data flow can be processed with high efficiency; the coordinative working among multiple departments in the enterprises can be realized; the interaction between enterprise internal processes and inter-enterprise office processes is supported. Therefore, the collaborative working in an enterprise or different enterprise can be realized in a real sense.

80.3.7 In-Depth Integration with Project Management Software

In the remote visualization system for plan approval, the on-site monitoring can be directly called according to projects, and can also be integrated with relevant businesses. If a hidden trouble for security can be found, the rectification and reform notice can be directly called, and also the images captured in the monitoring process can be automatically saved by the system as an attachment in the letter of notice.

80.4 Advantages of the Remote Visualization System for Plan Approval

Because people are allowed to randomly write and input something with hands in the remote visualization system for plan approval, images, and figures can be inserted and can also be freely zoomed for the sake of easy explanation; multiple new white boards can be established at the same time, and also the teaching contents on the white board can be repeatedly browsed; the tools of hardware electronic white boards as well as all sorts of functions can be easily called. All personnel are allowed to write on the white board and images and interactively learn. All these are the advantages of the remote visualization system for plan approval. Therefore, the following functions can be realized.

80.4.1 Unimpeded Data Sharing

Users can share the commonly used file formats such as PPT, Word, Excel, and PDF, are allowed to write and draw diagrams and curves on the white board provided in the system, and also can share the multimedia files for an aided teaching. In the meantime, a more perfect interaction can be provided for the users. Therefore, users can share their desktops and applications, and also can transfer the control privileges to conference's participants for a remote control [6].

The sharing of desktops and applications makes the professional programs such as CAD, 3D graphics software, and professional management software shared as well and also the remote control and technical support realized. Therefore, it becomes a convenient tool.

80.4.2 Saving and Track of All Communication Data

In the process of sharing white board, documents and programs, the shared and collaboratively shared labels and modifications of each participant in the conference can be saved with two ways (i.e., recording in conference and saving label records), Compared with the conference system only providing a recording function, a track way, which is more convenient, intuitional and easier to find, needs to be realized. All video and audio records as well as data in the communication process can be saved and traced.

80.4.3 Integration with PSTN and GSM Networks

PSTN and GSM telephone conference accesses are realized in a creative way. If a conference is held in the system and also a person out of the conference needs to be contacted, the telephone number of the person can be directly

dialed in the system and he will access to the conference for communication. Similarly, under the state of no Internet access conditions, the participants can take part in the conference through the traditional PSTN telephone system and even a mobile phone and have an exchange with the participants in other places.

80.4.4 Giving Consideration to Conference Room Application and Desktop Application

In this system, a full consideration is given to conference room application and desktop application. Therefore, the leaders can realize mobile official business and emergency commanding by using notebooks and Internet when having a business trip, and also can hold the conferences through mobile phone and land line when there is an emergency. In the meantime, the working personnel can carry out remote conference, business consultation, training, work negotiation, etc.

80.4.5 Integration with the On-Site Monitoring System

The system can be integrated with video monitoring system, promoting the users to not only receive reports in the conference when using it, but also get a clear understanding of the current progress of project.

In addition, the access of project construction site monitoring video to the conference is supported. Therefore, construction site can be very intuitively shown to the personnel participating in the communication through the comparative presentation of drawing and on-site practices. This is very useful for efficiently solving the design problems, which are encountered in the construction.

80.4.6 Integration with the Instant Communication Products

Many forms of development API are provided in the system, and can facilitate the video conference system to integrate with other applications and programs. The perfect combination of conference system with instant communication system can promote the staff in a group to exchange and communicate at any time and place. Therefore, business can conveniently develop.

80.4.7 Integration with the Information Products of the Third Parties

On an "information islet", the timely sharing and feedback of information cannot be realized, and therefore the smooth development of business is affected. The primary problem in "information islet" is that information cannot be timely and sufficiently shared, and thus the information share cannot be realized efficiently between systems, affecting the smooth development of business. However, the remote system for plan approval is installed with a standard and open interface, which is compatible with Windows/Linux platform and can be seamlessly integrated with large-screen system, third party's OA system, and project management system. The problem in information islet can be prevented in the construction process of the information system to the maximum.

80.4.8 Individualized Customization and Development

An open components structure is applied in the remote visualization system for plan approval. All functional modules (including terminal and server) can communicate through a uniform messaging bus mechanism. Also, customization is available according to the actual needs of the end users. Project management can be achieved as long as API interface in development kits can be secondarily developed.

80.5 Conclusion

The remote visualization system for plan approval has a function supporting the access of the monitoring video on construction site to the scene of conference. Therefore, construction site can be very intuitively shown to the personnel participation in the communication through the comparative presentation of drawing and on-site practices. This is very useful for efficiently solving the design problems, which are encountered in the construction. More importantly, however, its presentation and operation habits can completely accord with the needs of real drawings approvals. Therefore, the remote visualization system can really become a feasible plan approval model in the water conservancy project design industry.

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Chapter 81
Study on the Popularity Phenomenon of Digital Media Art

Bo Jin and Jing Xie

Abstract City public art exists in city's public places, based on the self function and the connotative requirement of city. The public art media under the influences of digital age refers to those introduced digital content, mainly like the modem city public art with virtual display ad the city public art with the controlling of computer to achieve certain interactive functions. With the development of the times, artistic form and media materials are also changing. The selection of media materials in city public art under the background of the digital age becomes increasingly diverse. Media materials which involves the integration of the latest achievements in digital technology, will comprehensively apply a variety of imaging, inductive devices. Thus, makes the interaction of public art more prominent, meanwhile it provides a strong material and technical support with the development of public art in the future.

Keywords Digital age · Digital media art · Popularity

81.1 Introduction

Digital art refers to various forms of independent art esthetic value and the basic characteristics of interaction and the use of the network media produces all kinds of digital and information technology since the twentieth century, it is undeniable

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that technological development has changed the world by many, including art [1]. Two powerful forces are to promote innovative art: First, is changing concept originated in quantum mechanics and relativity of natural science and other ideas, such as modern philosophy and social science and postmodernism [2, 3]. Second, it is scientific development tool changes from the media and network technology innovation. Effect on the innovation of the art can use the media. Fresh artistic experience of artistic creation and development trend of social life. The media were also compiling Therefore; the media change is one of the most profound historical events. The emerging digital media, not only provides an unprecedented strength, improve the means of communication with the new artistic forms, reflect the needs of social life, is to the scientific theory and social thought, but also improves the artistic research of innovative ideas and methods. Humanity is in an era, the development of high-tech. Fast and the accumulated knowledge of the past 30 years of sum is the equivalent of the past 2,000 years. We must admit that the development of science and technology develop a new batch of land for human civilization.

We are familiar with digital art and nothing like this; it is gradually developed in order to meet the needs of the audience with the development of social forms of multi-dimensional [4, 5]. The separation of science and art from the kind of phenomenon is a particular stage of human civilization. This separation does not only mean different areas of activity, vocational skills, and knowledge, but also means that different ideas of world. Arts and sciences have certain difference, but two ways to see the world. For example, it is accepted, art is a kind of ideology, but it is a controversial said science is a thought-form. However, the difference between art and science will not affect infiltration and fuses. Art cannot lack rational support, interference, and help. Artistic imagination can become orderly, free, can become the artistic esthetic emotion; Art creation can become corule and freedom and rational and scientific reason in particular. This reason is to provide largely on the development of science and knowledge structure. Art can be prosperous and different from intervention to support by science. Unlike traditional public art work is no longer entirely content by artist and creation of control rights are master audience. In the interactive process, artists will create rights to the audience's voluntary esthetic object ca play ads like a fish in water sharing.

81.2 Digital Media Art

Human evolution, the art is born. The "science and art is the two sides of a coin". Lee said, Tsung-Dao famous physicist in the world won the Nobel Prize, and also Zhenning Yang famous physicist in 1957. This means that art and science are the same and the indivisibility of each other. Now, computer technology and the rapid development of network technology, make technology a realistic tool and communication carrier for artistic creation.

The faster the speed, the development of science and technology, the more obvious digital art shows us its unique artistic form. Art is to adapt to the demand of people and evaluate, was born in certain social condition. Digital art, with emerging forms of mass artistic development is depending on the spread of digital media and the Internet. No doubt, because its work of art, show before the audience, the more influential . Digital art is really different from traditional art in communication than strong post-modern art features. This is generally thought of digital art is a kind of new art, which is based on modem. Today, we can clearly see the difference of digital art form and others. Like literature, painting, music, dance, although these art also depend on technology, for example, the application documents and printing technology, art and application of theory is music (musical instrument Angle of the manufacturing technology and application). But this is not to say that their direct product technology, because technology itself is external and acquired for them. On the other hand, literature, painting, music and dance can exist without this so-called technology, and digital art can't. Digital art, we know, is a kind of new art form, establishes new media is the carrier, dependence and means. Therefore, digital art concentration of science and technology. The birth and development of digital art is in the direct application of scientific technology revolution achievement in the field of art. It marks the beginning of human art into a new era. Digital art is close combination of information communication technology and new artistic conception. With digital technology and new media technology conditions, it was multidisciplinary integrated and media's vivid appearance, humanism and science and technology. It has a double attributes of science and humanities. It is an emerging art and scientific and cultural connection.

Digital art is according to the development of science and technology and culture media industry has become a new field of human creation. It provides an unlimited potential and high efficiency of the artistic creation and enriching its content, expands the space through the computer technology, such as input, storage, and process. Digital art is a kind of art form that is difficult to transfer performance traditional art form. It is a kind of burgeoning art; rely on the first productivity—science and technology.

Digital art does not change the nature of art. It is a kind of expansion form and traditional art. In fact the art language expressed traditional art into a new art form, is understandable, it is easy to use of high-tech means. It draws the distance between the other artists and audience, gradually formed a powerful integrated vector and makes it become a kind of independent art form. It is different from other art digital art element guidance. As a new category of art, art forms of digital art, far more than the traditional art. In addition to visual factors, such as image, pictures, text, digital art also have a voice, picture, audio, interaction, etc. And use of these basic visual elements, unlike other types of art, by direct processing, treatment, but the decisive technology tools, and modern high-tech tools—to deal with. As a result, because the tool itself is involved in the process of art creation, digital art marked with a technical brand, rather than single skills. Technology creates unprecedented new forms and new feeling of art. Therefore, digital art has a strong technical colorific art form in basic science and technology. And it is a

comprehensive new concept of the overall system, artistic style, and a set of artistic creation and digital technology at an organic whole, is relative to each other on scientific technology. This is true, digital art will increasingly become fully, as an important part of the art world.

81.3 The Development of Public Digital Media Art

In this context, as of the digital age, the rapid development of information technology, the new media art, digital media and network platform, prosperity speed is brilliant all over the world.

Public art collection rich media materials and performance testing of the context of the digital age, it brought more interactive features and public works of art, creative rights provided more audience to participate in the work of development, in public art material mainly elaborated from two aspects to traditional media advertising media materials under the background of the digital age.

Technical progress pushes forward the development of media. Media material is the carrier of public art content. It is the bridge to transmit language information and symbols for public art. Media applications not only present the external beautiful work, but also reflect the connotative meaning of the artist's. Meanwhile, media materials are the product era and works reflect background.

Material selection in public works of art creation should consider material performance, material, and environmental match. The following section compares the form. As shown in Tables 81.1, 81.2, and 81.3.

81.4 The Application of Media Materials in Public Art Under the Background of the Digital Age

81.4.1 The Application of Imaging Materials

81.4.1.1 The Application of LED Imaging Media Materials

Millennium Park, completed in July 2004, is located in a Michigan place; this is in the busy downtown Chicago. The famous architect Frank Gehry designed park. Covers the area of 24 acres and costs 500 million dollars. People are fully interactive of art wisdom digital technology in its ads in Millennium Park.

81.4.1.2 The Application of Project-Imaging Media Materials

"Vector altitude" is a huge digital interactive art by Mexican artist, Rafael Lozano-Hemmer and could which carries on the projection. First, their work was

Table 81.1 The analysis of media materials' types

	Material and environment
Metal material	1. The conductor of electricity and therm
	2. With the surface of color an fluster
	3. Good ductility
	4. With lattice structure and formed by metallic bonding
	5. Intermetallic compounds ca be made
	6. More active chemical, oxidation ad rush easily
Stone material	1. Fire resistance
	2. Freeze resistance
	3. Higher compressive strength
	4. Acid and alkali resistance, corrosion resistance, no rust occured
Timber material	1. Light and tough
	2. With the natural color ad patter
	3. With good property of insulation against electricity and therm
	4. Deformation and inflammable easily
	5. Processing ad finishing easily
	6. Plasticity
Ceramic	1. High strength and fully dense
	2. Not absorbing water, wear resistance
	3. Acid and alkali resistance, fireproof
	4. Clean easily and durable
Glass	1. Brittle material
	2. Higher hardness
	3. Highly transparent
	4. Poor properties of thermal conductivity and electricity
	5. Relatively stable chemical properties
Organic material	1. With solubility, thermoplasticity and thermosetting
	2. With insulation
Composite material	1. Excellent chemical stability
	2. Antifriction and antiwear, self-lubricating
	3. Heat and creep resistance
	4. Noise elimination
	5. With electrical insulation

Table 81.2 The analysis of media materials' performance

	Material application
Metal material	More used in indoor-outdoor sculpture and installation
Stone material	More used in indoor-outdoor sculpture, fresco and installation
Timber material	Used in indoor-outdoor sculpture and installation according to different timber characteristics
Ceramic	More used in fresco
Glass	Relatively less use than other materials, more used in indoor
Organic material	Indoor-outdoor sculpture, fresco, installation and public facility
Composite material	Wider used in comprehensive application of various materials

Table 81.3 The analysis of media materials' types

	Media materials' types
Imaging media	LED, projection, touch screen, etc.
Photoelectric media	Impulsive speed of light, laser, etc.
Inductive media	Touching material, inductor, etc.
Composite media	Comprehensive application of materials such as imaging, photoelectric, inductive, etc.

built to let more than 80 million people from 89 counties in the two-week long-term involvement in celebration square millennium encounter Mexico. Rafael Lozano-Hemmer and shy; 18 RS-controlled hemmer installed on the roof of the searchlights square-round buildings. This radio sports mode, controlled by computer and people all over the world could not enter the website GUI application and production mode, thus the interaction can be realized. In this project, Rafa's video Lozano-Hemmer said, "Vector altitude has established a new public innovation relations connection control technology, urban landscape and family and distance". Bought the application of imaging media—in this work really deliver construction site audience art.

81.4.1.3 The Application of Photoelectric Materials

Since the industrial age, light, and electricity have the product's age. Their application becomes necessary energy in daily life. However, they are used for lighting in public space city in the first place. Wit the development of the Times, some artists began to try the current urban public art photoelectric material, the influence factors, such as increased technical level, in art colleges hassles. Install solar panels public art, it is located in Mueller Austin, village, Texas, United States, using photoelectric material. Environmental protection is a low carbon economy and could; Theme is affected by a couple of stylist and Lajos Maggie heder from Massachusetts harries.

Into the digital age, information technology and human wisdom get increasingly development. More advertising have more digital works using photoelectric for public provides a media and keep in the needs of the development of keep pace with The Times, reflecting the social life of the status quo.

81.4.2 The Application of Inductive Materials

81.4.2.1 The Application of Touching Inductive Materials

Far infrared sensor with your finger on the position of magic window on the screen get advertising recognition, and its physical coordinates logic coordinates computer screen instructions and control through a specific algorithm makes the system

control functions of moving advertising logo on the big screen finger or some similar finger and put into use.

81.4.2.2 The Application of Other Sensor Inductive Materials

Complete an interactive installation works of art; it needs the input device information interaction. That is to say, it is information collection. Therefore, sensor applications will require, such as photoelectric sensor, including infrared light, CCD image sensor, digital sensors, including grating sensor, induction sensor, contact encoders, piezoelectric sensors, and etc., also including superconducting sir, intelligent sensor etc., all kinds of sensors.

Multimedia interactive job monitoring device, , produced by a Canadian artist David Rokeby two parts,take away by showing the huge projection on the wall. On the left of the exhibition space, manhunts tourists common trace system from the ground, wall, and other Angle.

81.4.2.3 The Application of Composite Materials

New digital materials such as imaging, photoelectricity, inductive comprehensive application of composite materials, it is highly integrated art and technology.

The application of composite material is combination of the video, audio, hypertext text, control technology, which links with its large variety of elements within a couple of possibilities. Every time, according to the different work of participants or creator could lead to different results; this brought endless charm of digital public art interactions.

Glowing works interactive public art "volume", this shows up in London's Victoria and Albert Museum (V) and playing computer games and finished joint you a (Manchester united) and compointsix visual artist. Public works of art has been placed in London's Victoria and Albert Museum John Pitt garden. It has also been demonstrated in China, Hong Kong, and Taiwan. "Quantity" is a sound-light installation work, from a series of beams, becomes the beautiful scene of John madejski garden. "Incredible" has very good function interaction characteristic; it emits a series of visual and auditory mutagenesis according to the human body movement. When your body movements are interacted on each other "quantity", you will enjoy the special enjoyment, sound, light. For each person's "innovation" the sound and light is different.

81.5 Conclusions

At present, we criticized for lack of digital art works Humanistic care. At the same time, we also confirmed that value Digital art characteristic. Because digital art make modems feeling on a global scale to the spread of culture through multiple

the media, leads to a new concept of ethics and human spirit using digital art, and has brought new challenges: that is how to live Style in modern society. This shows that digital art the culture connotation is permeated with the support and the support Technology. Artists continue to learn good nature from personal integrity and cultural knowledge level.

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Chapter 82
Algorithm for Estimating Mountainous Surface Area Based on GPS Data

Guopeng Song, Yifan Chen and Yunfeng Zhou

Abstract By combining global positioning system (GPS) device with carrier phase of tracking technology, the engineering staffs can obtain geological information more accurately. In this chapter, we did the estimation experiment of mountain surface acreage according to the algorithm created, analyzed the absolute accuracy and relative accuracy of the estimation results, and verified the reliability and accuracy of the algorithm. And then we further analyzed the stability of the algorithm , the estimate results obtained by the algorithm can maintain good stability in the case of a relatively small amount of data.

Keywords GPS · Algorithm · Triangulated irregular networks · Surface fitting

82.1 Introduction

82.1.1 GPS and Accurate Surveying

The global positioning system (GPS) is a space-based satellite navigation system that provides location and time information in all weather, anywhere on or near the Earth, where there is an unobstructed line of sight to four or more GPS satellites.

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It is maintained by the United States government and is freely accessible to anyone with a GPS receiver.[1] It became fully operational in 1994.

All satellites broadcast at the same two frequencies, 1.57542 GHz (L1 signal) and 1.2276 GHz (L2 signal). L1 contains Coarse-acquisition (C/A) code and encrypted precision *P*(*Y*) codes, plus the L1 civilian (L1C) and military (M) codes on future Block III satellites. L2 contains *P*(*Y*) code, plus the L2C and military codes on the Block IIR-M and newer satellites. The C/A code, for civilian use, transmits data at 1.023 million chips per second, whereas the *P* code, for U.S. military use, transmits at 10.23 million chips per second. The *P* code can be encrypted as a so-called *P*(*Y*) code that is only available to military equipment with a proper decryption key. The L1 carrier is modulated by both the C/A and *P* codes, while the L2 carrier is only modulated by the *P* code [1].

Integrating external information into the calculation process can materially improve accuracy of positioning. A common method that is used in surveying applications is carrier phase tracking. The period of the carrier frequency multiplied by the speed of light gives the wavelength, which is about 0.19 m for the L1 carrier. Accuracy within 1 % of wavelength in detecting the leading edge reduces this component of pseudo range error to as little as 2 mm. This compares to 3 m for the C/A code and 0.3 m for the *P* code. However, the accuracy of 2 mm requires measuring the total phase—the number of waves multiplied by the wavelength plus the fractional wavelength, which requires specially equipped receivers. The method of carrier phase tracking has many surveying applications [2].

82.1.2 Methods for Surface Area Processing

Surface area is a fundamental parameter derived from terrain analysis. A variety of methods exist in the literature for measuring terrain irregularity. Hobson [3] described some early computational methods for estimating surface area and discussed the concept of surface area ratios. Beasom [4] described a method for estimating land surface ruggedness based on the intersections of sample points and contour lines on a contour map. Jenness [5] described a similar method based on measuring the density of contour lines in an area. Mandelbrot [6] described the concept of a "fractal dimension" in which the dimension of an irregular surface lies between 2 (representing a flat plain) and 3 (representing a surface that goes through every point within a volume). Calculating fractal dimension can be very computationally challenging. Polidori et al. [7], Lam and De Cola [8], and Lorimer et al. [9] discussed a variety of methods for estimating the fractal dimension for a landscape. Among these methods, two have been proved to be relatively simple and practicable and of the most widely use.

[1] http://en.wikipedia.org/wiki/GPS.

Triangulated irregular networks (TINs) [10] has always been used to generate surface area statistics, especially when trying to analyze areas enclosed by vector-based polygons. It contains the simple notion of splitting the target area into small pieces and using the given data to estimate them each. This method can give a relatively more accurate result of estimation when given enough terrain information.

Raster-based [11] analyses offer several advantages that are difficult or impossible to achieve with TINs, including neighborhood analysis, faster processing speed, and more consistent output. Digital elevation models (DEM) has been researched mostly. A DEM is a continuous grid containing the elevation at its spatial location in each grid cell. The slope area for each pixel can be estimated based on the resolution and the slope for the pixel and then the surface area can be produced by summarizing the slope areas of all the pixels contained in the target region [12]. The surface area of each pixel can also be calculated directly from a DEM using elevation information from that pixel plus that of the eight adjacent pixels [13].

To estimate the surface area of a relatively small mountain region, method of TINs has its unique advantage. With adequate high-accuracy data of terrain information, TINs can give reliable result of estimation. In the situation of estimating small mountainous region, amount of calculation is less important comparing with accuracy. We consider introducing surface fitting methods to TINs in order to improve the accuracy and consistency of estimation.

82.2 TIN-Based Surface Fitting

Combined with triangulation theory and idea of least squares surface fitting, triangulate the plan according to the coordinate data points, then start the surface fitting by using each triangle and the ten points extended around the triangle. The strategy of taking point is shown in Fig. 82.1:

In order to obtain the approximate area of the triangle region, least squares fit of the binary function has been done by selecting the vertex of the triangle and the peripheral 10 points in area D, a total of 13 data points coordinates been selected. The specific way is as follows:

If $z = zx^2 + by^2 + cxy + dx + ey + f + \varepsilon_m$, a, b, c, d, e, f are constants.

$$Q = \sum_{m=1}^{n} \left(z_m - ax_m^2 - by_m^2 - cx_m y_m - dx_m - ey_m - f\right)^2$$

According to our model, $n = 13$.

$$\frac{\partial Q}{\partial a} = \frac{dQ}{\partial b} = \frac{dQ}{\partial c} = \frac{dQ}{\partial d} = \frac{dQ}{\partial e} = \frac{dQ}{\partial f} = 0$$

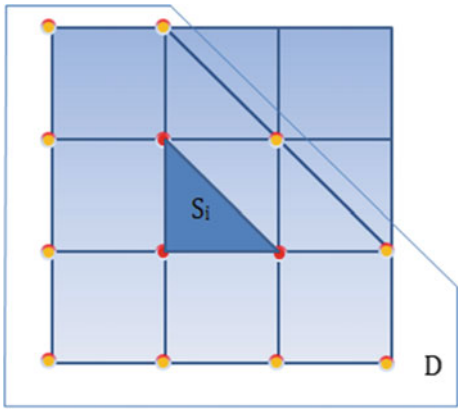

Fig. 82.1 Surface fitting strategy

Results in:

$$\begin{bmatrix} \sum x_m^4 & \sum x_m^3 y_m & \sum x_m^2 y_m^2 & \sum x_m^3 & \sum x_m^2 y_m & \sum x_m^2 \\ \sum x_m^3 y_m & \sum x_m^2 y_m^2 & \sum x_m y_m^3 & \sum x_m^2 y_m & \sum x_m y_m^2 & \sum x_m y_m \\ \sum x_m^2 y_m^2 & \sum x_m y_m^3 & \sum y_m^4 & \sum x_m y_m^2 & \sum y_m^3 & \sum y_m^2 \\ \sum x_m^3 & \sum x_m^2 y_m & \sum x_m y_m^2 & \sum x_m^2 & \sum x_m y_m & \sum x_m \\ \sum x_m^2 y_m & \sum x_m y_m^2 & \sum y_m^3 & \sum x_m y_m & \sum y_m^2 & \sum y_m \\ \sum x_m^2 & \sum x_m y_m & \sum y_m^2 & \sum x_m & \sum y_m & n \end{bmatrix} \begin{bmatrix} a \\ b \\ c \\ d \\ e \\ f \end{bmatrix} = \begin{bmatrix} \sum x_m^2 z_m \\ \sum y_m^2 z_m \\ \sum x_m y_m z_m \\ \sum x_m z_m \\ \sum y_m z_m \\ \sum z_m \end{bmatrix} \tag{82.1}$$

According to Eq. (82.1) and the measured data in the domain D, we can calculate the values of a a, b, c, d, e, f.

Therefore, according to $z = ax^2 + by^2 + cxy + dx + ey + f$, we can get the least squares fitting surface of domain D, using the integral formula of the surface area:$S_i = \iint \mathrm{d}S_i = \iint \sqrt{1 + z_x'^2 + z_y'^2}\mathrm{d}x\mathrm{d}y$, $z_x' = 2ax + cy + d$, $z_y' = 2by + cx + e$

Substitute them into the integral formula, we get:

$$S_i = \iint \sqrt{1 + (2ax + cy + d)^2 + (2by + cx + e)^2}\,\mathrm{d}x\mathrm{d}y \tag{82.2}$$

According to the integral (82.2), we can get each triangular unit area S_i, the sum will be the total surface area of the region $\sum S_i$.

This selection of data points and the approximate surface fitting, not only ensures the accuracy of the approximate fitting, but also links inner surface of the triangular unit with periphery of the triangular unit surfaces. Taking the advantages of these two ways, we can avoid the limitations and get better results in the approximate calculation of the surface area.

82.3 Experiment

82.3.1 Estimating Mountainous Surface Area

By the use of GPS devices combined with the carrier phase tracking technology, accurate mountainous terrain information and data can be obtained. The data can be converted into the form of three-dimensional vector (x, y, z), in which (x, y) denotes the horizontal coordinates, z denotes vertical elevation of that point. Below is a mountain contour map, the three-dimensional vector data of each evenly distributed point with five meters interval have been obtained during the experiment (Fig. 82.2).

According to the estimation algorithm of surface area, the surface area of the region which is 12 m above sea level can be estimated. When handling the boundary, take the characteristics of this algorithm into consideration and do the following process: intersect the plane whose altitude is 12 m with fitting surfaces in the triangular unit, re-determine the upper and lower limit of surface area integral in the triangular unit. That is: $z = ax^2 + by^2 + cxy + dx + ey + f = 12$.

The result is the triangular boundary unit area integral domain S.

$$S_i = \iint \mathrm{d}s = \iint \sqrt{1 + (2ax + cy + d)^2 + (2by + cx + e)^2}\,\mathrm{d}x\mathrm{d}y \qquad (82.3)$$

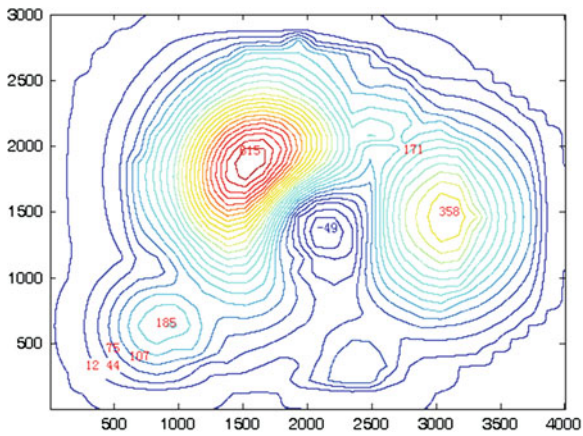

Fig. 82.2 Contour map of the target area

Obviously, the uncertainty of dealing with boundary situation in pure triangulation algorithm will not happen by using proposed algorithm. The determined limits of integration can be given during the calculation. This algorithm has unique advantages.

By calculating the fitting surface area of each triangular unit and summation, we finally get: $\sum S_i = 1.00631467599 * 10^7$.

82.3.2 Accuracy Analysis

According to the estimation model, further analyzing the accuracy of the estimation, we can get the following results based on the above derivation:

$$\begin{aligned} S_i &= \iint \sqrt{1 + z_x'^2 + z_x'^2}\mathrm{d}x\mathrm{d}y \\ z &= ax^2 + by^2 + cxy + dx + ey + f \\ S_i &= \iint \sqrt{1 + (2ax + cy + d)^2 + (2by + cx + e)^2}\,\mathrm{d}x\mathrm{d}y \\ u &= 2ax + cy + d, \quad v = 2by + cx + e \end{aligned} \tag{82.4}$$

Estimation error is

$$\Delta S_i = \frac{\partial S_i}{\partial a}\Delta a + \frac{\partial S_i}{\partial b}\Delta b + \frac{\partial S_i}{\partial c}\Delta c + \frac{\partial S_i}{\partial d}\Delta d + \frac{\partial S_i}{\partial e}\Delta e \tag{82.5}$$

According to the highest accuracy of GPS positioning, we can take data error as 10^{-4} m, then

$$\begin{aligned} \Delta a = \Delta b = \Delta c = \Delta d = \Delta e &= 10^{-4} \\ \Delta S_i = 10^{-4}\left(\frac{\partial S_i}{\partial a} + \frac{\partial S_i}{\partial b} + \frac{\partial S_i}{\partial c} + \frac{\partial S_i}{\partial d} + \frac{\partial S_i}{\partial e}\right) & \end{aligned} \tag{82.6}$$

We can do the transformation using the following formula.

$$\frac{\partial S_i}{\partial a} = \frac{\partial S_i}{\partial u}\frac{\partial u}{\partial a} + \frac{\partial S_i}{\partial v}\frac{\partial v}{\partial a} \tag{82.7}$$

Do substitution, and then we can get.

$$\begin{aligned} \frac{\partial S_i}{\partial a} + \frac{\partial S_i}{\partial b} + \frac{\partial S_i}{\partial c} + \frac{\partial S_i}{\partial d} + \frac{\partial S_i}{\partial e} &= \frac{\partial S_i}{\partial u}(2x + y + 1) + \frac{\partial S_i}{\partial v}(2y + x + 1) \\ &= \iint \frac{u(2x + y + 1) + v(2y + x + 1)}{\sqrt{1 + u^2 + v^2}}\,\mathrm{d}x\mathrm{d}y \end{aligned} \tag{82.8}$$

According to Cauchy inequality:

$$u(2x+y+1)+v(2y+x+1) \le \sqrt{u^2+v^2}\sqrt{(2x+y+1)^2+(2y+x+1)^2} \tag{82.9}$$

Both sides divided by $\sqrt{1+u^2+v^2}$:

$$\begin{aligned} \frac{u(2x+y+1)+v(2y+x+1)}{\sqrt{1+u^2+v^2}} &\le \frac{\sqrt{u^2+v^2}}{\sqrt{1+u^2+v^2}}\sqrt{(2x+y+1)^2+(2y+x+1)^2} \\ &\le \sqrt{(2x+y+1)^2+(2y+x+1)^2} \\ \Delta S_i &\le 10^{-4}\iint \sqrt{(2x+y+1)^2+(2y+x+1)^2}\,\mathrm{d}x\mathrm{d}y \end{aligned} \tag{82.10}$$

Then the absolute accuracy of the estimated results will be:

$$\sum \Delta Si \le 10^{-4} \times 107 \times 960,000 \approx 10^3 \tag{82.11}$$

According to the results we have got, the relative accuracy of the area estimation is

$$\frac{\sum \Delta S_i}{\sum S_i} \approx \frac{10^3}{10^7} = 10^{-4} \tag{82.12}$$

82.3.3 Stability Analysis of the Estimation

The relative error of this area estimation model can be controlled in 10^{-4} magnitude; we will further analyze the stability of established model.

The distance distribution of data points can be changed by reducing the quantity of the data collection point, estimate the area of the region respectively, compare the estimated results obtained in different amount of data, and the results obtained from triangulated plane area estimation were compared to the established algorithm. Under the condition of distance of data points are 5, 10, 15, 20, 25 m, the results are shown in Fig. 82.3.

It can be seen from the figure that with the gradual reduction in the amount of data, data-collected points (data points) distribution gradually sparse, description of terrain details gradually rough for estimated results, the accuracy of the two algorithms have different degrees of decline. But at the same time, we found that the algorithm used given terrain information for surface fitting, at the expense of

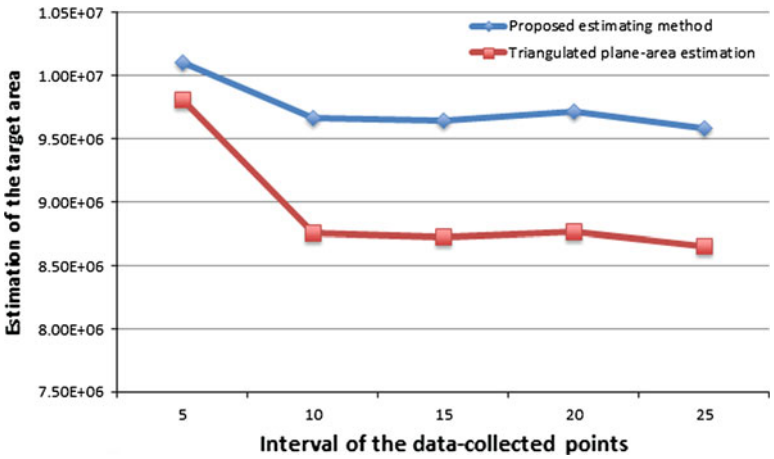

Fig. 82.3 Stability analysis of the estimating result comparing TIN-based surface fitting with triangulated plane-area estimation

some computational efficiency, but the results will much closer to the true value, and the amount of data has been reduced, data distribution also become thinning in the process, the estimated results can maintain to better stability.

82.4 Conclusion

GPS device combined with the carrier phase of tracking technology can help the engineering staff to obtain more accurate geological information, the use of surface data to infer surface characteristics of the geographical; can conduct more accurate surface area estimation. According to the combination of TINs methods and surface fitting methods, established the TIN-based Surface Fitting algorithm. This algorithm can obtain accurate surface information data to achieve higher estimation accuracy through the use of GPS equipment. Estimation experiment of the mountain surface area by using this algorithm verified the results of estimation has better estimation accuracy, so the algorithm has good reliability and accuracy. Besides, the estimates of this algorithm can also maintain good stability under the condition of the amount of data reduced and data-collected points gradually sparse. Finally, we still need to point out that the surface fitting algorithm for surface area estimates, making the calculation amount increased. It can get better estimation results, if the range of the surface area is small. However, for a wide range of surface area, the applicability of this algorithm will not do well and have certain limitations.

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Chapter 83
Research on Network Learning Process from Perspective of Communication

Yuehui Zhou

Abstract Network learning has already become the main way of learners' learning. This new approach to learning bring in learning convenient but also to bring some new problems: One of the most important is that network learning process often appears network trek phenomenon. In order to overcome this shortcoming, this research in the perspective of transmission, on network learning of the whole process is studied, in order to spread factors as the basic starting point, taking the typical network communication model as the research frame of network learning, is the study of a new train of thought. Through the analysis, introduce model of communication analysis problems, put forward countermeasures to solve the problem of information trek, to improve learners' learning quality, promote the network education rapid and sustainable development, and have realistic significance.

Keywords Communication · Network learning · Information communication · Element analysis · Effectiveness analysis

83.1 Introduction

Online learning is the modern information technology in the education use of the inevitable trend, is one of the main way to learn in the information age, is the collective and individual communication, and acquiring knowledge of important

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ways. The current network has been very generally deep in people's life, entertainment, and learning process. As a result cyber source has optional sex, flexibility, sharing, accord with people's learning characteristics and needs, natural network learning is introduced into the learning process, so there are a variety of network learning model, including organized network learning and independent learning mode, the information transfer also has considerable complexity. Communication studies is the study of the dissemination of information process and the laws of science, as an interdisciplinary subject, its general theory relates to information theory, semiotics theory, the theory of communication effect, feedback theory, model theory, and is about the general propagation rule summary. Communication research of human communication behavior, pays attention to all sorts of information on human impact and influence, pays attention to the information issued and receiving mechanism, which makes the dissemination and education relations become inevitable [1].

83.2 Basic Theoretical Foundation

83.2.1 The Concept of Network Learning

The so-called network learning, refers to platform for a learning activity through the computer or other media of a network , and the learning activities mainly uses the cooperative learning and autonomous learning ways. Compared with the traditional significance in the learning process, network learning process mainly has the following characteristics in three aspects: one is to break the traditional learning limitation of time and space. The second is the learner's collaboration between learning and learning individual autonomous learning as the main form of learning; the third is the study of vast content, learning resource sharing, and interactive learning network [2].

Network learning itself is spreading behavior, belonging to the spread of education, the purpose is to promote and help people in need of learning, expand their knowledge, has extensive, sharing, not subject to time, place influence characteristic.

83.2.2 The Perspective of Communication Science

Communication is the study of humans on how to use symbols and media information communication course, the scope of the study to the mass, and also on how to accept news and intelligence, according to how educated is a person. Communication is research of all human communication processes and communication

behavior the occurrence, development of the scientific. Study on the rule and in the process of communication between people, knowledge between man and society , is the social information system and its operation rules of Science [3].

83.3 The View of Communication Network Learning Elements Analysis

83.3.1 Network Learning Information Process Analysis

Educational communication has many very famous communication modes, and especially on Shannon-Weaver model with the social mainstream network learning process is closest. This model is the Shannon-Weaver on the telegraph communication issues and it is the use of telephone communication, we are now using network learning as the transmission equipment propagation learning content. Shannon-Weaver model structure as shown in Fig. 83.1.

This model divides the communication process into seven components provided with a feedback of two-way communication model. Network learning process and the model of the dissemination process have great similarities. Shannon–Weaver model and the network learning process have very similar place, at the same time, the model is also very important in the communication mode of the education spread model. This model is established on the basis of the new network learning model that can better play the advantages of network learning.

83.3.2 The Communication Concept Guidance Network Learning

Dissemination of knowledge is very wide, many subjects can use its theory, and there is no transmission at everymoment and hour of human life . Communication is the use of the optimal means to obtain the best effect . Communication content is

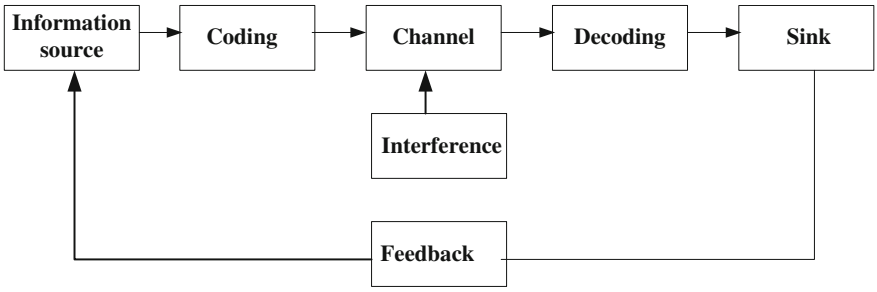

Fig. 83.1 Shannon and weaver model structure

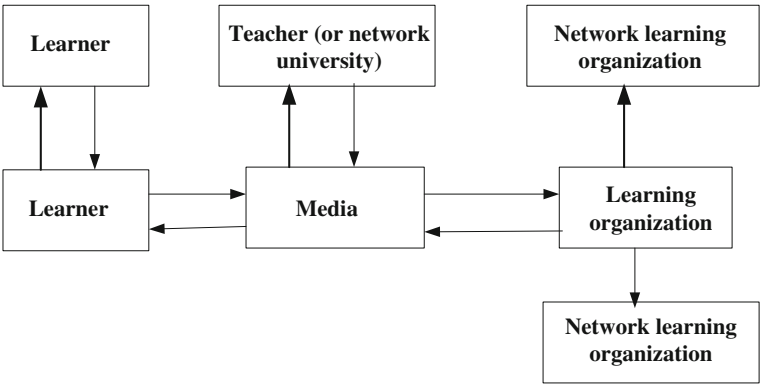

Fig. 83.2 Network learning process structure

not fixed, it can be arbitrary, and recipients can also be arbitrary. It shows that in the network study any individual or group can evolve into a biography or recipients where teachers transfer students, and students after digestion and absorption can also transfer to other people. In the second propagation process, students will become the communicators (equivalent to the teachers), who can achieve "one biography ten, ten pass 100" effect [4]. The use of these concepts, network learning is a loop learning process, knowledge in the network communication is faster and more can improve learning efficiency. As shown in Fig. 83.2.

83.4 Factor Analysis of Network Learning

83.4.1 Information Teaching of Network Learning

In the spread of education, teacher the central task is information collection, Process and the transfer is also the basic communication behavior. For teachers, collecting and processing information is mainly to transfer to the students effectively. The network study has had less significant level of communication, namely the teachers through the Internet and other means of teaching, eliminate doubt and confusion and the tasks were transferred to the students. In the learning demand for power network autonomous learning process, teachers will no longer have to spend a lot of time to organize the teaching plan and teaching as the main task, and to provide students with a variety of learning resources, concentrate students to collect resource query and do assistant work, reduces the student to collect resource to the desired time, simplify the operation steps, improve learning efficiency.

83.4.2 Recipient in Network Learning

From the learner's psychological analysis, obviously, the network learner and traditional learners have different psychological feeling and psychological changes. From the perspective of communication science, analysis of network learning psychology, learning performance in four aspects: the need of study, learning motivation and psychological tendency, psychological effect [5].

1. The network learners learning motivation

Learning motivation mainly for the intrinsic and extrinsic motivation, for autonomous learning should emphasize the learning motivation, is the internal excitation or self excitation [6].

2. The network learners self-efficacy

Self-efficacy refers to learners in network learning activity that can lead to a particular outcome expectancy. Experiments show that [6]. High self-efficacy learners in network learning activities, will be able to use more species and more learning strategies, shows strong self-confidence, to network system more exploration; these researches will have more access to information, so as to make the learners get high orientation.

83.4.3 Network Learning Communication Content-Network Information

The traditional learning information is the main source of teachers and teaching materials, while the network learning information mainly comes from the network media. Network information resources the dissemination of the content is the network learning system entity, mainly to the knowledge, the control signal, news, games, problem, and other forms of existence. Network information resources in the separation between teachers and students under the condition of learners are learning essential component. Information resources here mainly include the following categories: learning process information, learning content information, and auxiliary resources. Learning content information mainly refers to the provisions of the course content, the forms of media including text, video, such as small class teaching; The learning process information mainly refers to the information transmission control information and the receiver (learners) feedback information, under the environment of network the form of question, learning, online discussion, question answering; learning auxiliary resources is based on various cyber source to help learners learning support service and course information, including the teaching outline, teaching arrangement, practice exercises, and so on.

83.5 Network Learning Effectiveness Analysis from Perspective of Communication

83.5.1 Network Learning Student Participation Degree Analysis

This research is mainly done by education technology research methods course, the application of the virtual learning community as an example. In the process of the course, with traditional teaching as the foundation, 33 students of this class were divided into five groups, each group has the focused responsible for a project. Each group is responsible for the project by collecting material, literature form the case, then demonstrates and explain the problem of existence discussing in class and after class using virtual learning community. Students in the interaction process leads related problems, a new wave of search and integration, this process is primarily in the online community. As shown in Fig. 83.3.

83.5.2 The Network Learning Effectiveness Analysis

This study selected the school's students as research subjects, randomly selected subjects investigated for university students' network autonomous learning situation survey. This research adopts the investigation method of the questionnaire as a qualitative study, with greater subjectivity. Research achievements and learning about the scale and a questionnaire. At the same time, through the open questionnaire survey method, and then on contemporary college students' autonomous learning network is indicators collection. By writing "the university students'

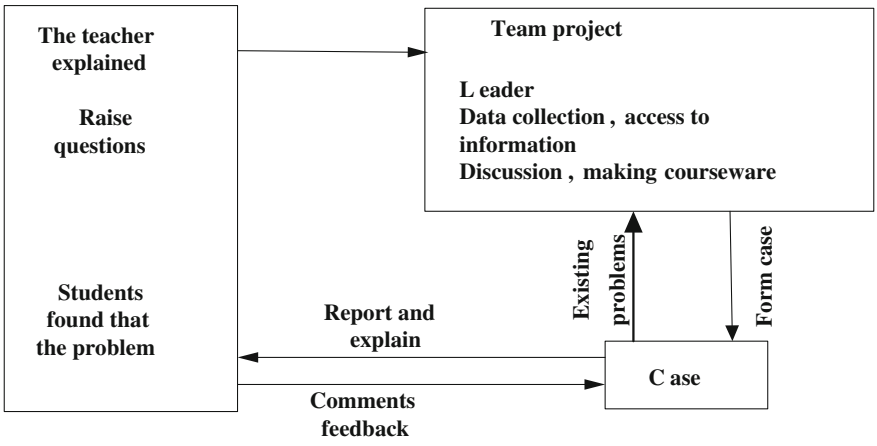

Fig. 83.3 Network learning community function

network autonomous learning questionnaire" to measure of college students' network autonomous learning (issuing questionnaires 123, recycling of 123, the boy 86, the girls 37, all effective),. Influence of network autonomous learning internal factors mainly include the students learning motivation, learning objectives, on autonomous learning, economic status, or physical quality; The external factors mainly include the school ethos or established by the professional, network curriculum design, around teachers and students the attitude of learning, online learning resources and network environment, and so on.

83.6 Conclusion

Network dissemination is present as the most advanced communication in human communication. The spread and popularity, information extensiveness, and information reproduction is simple, fast and lively communication, etc., in many communication tools should come first on the list. Using the network to learn has become an important way of learning in the world today. The network learning can effectively improve the learning quality is determined by the learning system of multiple elements, combined with network learning process and communication, with the perspective of transmission analysis of network learning.

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Chapter 84
Research of Medical Image Registration Based on RMI-SAPSO Algorithm

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Abstract Aiming at avoiding misregistration in complicated medical image registration based on mutual information-simulated annealing particle swarm optimization (MI-SAPSO), we propose a novel algorithm named regional mutual information-simulated annealing particle swarm optimization (RMI-SAPSO). This method uses wavelet decomposition to denoise images, then determines optimum transformation parameters under choosing regional mutual information as objective function, finally does spatial geometric transformation according to the parameters to register medical images. Experimental results showed that the proposed method can register medical images effectively. It has a good robustness and owns better precision than traditional algorithm.

Keywords Medical image registration · Wavelet decomposition · PSO algorithm · SA algorithm · Regional mutual information

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84.1 Introduction

With the development of modern computer technology and digital medical equipment, digital image in medicine has been one of the most important methods in disease diagnosis for clinicians and experts. Medical image registration has important guiding significance for computer-aided diagnosis (CAD). Registration accuracy impacts the quality of feature extraction and diagnosis of the CAD system directly. Therefore, improving the accuracy of image registration has important application value for clinical medical research.

For medical image registration method, it is divided into 2D and 3D registration, rigid registration and nonrigid registration, single-mode image registration and multimodality image registration according to dimension of images, image space transformation model, and the mode of imaging, respectively. Among them, feature-based registration and gray-based registration are most widely used. The accuracy of feature-based registration is limited by feature points. However, gray-based image registration does not. Therefore, this chapter will improve gray-based image registration algorithm.

The optimization algorithm and a suitable objective function are very important in the gray-based image registration algorithm. At present, commonly used optimization algorithms are genetic algorithm (GA) [1], Powell Algorithm [2], simulated annealing (SA) [3], particle swarm optimization (PSO) [4, 5], etc. These optimization algorithms can optimize objective function well, but they still have some problems. For example, the algorithm based on PSO is easily trapped into local optimal solution; the performance of SA algorithm is sensitive to parameters and has a slow rate of convergence. Therefore, we should consider the problems of both global and local. For measurement function, most image registration using mutual information as objective function can implement registration process simply and quickly. But it is lack of spatial information, which will lead to misregistration. Furthermore, mutual information is very sensitive to the changes of the overlap region, which is the reason for misregistration [6].

Aiming to overcome these blemishes, we propose a medical image registration algorithm based on regional mutual information and SAPSO hybrid optimization (RMI-SAPSO). It chooses regional mutual information as objective function first, and then uses SAPSO to optimize the regional mutual information, which can improve image registration accuracy.

84.2 Related Technologies

84.2.1 Regional Mutual Information

Regional mutual information is mutual information that introduces spatial information. During calculation, it regards image as multidimensional point set of distribution, each point not only presents pixel values, but also its neighborhood. Thus,

the obtained image information by this method is accurate, the registration results are smoother, and robustness is also enhanced. From the view of time complexity, the time complexity of RMI and MI will eventually converge to $O(n^2)$ [7].

The calculation of regional mutual information is shown as formula (84.1).

$$\mathrm{RMI} = H_g(C_R) + H_g(C_F) - H_g(C) \tag{84.1}$$

Among them, C is the covariance matrix, $H_g(C) = \log_2((2\pi e)^9 \det(C)^{\frac{1}{2}})$ represents the corresponding joint entropy, $H_g(C_R)$ is the corresponding marginal entropy of image R, which is gained from calculating the 9×9 matrix in the upper left corner of the covariance matrix, $H_g(C_F)$ is the corresponding marginal entropy of image F, which is gained from calculating the 9×9 matrix in the upper right corner of the covariance matrix.

84.2.2 Hybrid SAPSO Algorithm

Due to traditional PSO algorithm's shortcomings, a new mechanism was proposed. This mechanism can make the algorithm jump out of the local optimal position with a greater probability and enter into other areas of the space for searching.

The formulas of SAPSO hybrid algorithm to the particle's location and speed optimization are shown as formulas (84.2), (84.3), and (84.4).

$$x_{i,d}^{k+1} = x_{i,d}^{k} + v_{i,d}^{k} \tag{84.2}$$

$$\begin{aligned} v_{i.d}^{k+1} = {} & \mathrm{sign}(f(x^{k+1}) - f(x^{k}))w \times v_{i,d}^{k} \\ & + c1 \times r1 \times (p_{i,d}^{k+1} - x_{i,d}^{k+1}) + c2 \times r2 \times (p_{g,d}^{k+1} - x_{i,d}^{k+1}) \end{aligned} \tag{84.3}$$

$$\mathrm{sign}(x) = \begin{cases} 1 & x \geq 0 \\ -1 & x < 0 \ \text{ and } \mathrm{rand}() < \exp(\frac{x}{t_k}) \end{cases} \tag{84.4}$$

In formulas (84.2) and (84.3), i is particle's serial number and $i = 1, 2, \ldots, M$, M is the number of initial particles, d is the serial number of the N dimensional coordinates of each particle, k is the subcode of particle, and c_1, c_2 are non-negative constants, r_1, r_2 are the random number during $[0, 1]$, $v_{\min}, v_{\max}$ are the minimum and maximum speed and $v_{id} \in [v_{\min}, v_{\max}]$, w is the inertia factor. In formula (84.4), $\mathrm{sign}(x)$ is the probability function of particles' position transferring, which is obtained in terms of Metropo1is [8] criterion based on simulate anneal arithmetic, and t_k is the control parameter.

84.3 RMI-SAPSO-Based Medical Image Registration

For RMI-SAPSO-based medical image registration, first it denoises the reference image and floating image and initializes images after pretreatment. Then it iterates RMI-SAPSO algorithm and completes the image registration according to the optimal transformation parameters determined by the algorithm. Finally it outputs image registration results. Summary of the proposed algorithm is shown in Fig. 84.1.

84.3.1 Image Denoising Based on Wavelet Decomposition

This paper uses the wavelet shrinkage algorithm [9] for image denoising. Threshold function is mainly divided into the hard threshold function and the soft threshold function. Although the hard threshold method can be better to retain the image edge features, the processed image will appear visual distortion of the ring, etc. However, the results of the soft threshold method are relatively smooth, so we use the wavelet shrinkage algorithm based on the soft threshold method for denoising.

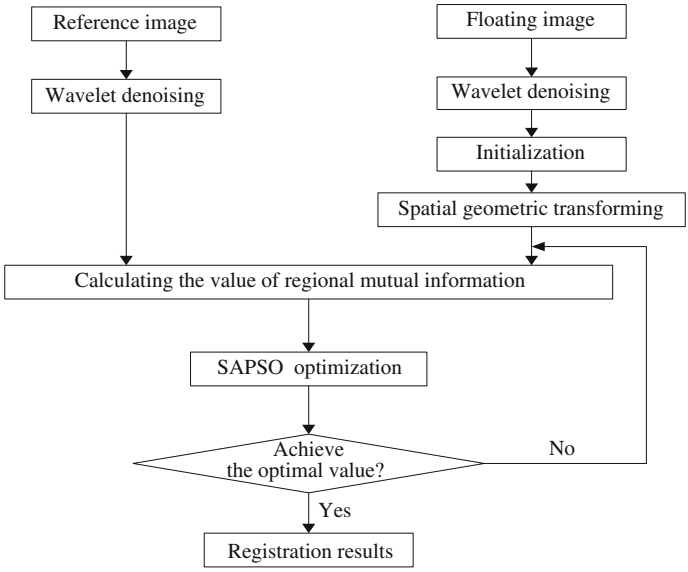

Fig. 84.1 RMI-SAPSO image registration process

84.3.2 RMI-SAPSO-Based Medical Image Registration Algorithm

After denoising, we do a series of initial operation including determining the population size of SAPSO algorithm, setting the initial point of the search process and the initial search direction, and determining the initial temperature in the SA algorithm.

The pixels in images do spatial geometric transformation according to the transformation parameters from the optimize algorithm. And spatial geometric transformation is shown as formula (84.5).

$$\begin{aligned} T(x) &= Rx + t \\ &= \begin{pmatrix} \cos\beta\cos\gamma & \cos\alpha\sin\gamma + \sin\alpha\sin\beta\cos\gamma & \sin\alpha\sin\gamma - \cos\alpha\sin\beta\cos\gamma \\ -\cos\beta\sin\gamma & \cos\alpha\cos\gamma - \sin\alpha\sin\beta\sin\gamma & \sin\alpha\cos\gamma - \cos\alpha\sin\beta\sin\gamma \\ \sin\beta & -\sin\alpha\cos\beta & \cos\alpha\cos\beta \end{pmatrix} \\ &\quad \begin{pmatrix} x \\ y \\ z \end{pmatrix} + \begin{pmatrix} t_x \\ t_y \\ t_z \end{pmatrix} \end{aligned} \tag{84.5}$$

where α, β, γ are rotation angles around each axis and t_x, t_y, t_z are translations around each axis, respectively.

RMI-SAPSO optimization algorithm processes are described as follows:

Step1: (initialization) Select population size m, and for the particles of each population $i, \cdots i = 1, 2 \cdots m$

Step 1.1: Initialize $x[i]$ as the position of the particle i of population;

Step 1.2: Take the result of calculating $fitness[i]$ as the fitness value of particle i. The fitness value is the regional mutual information of the two images;

Step 1.3: Initialize $v[i]$ as the velocity of particle i;

Step 1.4: Initialize *gbest* with the particle which has the best fitness value in the population;

Step 1.5: Initialize $pbest[i]$with $x[i]$and initialize $pbest\_fitness[i]$ with $fitness[i]$;

Step 2: Iterate $i = i + 1$ until meeting the termination condition of the algorithm, and then stop iteration to implement step 3.

Step 2.1: Calculate the current value of $x[i]$ according to formula (84.2);

Step 2.2: Do spatial geometric transformation for each particle and statistic the joint histogram by using image interpolation algorithm. After that, calculate the regional mutual information $fitness[i]$;

Step 2.3: Estimate and process the local best position of each particle. If $fitness[i] > pbest_fitness[i]$then $pbest\_fitness[i] = fitness[i]$ and $pbest[i] = x[i]$;

Step 2.4: Search *gBest* and if $pbest\_fitness[i] > pbest\_fitness[gBest]$ then $gBest = x[i]$;

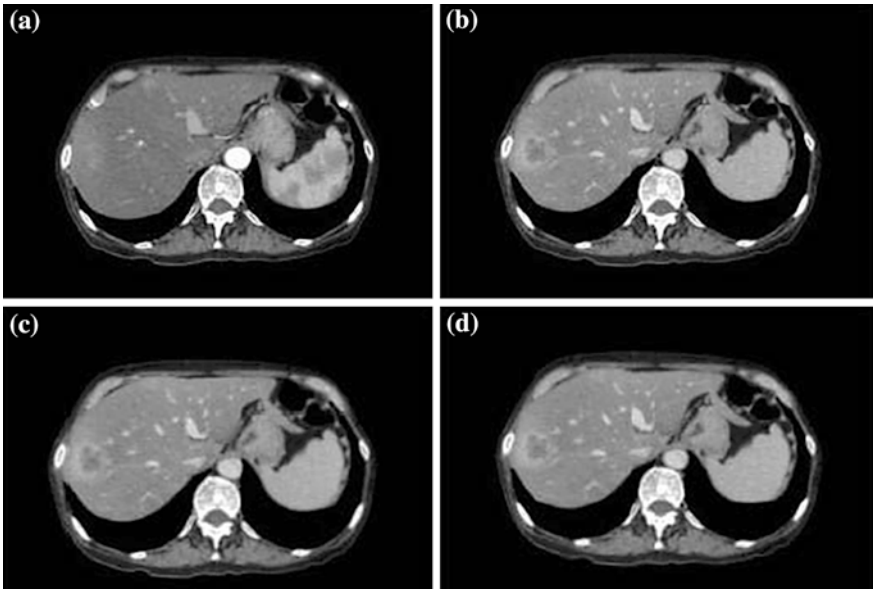

Fig. 84.2 Registration results of the two algorithms

Step 2.5: Judge the number of iterations. If the number of iterations is 1, then give the initial temperature t_0 and determine the coefficient of temperature degradation. If the number of iterations is greater than 1, then calculate the current temperature according to $t_{k+1} = a * t_k$;

Step 2.6: Calculate the speed of each particle according to formula (84.3) and formula (84.4);

Step 3: Output the global optimal solution and use it to do spatial geometric transformation for the floating image. Finally, output the registration results.

84.4 Experimental Results and Analysis

The medical image data used in the experiment are all abdominal CT images from a domestic large hospital. Among them, the resolution between the layers of the reference image and floating image ranges from 0.9 to 3 mm, and the resolution within the layers is 512 × 512. The data are all DICOM data and the bit depth is 12. The platform for experiments is MATLAB R2008a.

The experimental results are shown as Fig. 84.2, where (a) and (b) represent the reference image and floating image after denoising respectively, (c) is registration result of traditional SAPSO algorithm, (d) is registration result of the proposed RMI-SAPSO algorithm.

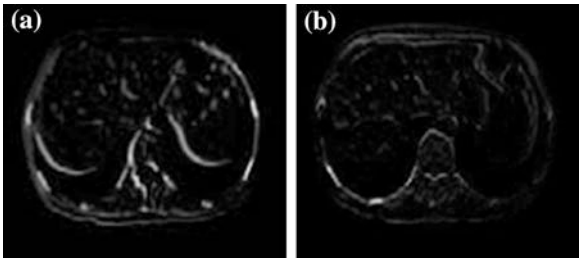

Fig. 84.3 Image of gray difference

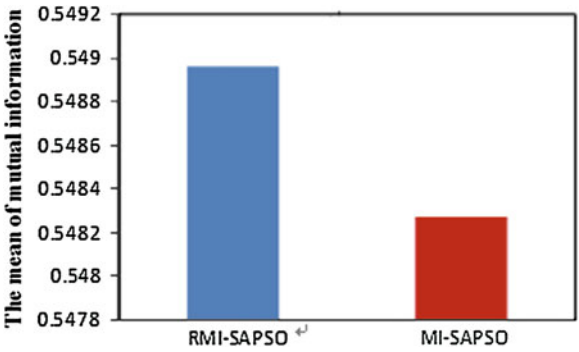

Fig. 84.4 Contrast of RMI-SAPSO and MI-SAPSO registration

Figure 84.3 shows the gray level difference between the two registration algorithms' results and the original image. Among them, (a) is the gray level difference between the result of the traditional SAPSO algorithm and the original image and (b) is the gray level difference between the result of the proposed RMI-SAPSO algorithm and the original image.

In this paper, we use mutual information value as an evaluation criterion to quantitatively compare the traditional MI-SAPSO algorithm with the proposed RMI-SAPSO algorithm and the results are shown as Fig. 84.4.

Figure 84.4 represents mean of the algorithm's mutual information. Through the contrast, it can be seen that the mean value of the proposed RMI-SAPSO registration algorithm is higher than that of the traditional MI-SAPSO registration algorithm and it has a good robustness. It is thus clear that the proposed algorithm can effectively improve the accuracy of the registration.

84.5 Conclusions

The proposed RMI-SAPSO medical image registration algorithm increases the extraction of the spatial information through introducing the regional mutual information and improves the registration accuracy of the local area of the image. Experimental results show that this registration algorithm can effectively improve

the accuracy of abdominal CT image registration with good robustness. It can solve the problem of misregistration in a complex medical image registration.

Acknowledgments The research is supported by the National Natural Science Foundation of China (No. 60973071).

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Chapter 85
Beam Width Performance of the Adaptive Beam Former Based on Pseudo-Interference Technique

Yi Chu, Wei-Yau Horng, Shinn-Fwu Wang, Yuan-Fong Chau and Jeng-Hua Wei

Abstract In this paper, we examine the beam width performance of the recently addressed robust Capon beam formers (RCB). This adaptive array employs the estimated steering vector, injected noise, and pseudo-interference to provide robustness against direction mismatch. With the generalized side lobe canceller (GSC) as the underlying structure, we first derive the effect of angular mismatch on the estimated interference correlation matrix. Then, a simple approximate expression is presented for output signal-to-interference-plus-noise-ratio (SINR) of this new beam former. Based on this expression, the angular beam width of this robust beam former is investigated. Simulation results verify the analytically predicted performance.

Keywords Adaptive antenna array · Pseudo-interference · Angular beam width · Robust beam former · Interference cancellation

85.1 Introduction

Adaptive beam former [1] is a widespread tool to suppress the interfering signals and steer the array to the direction of the desired signal. Consider a linear antenna array of N sensors with uniform half-wavelength spacing. The array steering vector a (θ), where θ denotes the arrival angle, is a $N \times 1$ vector. Let $x(k)$ represent the

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received vector derived from this narrowband array, which is assumed to comprise a single desired signal and J interferers, expressed as follows:

$$x(k) = s_s(k)a_s + \sum_{j=1}^{J} s_j(k) \pm a_j + n(k) \tag{85.1}$$

where $s_s(k)$ is the complex amplitude of the desired signal with power σ_s^2, $a_s = a(\theta_s)$ denotes the steering vector of the desired signal with arrival angle $\theta_s, a_j = a(\theta_j)$ denotes the steering vector of the jth interferer with arrival angle θ_j, $s_j(k)$ is the complex amplitude of the jth interfering signal with power σ_{j2}, $\sigma_{12} \geqq \sigma_{22} \geqq \cdots \geqq \sigma_{J2}$, and $n(k)$ is the additive white noise with power σ_n^2.

The adaptive array uses a weight vector w for processing $x(k)$ to suppress the interferers and receive the desired signal. The array output y (k) is defined as

$$y(k) = w^H x(k) \tag{85.2}$$

where the superscript $(\cdot)^H$ denotes the Hermit and transpose for a standard Capon beam former (SCB) [2], the weight vector w is chosen to minimize the output power with unit gain on the assumed steering vector a_0, where $a_0 = a$ (θ_0) with $\theta_0 = 0$o being the assumed arrived angle of the desired signal. This beam former is devised under the assumption that a_0 is known.

But in practice, the exact θ_0 is unavailable. Recently [3], considers steering vector estimation, interference null constraint, and power minimization techniques for designing diagonally loaded Capon beam former [4]. Since the equivalent interference-to-noise ratio (INR) in the adaptive processing can be improved, it provides more robust capabilities than the previous robust Capon beam former (RCB) [5]. The angular beam width of adaptive array is defined as the spatial interval over which the desired signal remains within a given value. In this paper, we examine the beam width of this beam former to predict the acceptable angular mismatch.

This paper is organized as follows. In Sect. 85.2, we review this pseudo-interference algorithm. In Sect. 85.3, we derive the output SINR of this beam former. The main-lobe width is also investigated. Simulation results are presented in Sect. 85.4 to validate the proposed approach. Section 85.5 concludes the entire paper.

85.2 Review of the Pseudo-Interference Techniques

In [3], the uncertainty constraint addressed in [5] is used to estimate the steering vector as. Let R be the correlation matrix of the received vector $x(k)$, and λ_n and U_N, $n = 1, 2 \ldots N$, be the ordered eigenvalues and the corresponding eigenvectors of R, respectively. The estimated steering vector is given by

$$\hat{a} = [I + \beta^{-1}R^{-1}]^{-1}UU^H\, a_0 \tag{85.3}$$

where $U = [u_1, u_2 \ldots u_{J+1}]$ is the signal-plus-interference subspace eigenvectors of R, and $\beta = 0.5\tau\lambda_1^{-1} + 0.5\min\left\{\tau\lambda_{J+1}^{-1}, \left[\sum_{n=1}^{J+1} |u_n^H UU^H a_0|^2 (\varepsilon\lambda_n^2)^{-1}\right]^{0.5}\right\}$, with $\tau = (1/\sqrt{\varepsilon})(||UU^H a_0|| - \sqrt{\varepsilon})$, $||a_0 - UU^H a_0||^2$. To mitigate the effect of mismatch between us and $\hat{a}$, the diagonally loaded constraint $\hat{a}$ is added, where α a constant is. Moreover, the pseudo-interference algorithm also chooses w to minimize the output interference power $w^H R_i w$ to achieve high interference suppression with R_i being the interference correlation matrix. It can be expressed by the following optimization problem:

Min $w^H R w$, subject to $w^H \hat{a} = 1$, $w^H w = \alpha$ and $w^H R_i w = 0$

The solution of (85.2) is

$$w^H R_i w = 0 \tag{85.4}$$

where $\mu = 1/(\hat{a}^H Q^{-1}\hat{a})$, and $Q = R + \delta_1 I + \delta_2 R_i$ with δ_1 and δ_2 being Lagrange multipliers.

To improve the robustness, we would like to choose the Lagrange multipliers to maximize the output SINR. It is shown in [3] that the close-form solution is

$$\delta_1 = \max\left\{0, 2N\sigma_s^2 - \sigma_n^2\right\} \text{ and } \delta_2 = \delta_1/\sigma_n^2 \tag{85.5}$$

The interference correlation matrix R_i in Q can be estimated from the following processes: First, divide the N-element array into two sub arrays. The desired signal in two sub arrays will be blocked by an $(S-1)$-order blocking matrix [6]. Each sub array consists of $(N + J)/2 + S$ elements. Let T_k be the sample correlation matrix of the kth sub array, where $k = 1, 2$, and B be the $(S-1)$-order blocking matrix. Then, the signal-free correlation matrix corresponding to kth sub array can be expressed as BHTkB. Second, perform the subspace reconstruction procedure as discussed in [7]. Third, evaluate R_i from the eigenvectors of BHTkB.

85.3 Beam Width Properties

In the previous section, we have assumed that the interference correlation matrix is accurately estimated. When the direction mismatch $\theta_s - \theta_0$ is large, the blocking matrix B does not properly block out the desired signal and then the subspace reconstruction method cannot estimate R_i accurately. In this section, we will derive an analytic expression of the output SINR of this beam former. The angular beam width is then examined.

85.3.1 Output SINR When B Nulls Out $\mathbf{A_s}$

We first consider the case that the direction mismatch is small. To obtain the output signal power P_s, interference-plus-noise power P_n, and corresponding SINR P_s/P_n, we decompose the weight vector w into two parts: a fixed weight vector $d = \hat{a}/N$ and an adaptive weight vector $-F(F^HQF)^{-1}F^HQ^Hd$, where F is an $N \times (N-1)$ matrix which satisfies $d^HF = 0$ and $\text{rank}(F) = N-1$. With this GSC as the underlying structure, w can be represented as

$$w = d - F(F^HQF)^{-1}F^HQ^Hd \tag{85.6}$$

Using the matrix inversion lemma, $(F^HQF)^{-1}$ in w can be represented as: $\left[(F^HF)^{-1} - (1+\zeta_s\gamma_s)^{-1}Ma_sa_s^HM^H - \sum_{j=1}^{J}\zeta_j\left(1+\zeta_j\gamma_j\right)^{-1}Ma_ja_j^HM^H\right]$, $(F^HQF)^{-1} \approx \frac{1}{\sigma_e^2}$ where $\zeta_s = \sigma_s^2/\sigma_e^2$ denotes the equivalent signal-to-noise ratio (SNR) with $\sigma_e^2 = \sigma_n^2 + \delta_1$ being the equivalent noise power, $\zeta_j = (1+\delta_2)\sigma_j^2/\sigma_e^2$ denotes the equivalent jth INR, γ_s, γ_j, and M are defined as $\gamma_s = a_s^H F(F^HF)^{-1}F^Has$, $\gamma_j = a_j^H\ F(F^HF)^{-1}F^H\ a_j$, $M = (F^HF)^{-1}F^H$, respectively, and we have neglected the cross-terms between a_s and a_j. Then, the output signal power, $P_s = \sigma_s^2|w^Ha_s|^2$, can be approximated by

$$P_s = \sigma_s^2(1+\zeta_s\gamma_s)^{-2}\left|d^Ha_s\right|^2 \tag{85.7}$$

Similarly, the output interference-plus-noise power, $P_n = \sigma_n^2||w||^2 + j_2\left|w^Ha_j\right|^2$, is given by

$$P_n + \sigma_n^2\eta_j + \zeta_j^2\gamma_j)\left(1+\zeta_j\gamma_j\right)^{-2}\left|d^Ha_j\right|^2 \tag{85.8}$$

where $\eta_j = \sigma_j^2/\sigma_n^2$ denotes the jth INR. Using (85.3) $\gamma_j \approx N$, and $\left|d^Ha_j\right|^2 \le 1$, the interference term in P_n can be neglected. We have

$$P_n \approx \frac{\sigma_n^2}{N} \tag{85.9}$$

85.3.2 Output SINR When R_i Cannot Be Properly Estimated

In this case, the desired signal is wrongly considered as interference. After processing the interference subspace reconstruction procedure, the blocking matrix acts similarly as a high pass filter in the spatial domain. Let $E \in C^{N\times N}$ be the transform matrix corresponding to this filtering. Assume that the interferers are located at high pass region in the spatial domain, we have $Ea_j = a_j$.

When θ_s and σ_s^2 are large, i.e $\sigma_s^2||Ea_s||^2/N > \sigma_J^2$, the estimated interference correlation matrix can be expressed as

$$\hat{R}_i = \sum_{j=1}^{J-1} \sigma_j^2/\sigma_e^2\gamma_j = a_j^H a_j \tag{85.10}$$

Then, the weight vector can be represented as

$$\tilde{w} = d - F(F^H\tilde{Q}F)^{-1}F^H\tilde{Q}^H d \tag{85.11}$$

where $\tilde{Q} = Q - \delta_2\sigma_J^2 a_J a_J^H + \delta_2\sigma_s^2 Ea_s a_s^H E^H$ using the matrix inversion lemma, the output signal power, $\tilde{P}_s = \sigma_s^2\tilde{w}^H|a_s|^2$ can be approximated by

$$\tilde{P}_s = \sigma_s^2|(1+\zeta_s\gamma_s)^{-1}d^H a_s - \delta_2\zeta_s\gamma_{es}[(1+\zeta_s\gamma_s)^{-1} - \delta_2\zeta_s\gamma_e(1+\delta_2\zeta_s\gamma_e)^{-1}]d^H Ea_s|^2 \tag{85.12}$$

where γ_e and γ_{se} are defined as $\gamma_e = a_s^H E^H F(F^H F)^{-1}F^H Ea_s$ and $\gamma_{es} = a_s{}^H E^H F(F^H F)^{-1}F^H$ as, respectively. In (85.6), we have used $(1+\zeta_s\gamma_s) \approx 1$, $|\gamma_{es}| << 1$, and $\zeta_s|\gamma_{es}|2/\gamma_e\zeta_s|\gamma_{es}||\gamma_{es}|/(2N) \ll 1$. Similarly, the interference-plus-noise power $\tilde{P}_n$ can be approximated by

$$P_n \approx \frac{\sigma_n^2}{N} + \sigma_n^2\gamma_J\sigma_J^4\sigma_e^{-4}\left(1+\sigma_e^{-2}\sigma_J^2\gamma_J\right)^{-2}|d^H a_J|^2 \tag{85.13}$$

85.3.3 Angular Beam Width

Based on the discussions in the above two subsection, we fist derive the overall output SINR. From (85.4) and (85.6), we can observe that γ_e, γ_{es}, and $d^H Ea_s$ are unwanted factors but appear in (85.6) due to as passing through the blocking matrix. When the direction mismatch is small, these factors are approximately equal to zero, and then (85.6) reduces to the same expression of (85.4). Therefore, the overall output signal power can be approximated by (85.6). Consider the case when $\sigma_J^2/\sigma_e^2 > 1$, using $\gamma_J \approx N$and $|d^H a_J|^2 << 1$, we have

$$\frac{\sigma_n^2}{N} >> \Sigma_n^2\gamma_J\sigma_J^4\sigma_e^{-4}\left(1+\sigma_e^{-2}\sigma_J^2\gamma_J\right)^{-2}|d^H a_J|^2 \tag{85.14}$$

Then, (85.7) can be approximated by $\tilde{P}_n \approx \sigma_n^2/N$ as in (85.5). Consequently the overall output SINR can be approximated by

$$\text{SINR} \approx \frac{N\tilde{P}_s}{\sigma_n^2} \tag{85.15}$$

Using $(1+\zeta_s\gamma_s)\approx 1$, it can be verified that the dominant term in $\tilde{P}_s$ is $\sigma_s^2|d^H a_s - \delta_2\zeta_s\gamma_{es}d^H E a_s|^2$. For large value of η_s, where $\eta_s = \sigma_n^2/\sigma_n^2$ denotes input SNR, it can be shown that $\delta_2\zeta_s \approx \eta_s$ Since γ_{es} and $|d^H E a_s|^2$ increase as direction mismatch increases, according to (85.6), (85.8) and $\delta_2\zeta_s \approx \eta_s$ the SINR and beam width decrease as input SNR increases. Since B form a high pass filter in the spatial domain, a large value of S will provide a wider null in the direction θ_0 [6]. Therefore, the beam width increases as S increases.

85.4 Simulation Results

The array in the simulations is composed of equispaced $N = 32$. The received data vector is as that of (85.1). Two interfering signals with $\{\theta_1, \eta_1\} = \{25^o, 10\text{dB}\}$ and $\{\theta_2, \eta_2\} = \{45^o, 20\text{dB}\}$ are impinging on the array.

Figure 85.1 shows the output SINR versus direction mismatch θ_s for a fixed $S = 3$. We can observe from this figure that the output SINR of the adaptive array decreases rapidly as θ_s increases for large SNR. By comparing the approximations of SINR computed from (85.8) with the simulation results, we see that the analytical results are close to the simulation results.

Figure 85.2 shows the output SINR versus direction mismatch θ_s for a fixed $S = 5$. For comparison, the analytical results of output SINR using (85.8) are also

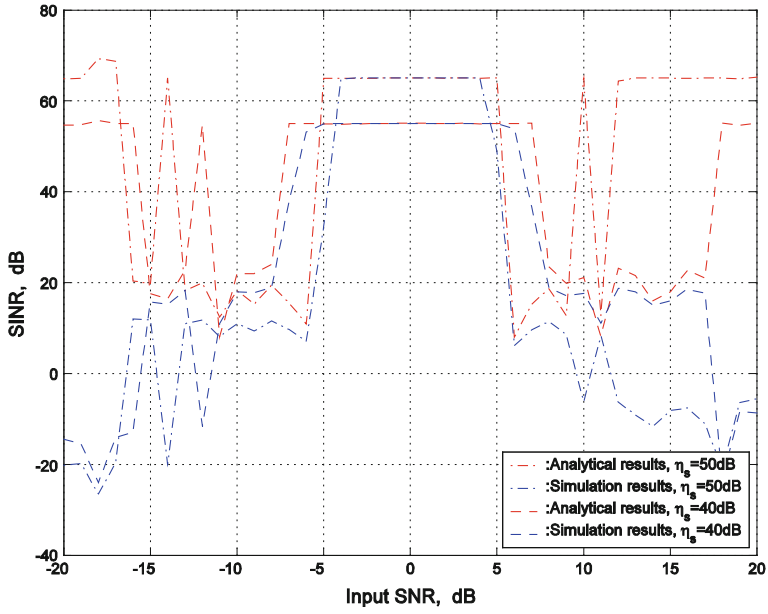

Fig. 85.1 Output SINR versus θs $S = 3$

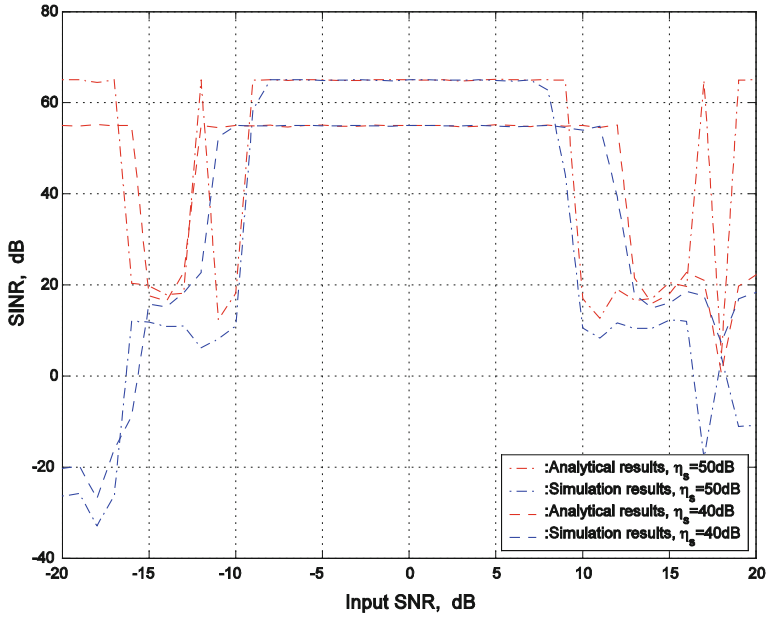

Fig. 85.2 Output SINR versus θs. $S = 5$

plotted. Again, the analytical results are close to the simulation results. Comparing the results of Fig. 85.1 with the corresponding results shown in Fig. 85.2, we see that the beam width of these beam former increases as S increases.

85.5 Conclusion

We derive the effect of angular mismatch on the recently addressed (RCB). This beam former employs the derivative constraints to obtain the interference correlation matrix. Then, the pseudo-interference is injected into the RCB to provide robustness against direction mismatch. With the GSC as the underlying structure, the output SINR is investigated. It shows that the angular beam width increases as the order of the derivative constraints increases. Simulation results are furnished as well to justify this new approach.

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Chapter 86
Innovative Monitoring and Evaluation System of Chinese Cities Based on GIS

Chuanglin Fang, Jing Qin and Xiong Shu

Abstract On the basis of collecting, modifying, storing, and managing the innovative urban indicators data and the GIS data of Chinese prefectural-level cities, this article is proposed to design and develop a system for monitoring and evaluating the innovative level of Chinese cities. This system integrates the technology of DBMS, MIS, and GIS. It can not only manage the indicators data and GIS data of prefectural-level cities but also could fulfill functions of the spatial query analysis and the thematic map rendering based on the secondary development of ArcGIS Engine. The system can help the researchers to manage, analyze, and compare the indicator data of many years and different cites, and provide support for writing assessment report of innovative cities.

Keywords Monitoring and evaluation system · .NET · ArcGIS Engine · GIS

86.1 Introduction

The innovative city is defined as follows: it is a city whose driving force is scientifical and technological progress; foundation is innovation culture; and the guide is independent innovation. It is also an urban morphology whose economic development is driven by innovation factors such as science, technology,

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knowledge, cultural, etc., [1–3]. In the twenty-first century, the competition among countries focused on the innovation ability. The main carrier of the national innovation capacity is urban which agglomerate technological, economic, and cultural. The strength of the city's innovation capacity indicates that the national innovation, so enhancing the national innovation capacity should vigorously raise the city's innovation capability. Establishing the evaluation indicators system is a necessary stage and an indispensable tool in constructing the innovative city. At present, the vast majority theoretical studies of innovation city are concentrated on the composition of the evaluation indicators system of regional innovation capability [4, 5].

In this paper, we developed a system with Visual Basice.NET 2008 and ArcGIS Engine on Windows XP, and the database system was SQL Server. The data connection mode is ADO. The innovation monitoring and evaluation system is an integrated information system which includes data management, data analysis, data visual functions, spatial and attributes query, and thematic map rendering capabilities. The goals of it mainly include: establishing an innovation monitoring indicator database of Chinese prefectural-level cities; implementing the basic functions such as information management, data query, data edit and output; providing better services for the city's innovation capacity analysis and management decisions.

86.2 System Database

In this paper, the SQL Server 2005 database platform is used to build the database. There are two types in the database: spatial data and attribute data. Spatial data is storage as shape file. Spatial data include national boundaries, provincial administrative boundaries, prefecture-level cities boundaries, and the coordination of prefecture-level cities which were considered as points. Attribute data include all levels of innovation indicators of 34 provinces, municipalities and autonomous regions and 287 prefecture-level cities. The data are from the Statistical Yearbook of various regions; provincial and municipal economic and social development communiqués; provincial and municipal Science and Technology Statistics Yearbooks, etc. Figure 86.1 shows the process of the system database establishment.

86.2.1 Attribute Data Organization

The attribute data in this system are management by SQL Server, data stored in the form of tables. Figure 86.2 shows the relationship of data tables in the attribute database. It is composed by the region table (Area), the index system table (Index), the basic data field table (Field), the basic data table (2009, 2010), and analysis

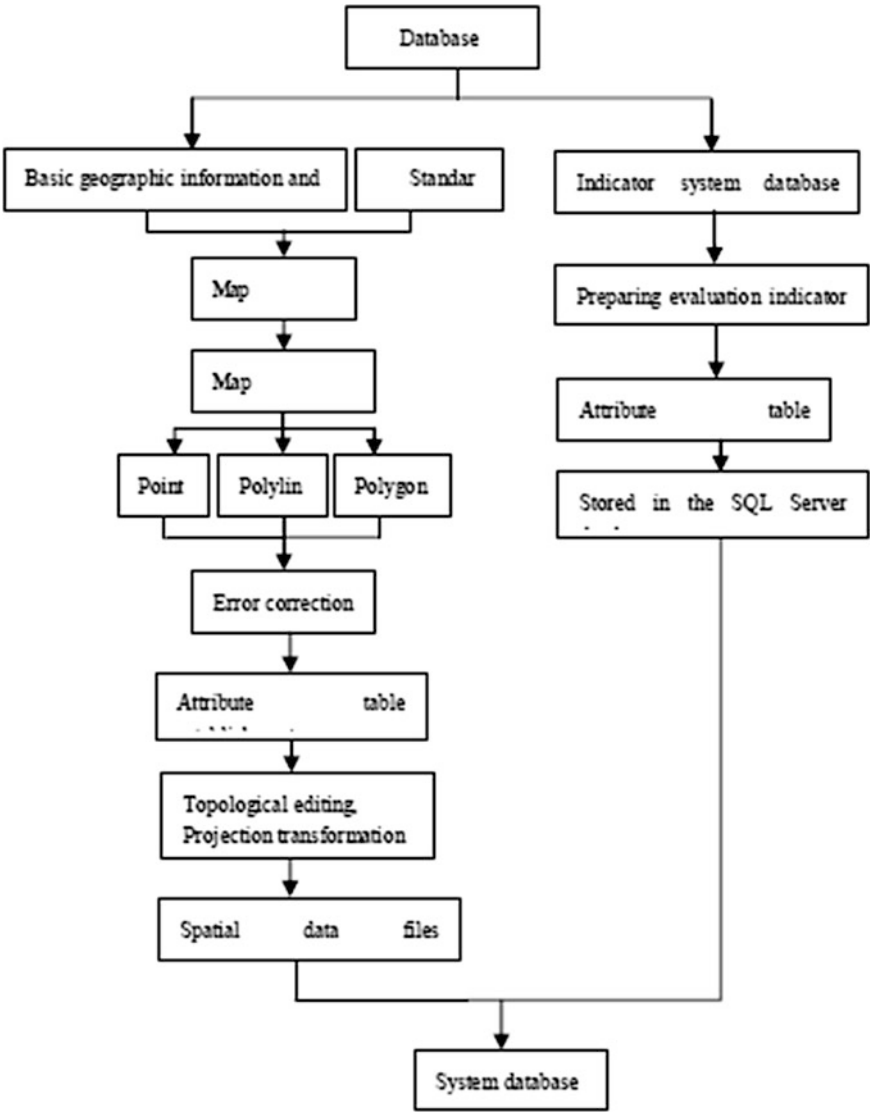

Fig. 86.1 Flowchart of database

result table (Result). The innovation cities information which prepare to evaluate is stored in the Area table. The evaluation indicators, formula, and the relationship between the indices are stored in the Index table. The name of basic data and formula are stored in the Field table. The basic data of different years are stored in the basic data table. The evaluation results are stored in the Result table.

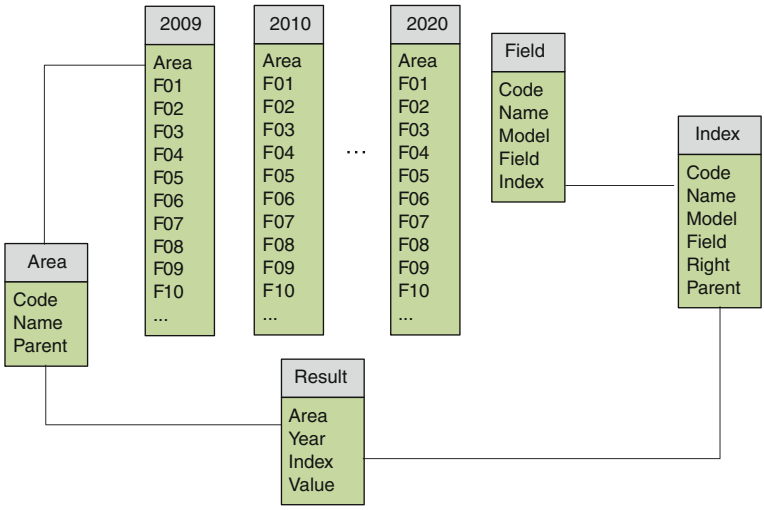

Fig. 86.2 The relationship of data tables in the attribute database

86.2.2 Spatial Data Organization

The spatial data in the system are stored in Shape file (the data format is .shp). It takes 1:500,000 underlying geographic data as data source and builds geographic data files in the form of different layers. Different .shp layers are associated with the corresponding attribute data tables in SQL database, so as to realize the GIS functions of spatial query, spatial analysis query, and thematic rendering.

86.3 System Architecture

The innovation monitoring and evaluation system concludes three layers which are the functional application layer, the logical design layer, and the data management layer (see as Fig. 86.3).

86.3.1 Functional Application Layer

The functional application layer is a client-oriented functional module, it concludes functions of user management, district management, attribute query, spatial query, the indicator query, the indicator weight calculating, statistical graphics drawing, spatial analysis, thematic mapping so that users can query, edit, analysis, modify, and map the spatial data and innovative urban indicator data.

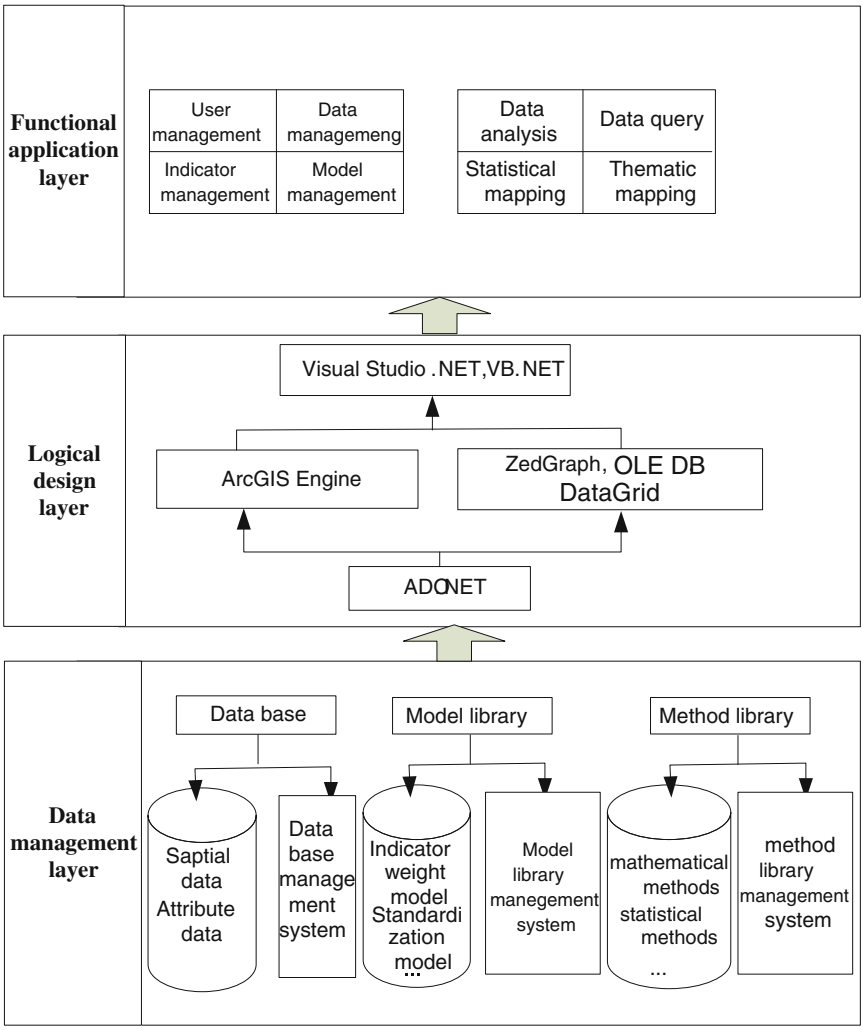

Fig. 86.3 System structure

86.3.2 Logical Design Layer

The logical design layer can supply technical support for the innovation monitoring and evaluation system. The software environment of this system is windows XP, Microsoft Visual Studio 2008 is the system's development platform, and the VB.NET is the developing language of this system. When the system is loaded, the database file (.mdb) is imported by ADO control; database table and the corresponding SHP file layer are associated in order to query the attribute information and location information, or SQL query.

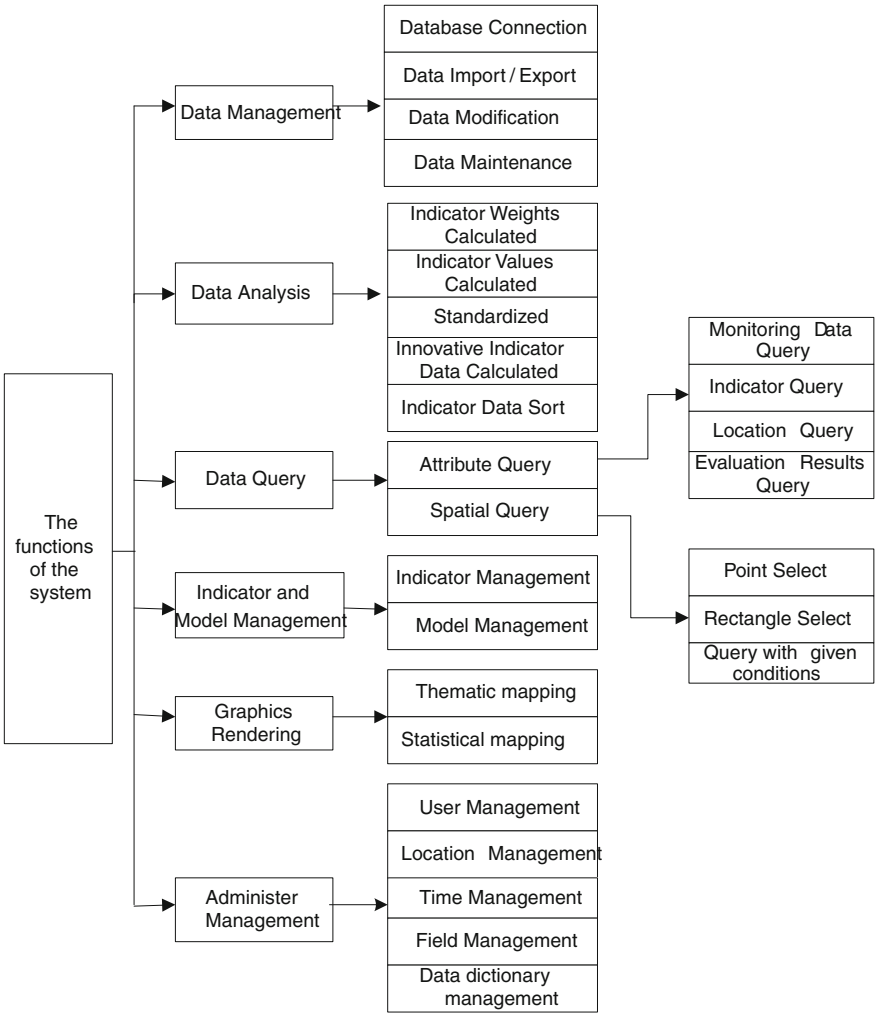

Fig. 86.4 System function

ArcGIS Engine is a collection of GIS components and developer resources that can be embedded, allowing you to add dynamic mapping and GIS capabilities to existing applications or build new custom mapping applications. The software developed with AE could be run on a Runtime environment and the installation of ArcGIS is never necessary. ArcGIS Engine provides GIS developing environment for system, but it just to use its GIS component to achieve spatial query and thematic mapping function in the system development. Others functions, such as innovative urban indicators database operations, statistical graphics rendering, visualization query, report generation are achieved using other components such as

data manipulation components (OLE DB, Data Grid), graphical component (zardgrap), etc.

86.3.3 Data Management Layer

The main purpose of the data management layer is to design and manage the database, model library and method library; it is the core of the whole system. The database is the important part of the system, which mainly consist of the spatial data and innovative urban indicators data. Data in the system are managed by SQL Server which can provide the function of data storage, querying, processing, and maintenance. And it can obtain data from various information resources and convert them to data structures which can meet the computing requirement. The model library is a collection of models which are stored as certain forms of organizational structure in the computer. The method library can be considered as the model library displayed in a smaller granularity level, it mainly store the basic mathematical methods, statistical methods, and other methods, it is responsible for calling the appropriate method to computing based on the needs of human–computer interaction subsystem and model library.

86.4 Main Function of the System

The functional modules of the system are composed by data management, data analysis, data query, indicator and model management, graphics rendering, and

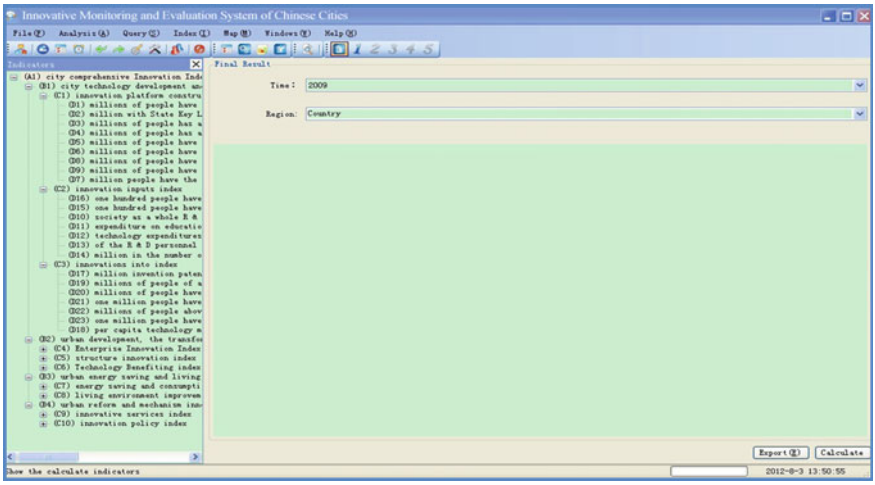

Fig. 86.5 Thematic rendering function

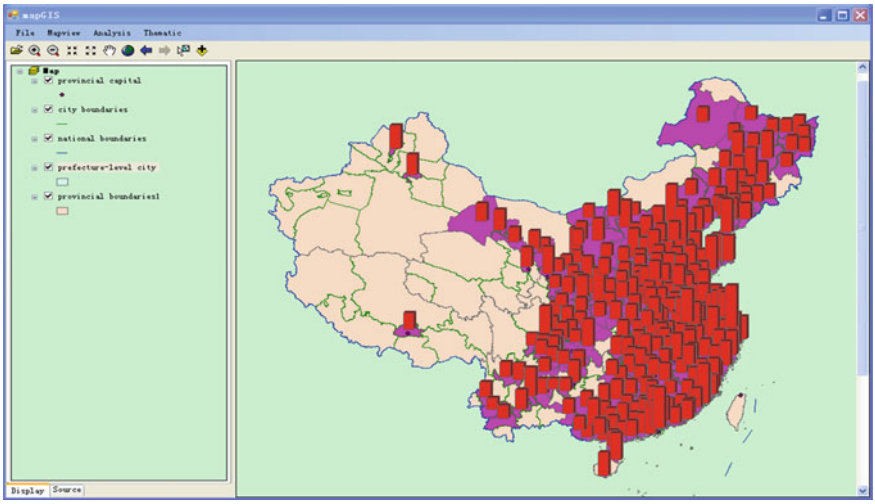

Fig. 86.6 The interface of the system

administer management. The core modules are data management, indicator analysis, indicator and model management, graphics rendering. Figure 86.4 shows the system functions. Figure 86.5 shows the interface of the system, and Fig. 86.6 shows the thematic rendering function. The innovation indicator is representing by the column height.

86.5 Conclusion

In this paper, the monitoring and evaluation system of Chinese innovative cities is developed based on the Visual Studio.NET developing environment with the support of ArcGIS Engine. The monitoring, management, and evaluation of innovative Chinese cities are effectively supported. And the information supporting platform for city planning and developing is provided. Further research should focus on updating system data in time, guaranteeing the reliability and timeliness of the system, and realizing the real time and dynamic monitoring of Chinese innovative cities. How to combine model operation and spatial data, how to integrate approach like artificial intelligence and fuzzy logic and complex mathematical models like multivariate statistical analysis, system dynamics and fuzzy mathematics into the system, and build an intelligent decision support system are also what should be considered in further research.

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Chapter 87
Power Dispatch Security Management Training Based on Multimedia Animation Technology

Yigang Liu, Sizhe Liao, Bingbing Liao, Zhiwen Zhao and Quanchao Zheng

Abstract The traditional education and training in the power industry is thought to be ineffective, high cost, and unpractical due to the various engineering conditions. Accordingly, a multimedia animation technical training system was developed based on years of training experience. The system utilizes a variety of multimedia animation technology which makes the training simple and vivid, as well as saving costs in traditional training. The system also achieved superior training resulting in a power bureau's training test run.

Keywords Power dispatch security management · Training · Multimedia animation technology

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87.1 Introduction

At present, the rapid development of power industry requires higher quality on the managerial skills and workforce in power enterprises while the recent Southern Power Grid brought forward the guideline principles of "Four Unification" [1, 2]. As a result, it is imperative to strengthen the competitiveness and resilience of power enterprises through effective training in order to adapt to the new situation under the rapid development of power grid. Security management of power dispatch is the great support of the security and stability of power grid operation as well as the company information technology building. Hence, training a group of qualified scheduling security managers has become an important and urgent issue.

87.2 Analyzing the Manual Training of Traditional Dispatch Security Management

In accordance with the general requirements of the company education and training, the scheduling system provides a solid human resource for the grid operation for a long time [3]. However, referring to the construction of the training system, the scheduling system failed to complete the reunification of the training principles. The problems of the traditional training are: the training tools are relatively simple; the working and study time of staffs is contradictive; the traditional manual training has led to a large number of simple and repeat processes; the teaching resources cannot be directly shared; the operational experience cannot be effectively delivered and the training effects cannot be real-time evaluated, etc. These issues have been causing obstruction to the cultivation of scheduling security management personnel, as follows [4].

1. Poor effectiveness: Singularity of the training methods brought great difficulties to the training effectiveness: First, a simple theoretical explanation brought difficulties to the workers to understand the security management of dispatch system [5]. At the same time, the analysis and processing of security incidents is still mere paper talk for the workers. Second, dispatch security management professional involves a wide knowledge which makes it difficult for staffs to obtain in a short time. Third, when training is over, there is no regular testing feedback; you cannot understand the mastery of the staffs' knowledge of dispatch security management which makes it difficult to improve the training content.
2. High cost: The dispatch security management profession covers a wide field including grid scheduling operation, network operation mode, computer information technology, and other disciplines which affect the security of grid operation [6]. As a result, to train qualified scheduling security management personnel often takes a lot of time and cost. Moreover, in the traditional manual

training, the staff dining and lodgment cost is essential. Further, the traveling fee is another high cost of off-site training and consuming a great deal of resources therefore makes the annul training impractical.
3. Contradiction between work and training: Due to the characteristics of the grid work, there is less free time to trainers or trainees. Hence, there are difficulties for training coordination and arrangement, and in the event of safety incidents, there are limited personnel to assign and thus may add to the risk of security management.

87.3 The Construction and Implementation of Multimedia Animation Courseware Training Methods

87.3.1 The Knowledge System Principles and Techniques of Multimedia Animation Training

87.3.1.1 The Principles of Dispatch Security Management Knowledge System Construction

The design principles of scheduling security profession knowledge management system focus on the scheduling functions of the production safety departments and the scope of security management professional responsibilities. Combined with the experience of curriculum developers, the design is also based on the job proficiency training standards, the relevant work norms (such as rules and regulations work standards, operating instructions, operation forms, etc.) or technical standards in order to sort out the demand of systematizing the safe production system. The design specifies requirements for the staffs safety production from the knowledge structure of the professional standards, management methods, business processes, and many other requirements. These tasks provide guidance for collecting, sorting, courseware designing, and editing. And finally form a set of dispatch security management knowledge to fulfill the job requirements and aim of Guangdong Power Grid to construct and complete the security management knowledge.

87.3.1.2 The Combination of Mainstream Multimedia Technology and Computer Software Technology

The basic elements of multimedia include text, graphics, static images, sound, animation, video clips. The design of multimedia courseware is fully conceived and organized the elements of multimedia, which starts from these elements and

features and proceed under the guidance of the principle of education and psychology. The design of multimedia makes use of the strengths of the various media elements for different types of learners with different learning media from a variety of media channels. The multimedia technology in the courseware includes flash animation, video, 3D simulation, e-books, flash interactive animation. Computer software technology is universally applicable in all kinds of occupation and the results of the animation courseware of this project will display and maintenance through computing management platform helps to carry out teaching, to share resources, and to facilitate the communication between students and between students teachers.

87.3.2 The Implementation of Multimedia Animation Training

87.3.2.1 Building the Professional Knowledge System of Dispatch Security Management

The dispatch security management processional knowledge training courseware includes electronic courseware, video, Flash animation, 3D simulation courseware, interactive electronic courseware. The professional knowledge of courseware involves the norms, basic theoretical knowledge, case study in security management, professional management operation, and five categories of professional management assessment. The professional knowledge of security management can be categorized from the management system as professional skills and knowledge, interactive interaction, examination and evaluation, and integrated management which is organized and managed by the system of the dispatch professional security management knowledge system. The construction of the professional knowledge of dispatch security management requires standardizing of the knowledge classification and system construction and systemizing the results output. Additionally, the management system must meet the needs of operating usability, knowledge applicability, and the results openness (Fig. 87.1).

87.3.2.2 The Development of Multimedia Animation Courseware Production Processes

Only the multimedia courseware is in line with learning and teaching theories that it can serve the teaching of dispatch security management profession. Moreover, the power industry first proposed the four principles of multimedia courseware production based on years of training experience: first, the courseware design must be in line with the teaching theory; second, the media material must be selected closely around the teaching content; third, the interface navigation has to be clear

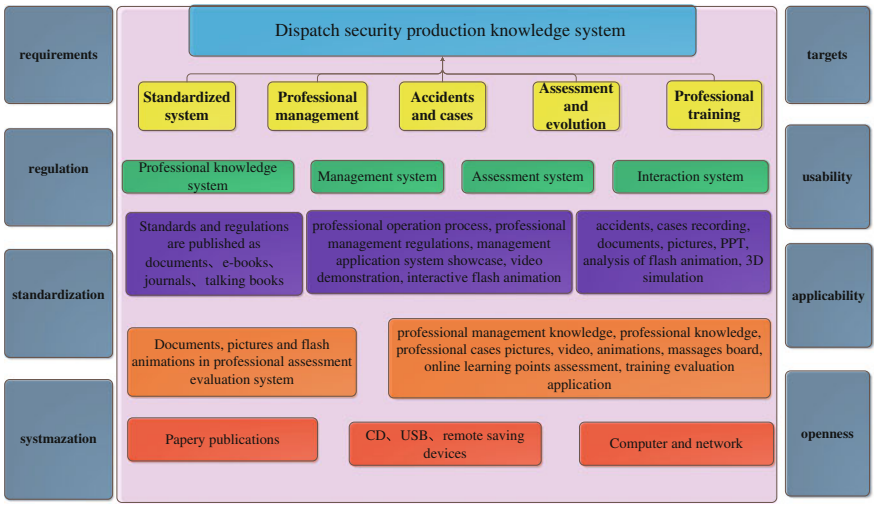

Fig. 87.1 Security management framework

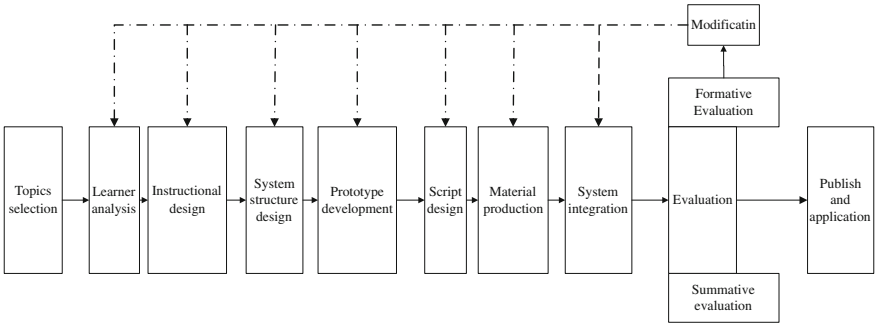

Fig. 87.2 The process of multimedia courseware production

and finally there must be high interaction. After the continuous exploration, the multimedia courseware production process is finally come up as Fig. 87.2 shows: topics selection → learner analysis → instructional design → system structure design → prototype development → script writing → material production → system integration → evaluation and modification → publish and application → update.

87.3.2.3 Knowledge Summarizing and Courseware Design

Utilizing the methods of job responsibilities, professional conduct to competent interpretation, and training assessment, the producers summarize the power dispatch security management responsibilities and combined with the understanding

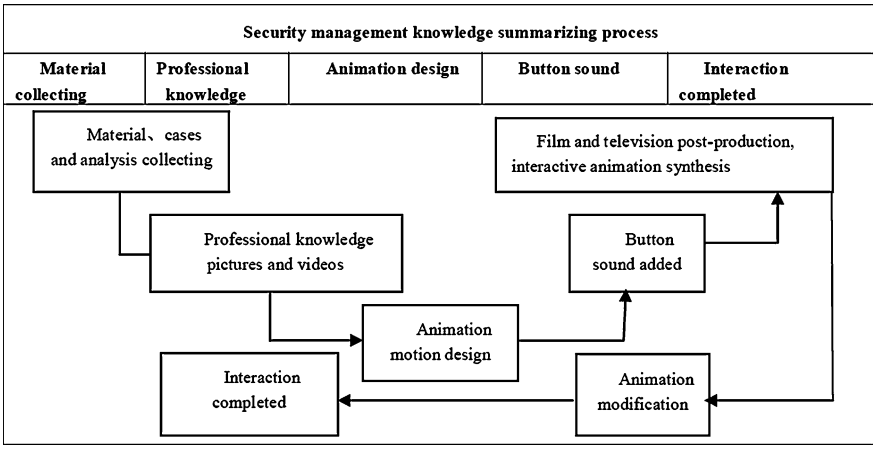

Fig. 87.3 Key knowledge points of safety management summarizing process

of the dispatch security management professional knowledge system. The producers conducted the professional and comprehensive job training content on the basis of a variety of security management books and online resources in order to strengthen the staffs' professional skills. Basically, the knowledge summarizing is the operation and demonstration of the security management's professional functions, which utilize the flash animation and the interactive animation to demonstrate operations (Fig. 87.3).

87.3.2.4 Results Output and Display

This power dispatch security management courseware utilizes a variety of mainstream multimedia technology, including flash animation, video, flash interactive animation, 3D simulation, e-books. In the animation courseware producing process, a variety of multimedia technology was combined so as to vividly demonstrate the professional knowledge. The combination of multimedia technology are varied, such as flash animation combined with video, e-books combined with flash animation, e-books combined with flash animation, and video combined with 3D simulation. The courseware production methods for knowledge is not mandatory required, however, the selection of multimedia technology or the combination of multimedia technology can be based on the characteristics of professional knowledge. Figure 87.4 shows the courseware production of dispatch security management system and its combination of animation techniques.

The Features of Courseware:

1. Analog devices analysis—the grid equipment cannot be set in the training site due to several facts that it is normally in operating state, or the load is heavy and high cost to move. This courseware simulates the equipment prototype and

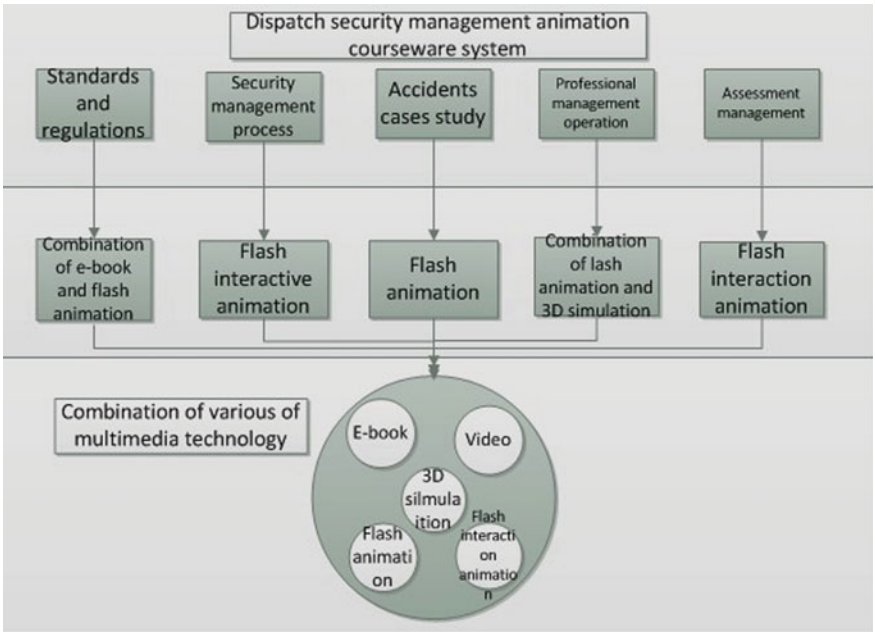

Fig. 87.4 Combination of multimedia technology and security management

its assembly and disassembly process through the 3D modeling so that the trainers can explain device structure and working principle while making no damage to the devices.

2. Simulate the scene of the accident—in the normal operation of the grid, it is impossible to carry out a risky operation or experiment to damage the whole grid because of training. Multimedia technology will demonstrate a complex security incident into a vivid animation. While simulating a variety of factors in the scene of the accident, the multimedia animation also help to analyze the causes of accidents, the correct approach and process to fix the accident. The multimedia technology visualizes the accident response and dispatch process of security management which facilitate the understanding and memory of the workers.
3. Operation simulation training—this courseware provides test scenarios and simulation operating functions through interactive reproduction of the dispatch operations. Additionally, the courseware has intelligent guidance, misuse alarm and the entire process operating records, and the courseware can utilize the information as part of the interactive system material to be used in learning exchange, training and production security counseling.
4. Integration of test training—the courseware utilizes the online interaction, learning knowledge points, interactive seminars, simulation operation, and online assessment to reach an effective outcome of promoting security

management professional knowledge. After the training on the information technology support platform, the trainees will conduct the self-test and based on test results to consolidate the dispatch security management knowledge so as to achieve the integration of test and training and implement the principle of promotion and evaluation.

87.4 The Advantages and Benefits of the Multimedia Animation Courseware Training Methods

87.4.1 The Advantages of the Multimedia Animation Courseware Training Methods

(1) Accelerate knowledge update: The innovation of dispatch security management technology, business management model, and business applications require continuously updated and improved of security management training system in order to promote and support the improvement of staffs' on-the-job skills. Thus, through system updates and new animated courseware, the knowledge management system ensures the staffs to obtain new knowledge quickly. (2) Facilitate the standardization of training system: Some problems exist in the traditional training that the trainers have insufficient capacity on course development and teaching. Accordingly, Guangdong Power Grid developed a model whose principle is "cultivate a group of internal trainers, develop a number of training courses, form a number of e-courses" and to carry out the "trinity" training resources construction. This model ensure the profession of e-classroom and bridge the gap among the course, basic level and the front-line so as to achieve the "integration and standardization" of dispatch safety management training construction. (3) Facilitate the organization and management of training activities: Multimedia training methods coupled with modern office network configuration, makes the daily training and examinations available through the network. It facilitates the organization and management of the training and examination activities and greatly improves the efficiency and shortens the preparation time. (4) Vivid and plentiful content: Multimedia technology includes not only audio and video, but also simulation animation, which is easy for trainees to understand the contents of the safety management and to mastery the process of incident management. At the same time, the amount of information contained in the technology is far greater than the human brain and textbooks and as the courseware knowledge refined and updated, the content is also increasing.

87.4.2 Analyzing the Benefits of Multimedia Animation Courseware Training Model

The biggest advantage of the multimedia training is that it significantly reduces the training costs. Traditional manual on-site training causes high traveling, accommodation, and tuition fee, etc. Similarly, retraining and training new staffs will also confront with such high expenses. In contrast, multimedia animation courseware only requires a single large number of inputs and a small amount of post-maintenance that can generate reusable training content. Thus, multimedia animation training has impressive efficiency in saving financial cost and time.

176 people were trained and assessed in Guangzhou branch office for a four months' multimedia training, including the content of theoretical knowledge and simulation field. In accordance with each person to complete a five-days training, the multimedia training saved the cost of 176×120 Yuan/day $\times$ 5 - days = 105,600 Yuan exclusive of the traveling fees. Currently, there are 337 staffs who are engaged in security management in Guangzhou branch office with 15 training days per person (including training new employees, assessment and the training for updated technology), the annual cost savings = 337 people $\times$ 15 days $\times$ 120 Yuan/person days = 606,600 Yuan.

87.4.3 Outcome

Achieve continuous application of management based on knowledge interaction and makes a great effort on training, independent study, online assessment, and professional research. The training technique also continuously improves and forms the norms, standards, and system on security management staffs' online training, learning, assessment, and evaluation.

The project results are classified by professional skills and functions and promoted in the form of online interaction, DVD and training materials with 32 teaching hours and 39 video animations.

87.5 Conclusions

In conclusion, the paper brought up the power dispatch security management training approach using multimedia animation techniques which is based on the analysis of the weakness of traditional manual training methods. In practice, the project makes full use of the multimedia animation techniques and computer technology which optimize the power training structure. Thus, the training techniques help power staffs to better understand knowledge so as to achieve the purpose of in-depth understanding of professional knowledge and quickly upgrade

security management capabilities. In addition, in order to improve the construction of training system, the project will be published as follow-up training materials to better promote and apply.

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Chapter 88
Power Dispatch Communication Training Based on Multimedia Animation

Ying Wang, Bingbing Liao, Ying Zeng, Zanhong Wu and Quanchao Zheng

Abstract In recent years, with the rapid development of electric power industry and electric power knowledge, it has become the top priority task to make the electricity staffs to master the power professional knowledge. Through investigation and analysis of the status of electric workers and staff training in recent years, this paper brings up a training approach based on multimedia animation in order to solve the problems of high cost, poor efficiency, and effectiveness. This paper aims to construct an electric power training system based on multimedia animation technology to reduce the training cost and improve training effect. In the implementation of a power bureau, the use of multimedia animation training has achieved better results.

Keywords Multimedia animation technology · Power dispatch communication · Staff training

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88.1 Introduction

Power grid enterprises are technology-intensive where the scientific progress and technological innovation has a particularly important role in grid security, stability, and economic operation. With China's economic boost, the growth trend is running from resource-intensive to technology-intensive and the traditional industries are facing the needs of upgrading and transformation. In the power industry, it is required to provide secure, stable, reliable, diverse, and personalized services while demand for power supply is growing. As a result, investing in human resources is of strategic significance for the grid enterprise development since there are issues to be solved in the quality and structure of manpower pool in grid companies.

The electric power communication network ensures the safe and stable operation of the power system and it is known as the one of the three most important guarantees of power system security and stability. Additionally, the electric power communication network is the foundation of power grid dispatch automation, online market and management modernization and the significant infrastructure of to ensure power grid to ensure operation's safety, stability, and economic operation. Most power companies in the world, which obtain the resources to develop communication technology, have constructed their own power system communication network due to the requirements of reliability, speed, and accuracy of information transmission. Therefore, to strengthen the knowledge and training of staffs' power communication is imperative under the rapid development of communication technology in the electric power industry.

Computer technology and multimedia technology have become part of everyday life in modern society. With the computer multimedia technology, especially the continuous development and integration of training technology, multimedia power dispatching and communication training has become the main technology of the modern power industry personnel's training. Multimedia power training is under rapid development and its advantages of advanced technology and powerful functions represent the trend of the development of modern education and training.

88.2 The Features of Power Dispatching and Communication Multimedia Animation Training

Multimedia Technology applies computer text, graphics, images, sound, animation, video, and other information processing to achieve the establishment of logical relations and human–computer interaction technology [1]. Multimedia technology is widely applied in various fields as well as in the field of training. The training practice shows that the application and promotion of multimedia technology helps to improve training efficiency ease the problem of the lack of and trainers and increase the training techniques [2].

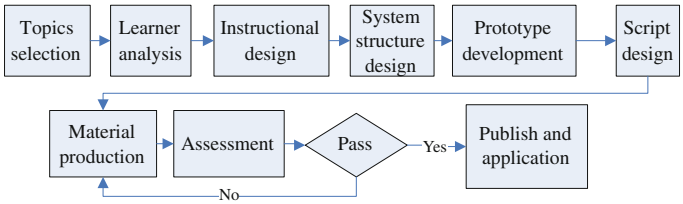

Fig. 88.1 Production processes of multimedia animation courseware

Multimedia animation techniques are widely used in advertising and news industries, which give the audience a stunning visual and sound effects and clear understanding of the expression of animation [3–5]. Multimedia animation techniques have the following advantages compared to and traditional training techniques: (1) transform the traditional teaching methods and visualize the abstract knowledge, motivate the trainees' interests on learning; (2) visually demonstrate some processes which are hard to observed in normal conditions; (3) increase the amount of information, training hours and teaching efficiency.

The production of multimedia animation courseware process is generally divided into the following sections: (1) topic selection, which are selected from the representative issues of power dispatching and communication professional knowledge; (2) instructional analysis, instructional design, system structure design, prototype development, script design, material production, assessment evaluation; (3) publish and application of the test. The detailed processes see Fig. 88.1.

The power industry is ongoing a rapid development and technological revolution which increase the demands on staffs' quality [6]. The fast updating and high complexity of electric power communication knowledge makes the staffs with low education, therefore, enhancing the training is the only way to solve this problem. The structure of power dispatch communication professional knowledge training system is shown in Fig. 88.2, in which the dispatch communication professional knowledge system is divided into six modules, namely standards and

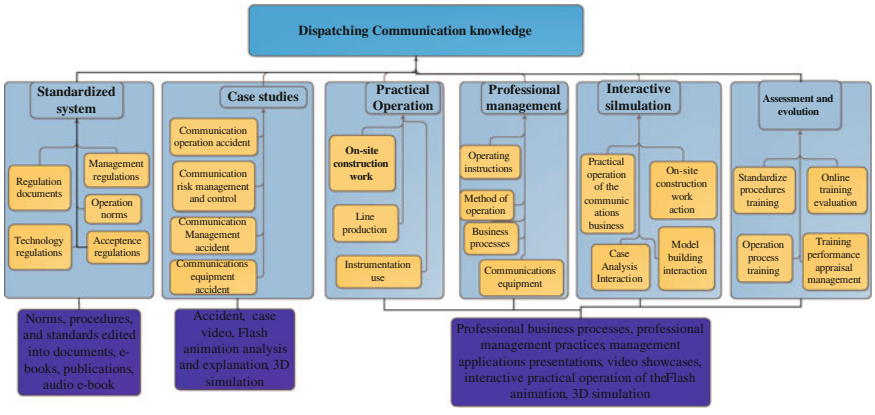

Fig. 88.2 Structure of dispatch communication professional knowledge system

regulations, case studies, practical operation, professional management, interactive simulation, examination and evaluation.

The use of multimedia animation and computer technology enrich the power dispatching and communication training, mobilizing the trainees' learning enthusiasm and motivation. The power dispatch and communication training helps to create a relax power training environment, so that the training effect will be greatly improved. The power dispatch and communication training has the following features compared with traditional training.

88.2.1 Conducive to Knowledge Acquisition

Multimedia power training effectively transform the knowledge into a visualize form and the interactive training combine the training content with the trainees' knowledge which helps the trainees to capture the training content, thus motivate the trainees' learning enthusiasm [7]. Moreover, multimedia power training reproduces the scene and demonstrates the knowledge visually to achieve the vivid training effect by the combination of sound and visual effects.

88.2.2 Conducive to Personalized Power Training

The traditional training is teacher-centered, ignoring the independent development of each trainees and trainees' personality is ignored with the same training content and exercises. Multimedia power dispatching and communication training makes the personalized training possible in which the trainees can obtain the knowledge more easily and thoroughly.

88.2.3 Conducive to Improve the Quality of Power Training

Multimedia animation presents power training content from multiple perspectives which thoroughly break down the complex knowledge, reduce the information processing and conversion, thereby greatly enrich and enhance the performance and appeal of the training. Moreover, using multimedia animation helps to achieve multi-channel information input and construct staffs' knowledge, improve the efficiency of training and reduce training time.

88.3 Characteristics of the Multimedia Power Training Courseware

In order to better promote the application of multimedia technology in the power dispatching and communication training, we should change the traditional training idea, training mode and training methods in line with the actual situation of the employees in electricity industry. It is also urgent to develop a set of multimedia technology-based electric power dispatching and communication training courseware to enhance the training effect of power dispatching and communication knowledge.

The structure of power dispatching and communication knowledge animation courseware is shown in Fig. 88.3, where the courseware demonstrate the tedious power dispatching and communication knowledge by e-books, video, 3d simulation, flash animation, flash interactive animation, etc.

This project combines a variety of multimedia technology to produce combining electric power dispatching and communication knowledge courseware which is relatively rare in the industry. Additionally, this project covers the advanced mainstream multimedia animation techniques and has the following unique advantages:

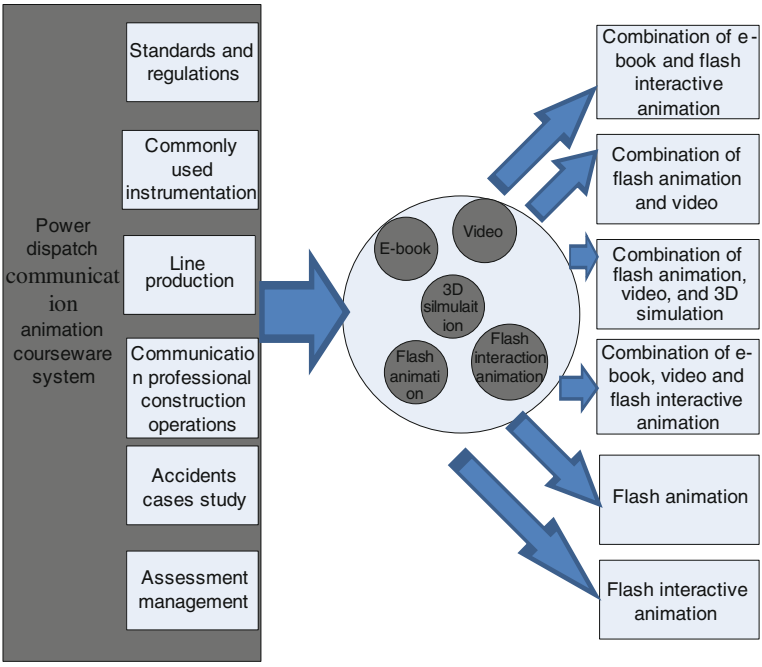

Fig. 88.3 Animation courseware system of power communication expertise

88.3.1 To Ensure the Safety of the Trainees and the Power Grid

Multimedia technology provides convenience and advantages for the training in power grid operation; for example, the multimedia courseware produces a risk-free, low economic loss experiments and operation training through simulation. The courseware has the similar with real experiments and operations and the simulation courseware is reusable and can be repeatedly used as risk-free and low economic loss experiments and operations, which is an efficient approach for training. If the operations of training may be cause risks and economic losses will be not allowed in power grid operation.

88.3.2 Easier to Understand the Basis of Theoretical Knowledge

Using multimedia animation techniques in power training helps trainees to better learn and understand the basic theoretical knowledge. Animated courseware demonstrates by text and pictures create an in-depth explanation by audios and complete revision questions by human–computer interaction. Hence, the training knowledge is absorbed more quickly and easily. The courseware also combined with a variety of multimedia technology, such as e-books, flash animation, video, 3d simulation and human–computer interaction technology in order to enhance learning effect.

88.3.3 Absolute Advantages in the Practical Operation Teaching

The multimedia training courseware is able to simulate the use of various instruments actual construction process of power dispatching and communication. For example, in the power dispatching and communication, we often need to use the test equipment and to produce a variety of communication cable, and if the staffs only read the operation documentation, operation instructions or even there are pictures for the actual operation, the operators may not quickly grasp the key operations. The multimedia technology demonstrates the whole operation process, which helps the trainees understand the training content and techniques easily so that the operators will reduce the chance of disoperation and material loss to achieve cost savings.

88.3.4 Systematic

Currently, the power dispatching and communication training of is short of corresponding teaching materials and courseware, especially for the existing and new power dispatch communication equipment where the e original supporting training courses cannot meet the demand for technology development. For these reasons, the existing training courses do not use the published materials, instead, the trainers write their own courseware for training. These scattered courseware as a teaching material has many drawbacks the bottleneck of the training development. To solve the above problem, multimedia animation training arranges animation courseware and forms the systematic training programs through the development of training plan.

Multimedia animations training courseware also constructs the management platform and establishes an upgrading and maintenance team: the maintainers maintain the normal operation of the platform, and verify the accuracy and real-time of the knowledge, the operators can modify the working steps and methods according to the latest construction process.

88.4 Applications

88.4.1 Multimedia Animation Courseware

This animated courseware is produced using a variety of mainstream multimedia technology; in the actual animation courseware production process the producers often combine a variety of animation techniques, which contribute to demonstrate the knowledge from multi-dimensions. There are various ways of the combination of multimedia animation techniques, such as flash animation combined with video. For example, the communication professional construction operation courseware, which uses e-book combined with flash interactive animation and video and 3d simulation technology, its features are as follows:

(1) Illustrations of content explanation; (2) Explaining the use of instrumentation by hyperlinks; (3) Human–computer interaction test; (4) Embedded functional test video explanation.

88.4.2 Multimedia Animation Effect

88.4.2.1 Reduce Training Costs

The implementation of multimedia animation technology training in the pilot power supply bureau multimedia animation technology has achieved good results, where was a increase in trained personnel's technical level, the training costs were

greatly reduced and thereby improved the economic benefits of the power supply bureau. The traditional training cost in the pilot power supply bureau including hiring lecturers, venues, accommodation and travel expenses, and the high cost of training new employees, new business and the new technology update. Hence, the cost of traditional training is increasing year by year. The preliminary statistics shows that the growth rate is 20 %. The pilot power supply bureau's traditional training expenses curve is:

$$y = 70 \times \left(1.2^{(x-2009)}\right) \tag{88.1}$$

where x is the year and y is the training expenses. Whereas multimedia animation training costs, including the courseware production and modification costs and new animation courseware production costs. Within all the expenses, only the first production cost the largest amount of money and it is one time input while the new content and upgrading of the animation courseware production costs will increase each year, and the preliminary statistics shows that the growth rate is 20 %. In the power bureau, the training cost of the multimedia animation expenditure curve is:

$$y = 20 \times \left(1.2^{(x-2009)}\right) \tag{88.2}$$

When $x = 2009$, $y = 80$; when $x > 2009$, $y = 20 \times (1.2^{(x-2009)})$. where x is the year, y is the training expenses. The following table shows the costs of the two training approaches and the follow up expenses in the next 2 years of the pilot bureau.

Table 88.1 shows that from 2009 to 2014, the pilot power bureau spent 6.94 million Yuan and 227 Yuan respectively on traditional training and multimedia animation training, the former one is more than three times as much as the latter one. Moreover, the multimedia animation training's advantage on costs appears more remarkable in the following years of usage.

Below is the comparison of the traditional training and multimedia animation training expenses based on Table 88.1 comparison chart.

In Fig. 88.4, we can see that in the pilot power bureau, the cost of traditional training is rapidly rising year by year whereas the multimedia animation training costs is high in the first year due to expense on animation courseware production but the cost is low in other years and it is much less than traditional training costs.

88.4.2.2 Improve the Effectiveness of Training

The assessment method of multimedia animation training is incomparable with the traditional assessment methods. The assessment of multimedia animation training randomly selected topics from thousands of questions on the training platform which involve extensive knowledge, abundant content and display forms. The traditional assessment can only tested through paper-based assessment while multimedia animation training combined with computer technology; manage

Table 88.1 Costs in each year

Years	Traditional training costs (10,000 Yuan)	Multimedia animation training costs (10,000 Yuan)
2009	70	80
2010	84	20
2011	100	24
2012	121	28
2013	145	34
2014	174	41
Total	694	227

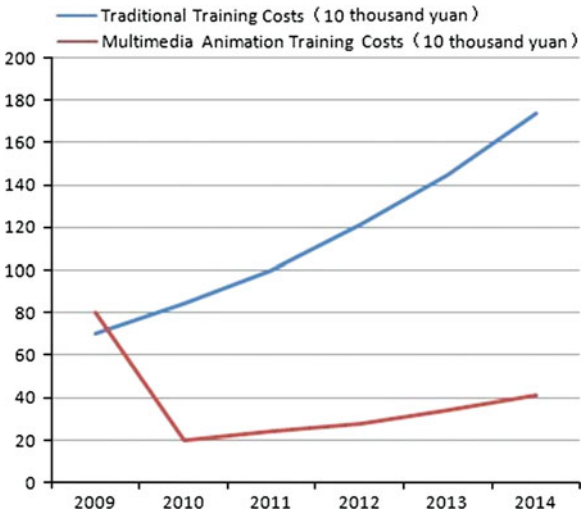

Fig. 88.4 The costs of training implementation in the pilot bureau

assessment questions through training platform. The assessment is integrated of multimedia animation that the assessment questions are displayed in various forms, including traditional examination questions, animated action response questions, and questions and answers with animation. Through the study of the implantation of the training in pilot bureau, we can observed that the participants absorb and mastery new knowledge more easily and their practical operation skills are enhanced greatly.

88.5 Conclusions

The paper put forward a multimedia animation technology-based power dispatching communication professional training system through the analysis of the weaknesses of traditional training system and the demand of power dispatch development and

training. In practice, the use of multimedia technology optimized the training structure system which therefore helps the learning and understanding of knowledge for trainees.

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Chapter 89
National Geological Map WebGIS System Based on MapViewer

Yi Xiao, Yuxin Li and Qun Wang

Abstract To realize the Internet service of geological map, a online WebGIS service system with lightweight small-scale geological map was designed and realized which is based on the Oracle Spatial and MapViewer, combined with JQuery programming technology. This system realized multisource heterogeneous spatial data integration. Through the WebGIS system, the user can inquire and browse the different medium and small-scale geological map by using the IE browser, without the installation of GIS system.

Keywords WebGIS · Oracle spatial · MapViewer · Geological map

89.1 Introduction

There is a large number of geology map information in China. It is hard to share with the public because of the professionalism of GIS map. To adequately share this geological information, it should make use of the distributed database technique, WebGIS technique, standards-based Web service, data exchange and data

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transmission of cross-system and cross-platform, metadata, website design, and standards-based interoperability technology, etc [1]. In order to make the GIS more flexible, the system provided the function of data reviewing, data query, and data analyzing, through the Internet to publish data. The user can only set up the IE browser, and they can search and browse the related geological information according to the online service system for national medium and small-scale map with lightweight B/S model which were designed by using Oracle Spatial and MapViewer.

89.2 Introduction for the WebGIS Technique

WebGIS is the production of Internet technology and GIS technology. The traditional GIS become truly popular tools by using the Web. The user can browse and visit the WebGIS spatial data from any node of network, and do any spatial index and spatial analysis, so that the GIS find its way into every family.

89.2.1 WebGIS

At present, the WebGIS which is based on Internet technology has already become the important development direction for GIS. Compared with the traditional GIS software, WebGIS has the following features:

(1) Wide range of access. Because of the Web's advantages, the management of distributed data sources is easier to achieve for WebGIS, and users can visit the multiple GIS data from different servers at the same time.
(2) Platform independence and simplicity of operation. After using the common Web browser, users can independently visit the WebGIS data and will not have much concern for which machine and GIS software to use [2].
(3) Fully utilizing the network resources and simplify system deployment. The operation of complicated system deployment can be finished on the server, and the client can do business process by using the Web browser, which can reduce workload of system deployment and maintenance.

89.2.2 Commonly Used WebGIS System

The current WebGIS constructions use the three layers structure of data access layer (DAL), business logic layer (BLL), and user show layer (USL). The USL can do the geographic spatial data query and provide the result through webpage for users on the running of the IE browser. The BLL will transfer the HTTP requests

from the USL to retrieve commands and inquiry commands for geographic spatial data, referring the commands to the DAL, and referring the result which returned by DAL to the USL. The DAL is used to geographical spatial data input, storage, and query. There are mainly three types of products:

(1) Commercial software, such as ArcGIS Server, MapGIS IMS, etc. Those softwares have mature technology and functional integrity, but the price is too high.
(2) Open-source projects, such as Geo Server, Open Map, Map Server, Map Guide, etc. Those systems are different technical standard, which cannot guarantee mature technology, functional integrity, and completely free.
(3) Free WebGIS for conforming to OGC standard, such as the MapViewer of Oracle, which have mature technology and functional integrity, and basically free.

89.3 The WebGIS Based on MapViewer

89.3.1 Introduction for MapViewer

The full name of MapViewer is Oracle Fusion Middleware MapViewer. MapViewer is a free middleware [3] which is convenient for users of the Oracle Spatial database to develop GIS software. Cooperated with Oracle Spatial space database, the MapViewer run on the server as a service that can provide some functions for users, such as spatial information release, presentation graphics, personalized retrieval, etc. (as illustrated in Fig. 89.1).

89.3.2 The Release Process for Map Based on MapViewer

The WebGIS uses the MapViewer middleware to edit and define the geographical spatial data from the existing Oracle Spatial database of the Data layer, defining the display style and display mode for each layer with the user's browsing habits. It will break the limits of the scale, and all layers in the geological database will be uniformly edited to an individual FOI or a Tile. Through the response of the JavaScript API from the USL, the MapViewer will select qualified layer from the DAL, and referring the result to the USL, so that the MapViewer can realize the fusion for browsing the geological data.

Oracle Maps is the name for a suite of technologies provided by MapViewer, which mainly include map cache service, a feature of interest (FOI) service, and an Ajax-based JavaScript mapping client API.

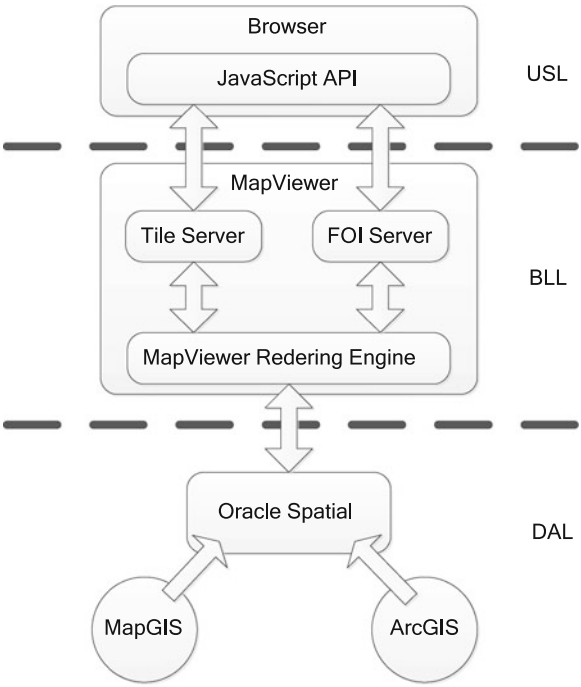

Fig. 89.1 The system framework based on MapViewer middleware

FOI Server. The map consists of some themes. These themes describe the different geographical objects, such as geological body, fault, etc. The map is formed from the superposition of these themes [4].

Sometimes, users need some layers they are interested by separately displaying instead of a range of themes by one-off display, such as contour and fault. These themes displayed separately are called a FOI. According to the request of users, the FOI server dynamically processes the information from the spatial data table and describes it.

Map Tile Server. Tile, namely the Tile Map, is a collection of pyramid static grid picture under the quad tree index, and it is formed by the themes according to the set representative fraction and zoom level in an orderly fashion. Tile popularly processes the static background map, which can pregenerate the map tile in order to improve the efficiency. Map Tile Server will produce static tiles according to application requirement, saved in the file system in the form of file, used by the host application servers, and shared to all users. Because of pregenerated and cached Tile, the client users can experience fast map viewing browsing performance [5].

89.3.3 Map Builder

Map Builder is a build tool for lightweight map, which can accomplish the map building based on Oracle Spatial, including building map symbol, defining appearance regular for spatial data, creating, or editing MapViewer object [5].

Spatial information in database is stored in the form of Point, Line, and Polygon. You can use Map Builder to define the pattern of these geometric primitives as required, including color, signs, map symbols, etc. You also can use Map Builder to manage and describe different spatial objects according to the different themes, such as geological body, contour, fault, etc. Users can select the data from map they needed through themes and the interaction between user and map will be more efficiently.

89.4 On MapViewer to Design the National Geological Map WebGIS System

89.4.1 The Small-Scale National Geological Map

Geologic map is with certain drawing principles by all kinds of geological characteristics boundaries, characteristic, occurrence, geological structure, and meaningful geological phenomenon. Geologic map has an important mean of displaying geological achievement, and is an important basis data for geological exploration.

The scale of the geologic map: 5,000,000, 1:2,500,000, and 1:1,000,000 mainly reflected the achievement of regional geological survey and geology for comprehensive research in China. As the production standard could not be unified at that time, the formats of geological data for different scales (including 1:5,000,000, 1:2,500,000, and 1:1,000,000) are MapGIS 6.5 and ArcView 3.1.

To solve the problems of multisource heterogeneous spatial data, this project had taken a method of uniformly integrating in DAL, using the MapGIS and ArcGIS to do some operation for original geological data, such as merging data, format conversion, and conversion process for projection [6], the geologic data will be converted to a SHP file of the Mercator projection at last. Then with the Map Builder we can directly import these files to Oracle Spatial database, and each SHP file corresponds to a table in the database.

To display the eventual geologic data to users, the system also need to define the eventual style. In the Map Builder, you can define the display style of point, line, and surface as required.

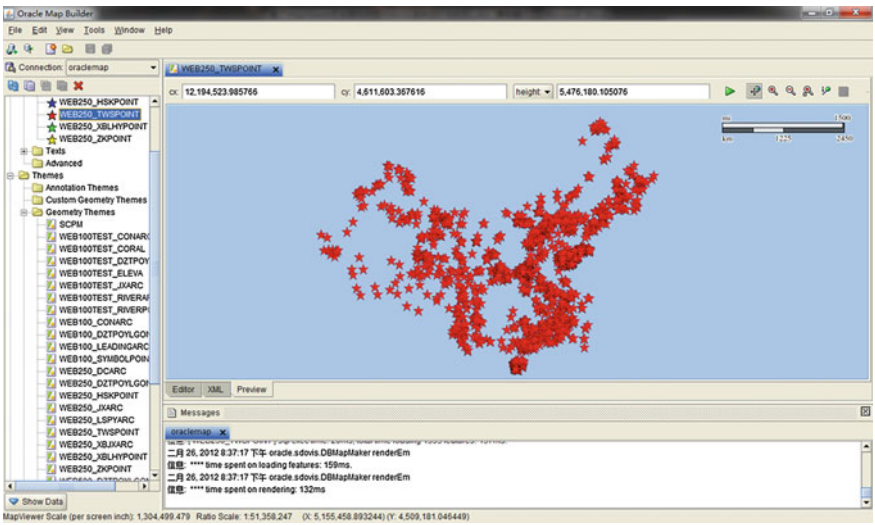

Fig. 89.2 The definition for isotope layer of FOI

89.4.2 The FOI Format of National Geological Map Layer

After importing data to the database, the system made these geological layers' point, line, and surface into FOI and displayed the geological data as defined, and the FOI provided the rule for which data should display in which way [4]. Users can see the FOI attached to the geographical base map. FOI realized the function of information extraction by clicking operation, and it is very convenience for users to consult.

Take isotope layer of FOI for example, it provided the display format of table WEB250_TWSPOINT (1:2,500,000 isotope tables) as "red star" in Map Builder, and the rendering as follows (Fig 89.2):

89.4.3 The Map Tile Format of National Geological Map Layer

To get the relevant geological data easily while displaying the geological spatial data, the system would use the Google Maps to display the geological data on the USL.

To improve the online display speed for geological body layer, it displays with the Map Tile format. After defining the geological body layer of FOI, it makes the Map Tile by using the data from the 19 level system of Google Maps. Meanwhile, it can directly get the information of geologic body by using Json.

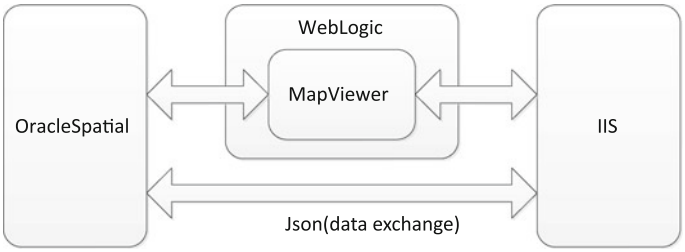

Fig. 89.3 The system architecture of website

89.5 Based on MapViewer to Realize the National Geological Map WebGIS System

89.5.1 Website Construction

This system is an on-line service system for lightweight Web GIS geologic map, grounded on the framework of the technical system of Oracle Spatial and MapViewer. The data resource of this system is Oracle Spatial data. The MapViewer middleware can provide a rendering service of graphical geological data to the website's foreground, which is running in the IIS. Meanwhile, through the function of fast geological information extraction by using Json technology, the system realizes the on-line query service of small-scale geologic map. The website's technical framework is as follows (Fig 89.3):

89.5.2 The Management for Website Running

Under the system structure of this website, the operational maintenance of foreground can be carried out by IIS. By entering the webpage of http://127.0.0.1:7001/mapviewer, the middleware layer can accomplish the management and maintenance of the system through MapViewer console, such as cache settings and data resource binding. The data resource layer can accomplish the definition of data format, follow-up data import, etc, by means of the visual spatial data management tool from Oracle Company.

89.5.3 Results

This website realizes the following main functions: Online presenting geological data, information extraction, searching for spatial data, etc.

89.6 Conclusions

A map Web servers design method is presented in this paper, which is based on Oracle Spatial and MapViewer. This method can realize the fusion of spatial data from multiple formats and multiple resources. This method also can provide the lightweight medium and small-scale maps for common Internet users. Moreover, by observing the OGC standard, this map service has good expandability. In order to realize a better geological map online service, the next working scheme is to extend the GIS data and distributed deploy.

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Part X
Multimedia Technology and Applications

Chapter 90
Study on Characteristics of Sports Network Course

Xiaoli Zhang

Abstract The sports network courses with interactivity, openness, collaboration, personalization, hypertext, multimedia, and other features. These features and physical education teaching combination make sports teaching more efficient, so the network Physical Education Curriculum is an important aspect of sports teaching Development. By analysis of the sports network curriculum teaching resources, building a sports network curriculum website, and students through online learning and evaluation to improve the construction of online courses and make the sports network curriculum as a supplement in sports teaching.

Keywords Sports · Network courses · Resources · Evaluation

90.1 Introductions

Online courses is the sum of the network performance in a discipline, teaching content and implementation of teaching activities, courses, and new forms of expression under the conditions of the information age. It includes teaching objectives, teaching content organized by teaching strategies and online teaching support environment. Online teaching support environment specifically software tools to support online teaching, teaching resources, and teaching activities on the network teaching platform. Network courses with the basic features of interactivity, sharing, openness, collaboration, and autonomy.

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It should be noted that the teaching includes teaching resources, online courses should include the teaching resources, including (at least, should include some teaching resources); only involved in the network program is not an ideal textbook (or at least incomplete) network courses. However, in the actual development process, in order to facilitate the work (such as division of labor or parallel operation needed) sometimes independent teaching resources and even tied it with the network courses—known as "network programs and network resources". However, this time should pay particular attention to: this distinction is only needed for the development of online courses and original of network resources should be included.

Computerized, digital, network into the main features of a new era of education is the development trend of the twenty-first century education; information technology has become the only way to achieve leapfrog development of the school. Foreign network courses start earlier, in 1989, the Educational Research and Discovery Center of Economic Cooperation and Development (OECD) issued a research report on the application of computer of the Member States to improve teaching, entitled IT in education. According to statistics, the United States assisted instruction software development has over 10,000 kinds of aided teaching software in Australia, France, Canada, Italy, and the United Kingdom between 1,000 and 4,000 kinds, and these figures are continuing to increase. Due to the particularity of the sports disciplines, worldwide achievements of the Institute of Sports Network Course are not a lot.

90.2 Characteristics of the Network Course

90.2.1 Interaction

One-way transfer mode in online teaching, online courses have changed in the past books, newspapers, and other printed information as well as radio and television, and other electronic information, network information carriers with two-way transfer function, this two-way communication can be synchronous and asynchronous. Learners can receive education teachers came through the Send E-mail, or teachers in the form of real-time chat, information feedback to the teacher teaching; teachers feel free to send information to students to constantly adjust and improve teaching, to promote the teaching [1]. Same time, learners can also be the publisher of the network information, can improve learners' active participation in the enthusiasm and sense of accomplishment, but also that a wide range of evaluation may be.

90.2.2 Opening

Network courses, due to technical breakthroughs in time and space constraints, show great openness. Learners at any time, any place to accept any network learning, the school has grown from a walled entity into a global coverage of the knowledge network. The online courses will not only open on time and space, it is open to all individuals; the individual would not have been shut out due to factors such as age, gender, race, open education in the true sense.

90.2.3 Collaboration

Learning supported by the network better reflect the advantages of collaboration. Network groups administrator (usually the teacher) as the dominant figure in the learning process, to guide, promote, help members of the group's collaborative learning, collaborative learning among its members to strengthen the cooperation between the learner the same ability and spirit of exploration, not only deepening the understanding and knowledge to master the use of great benefit, but also improve the ability to interact with the network classroom, abandoned the traditional classroom in a simple man–machine "stimulus response" interactive form. It has significant role in promoting the formation of the cultivation of the spirit of cooperation and good interpersonal.

90.2.4 Personalized

In the fully open network, the learners according to their needs, retrieve study subjects. In each subject has a wealth of learning resources, learners combine the learning situation, there are cognitive level, and learning characteristics, learning to adapt learning resources, self-paced learning through the network. They are not subject to the control of the mainstream culture and consciousness, according to their own experiences and perspectives to understand the knowledge to develop their personality, and development of innovative thinking.

90.2.5 Hypertext

Hypertext in online courses breaks the traditional textbook organization, logical, linear sequence structure, non-linear, non-structure, the mesh structure of the teaching materials, which is consistent with the association characteristics of the human mind, more in line with human thinking the characteristics and reading habits.

90.2.6 Multimedia

With the development of technology, network program can provide a set of video, audio, audio–visual technology as one of the online learning environment for learners richer, more realistic, more intuitive, and interactive forms. External stimuli provided by Multimedia are in favor of obtaining and maintaining the knowledge, the creation of the problem scenarios, and thus stimulate thinking inspiration to promote the cultivation of creative thinking.

90.3 Sports Network Construction of Teaching Resources

Teaching resources cannot be simply interpreted as PE Textbook electronic version, the network; it is important embodiment of the concept of practice teaching a lesson teaching video over the network to reproduce the physical education teachers teaching process. Construction of sports network curriculum teaching resources include teacher resources, teaching documents, and multimedia resources. Teaching file materials [2], syllabus, teaching calendar, lesson plans, lecture notes and exercises. Multimedia resources usually have a teaching video, courseware, video of student competitions, and major events video. Teaching resources focus to consider the systemic requirements of the sports network curriculum: with independent learning, personalized learning, interaction, practice, knowledge point, the consolidation exercise, knowledge query related Resources, and online examination module.

90.4 The Construction of the Sports Network Course Website

The emergence of multimedia technology, network technology, and the advent of the digital information era to modern teaching had a profound influence and impact on the traditional mode of teaching, teaching ideas, causing changes in teaching methods, and teaching methods. Building courses network teaching documents, teaching video [3], multimedia courseware, exercise library, event organization, and the Magistrates' organic integration, design network courses system, greatly facilitates the learning of the student sports knowledge to meet students' diverse sports and cultural needs. Improve the consciousness of the student exercise, physical exercise science; promote the formation of students' lifelong fitness awareness.

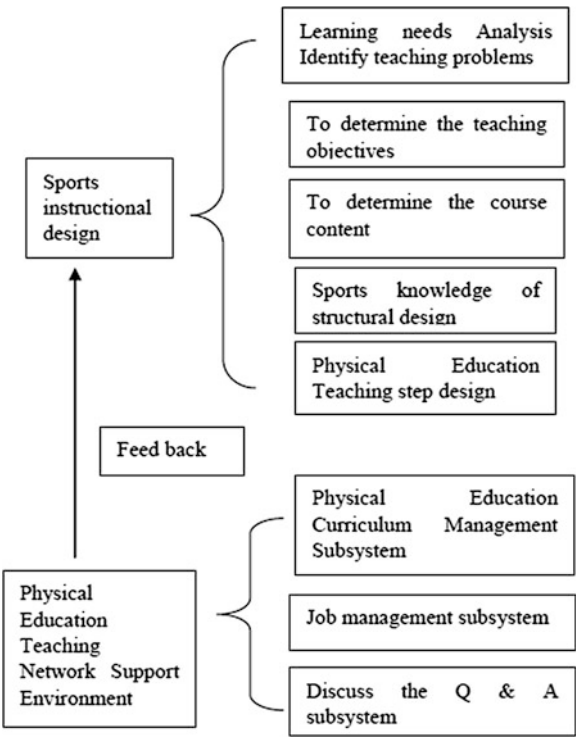

Fig. 90.1 Students' online learning sequence figure

90.5 Sports Network Curriculum Development Process

Sports network curriculum development in China is still in its infancy. Currently, online course development is generally divided into two modes, one teacher group mode, and the second is the commercial production model. The former focus only on the development network program on the instructional design while ignoring the development of online courses is also a system of software engineering, the lack of software engineering, design ideas throughout the entire network curriculum development, this model is also a direct result of the opening up of the online courses, collaborative and interactive capabilities are not strong; the latter with a strong commercial flavor, insurmountable barriers to profit maximization, to focus only on teaching materials, lesson plans online "move"; lack of advanced instructional design thinking, effective teaching organization of content and teaching activities, and ultimately dilute the realization of the function of network teaching. Taking into account these two modes of defects in the development process, as well as the sports network programs to achieve the characteristics of distance learning [4], I will combine modern distance education resources, building the technical specifications issued by the Department of Higher Education on Modern Distance educational resources system architecture diagram, the

network curriculum development processes, software engineering, design ideas, a considerationsports instructional design principles and Education Support Environment Sports network curriculum development model Fig. 90.1.

90.6 The Feedback Network of the Way of the Sports Network Teaching and Learning Activities

Exchanges between students and teachers and curriculum evaluation are the main form of feedback in teaching activities [5]. One of the features of online teaching is teachers and students in teaching and learning activities are not necessarily face to face, in this case, timely feedback of the process of teaching and learning activities is to ensure that online teaching is smooth and effective.

The timely exchange of teachers and students is an important part of teaching and learning activities. In the form of classroom teaching, the exchange of teachers and students has always been throughout the teaching process. In the form of online teaching, teaching and learning both sides finish teaching activities through the network when exchange is completed through network technology. In physical education, in particular, the timely exchange of teachers and students is particularly important in the teaching of technical subjects. Teachers in a timely manner "Inspiration", especially "hands-on coaching" is a very important role in the

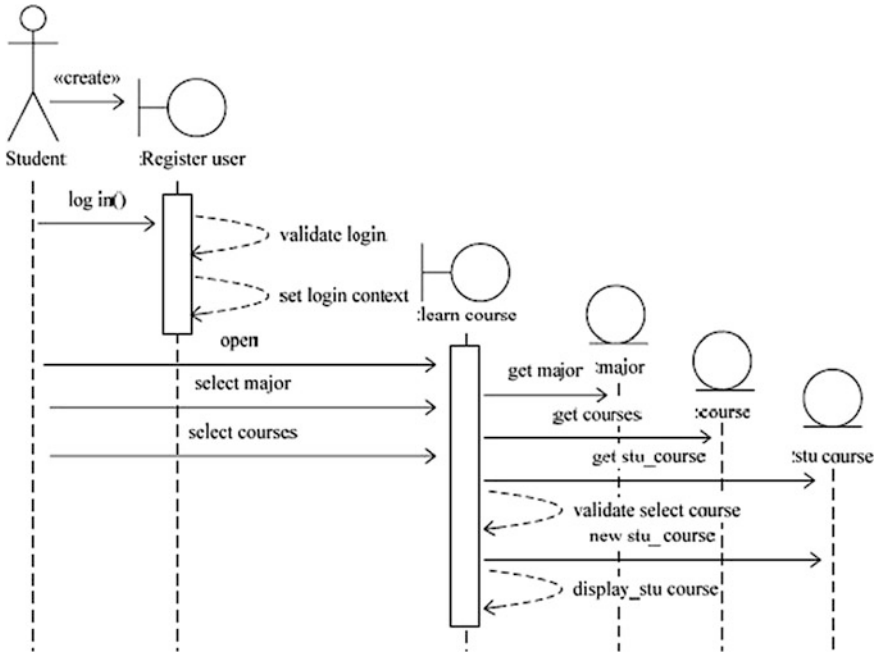

Fig. 90.2 Students learn the curriculum sequence diagram

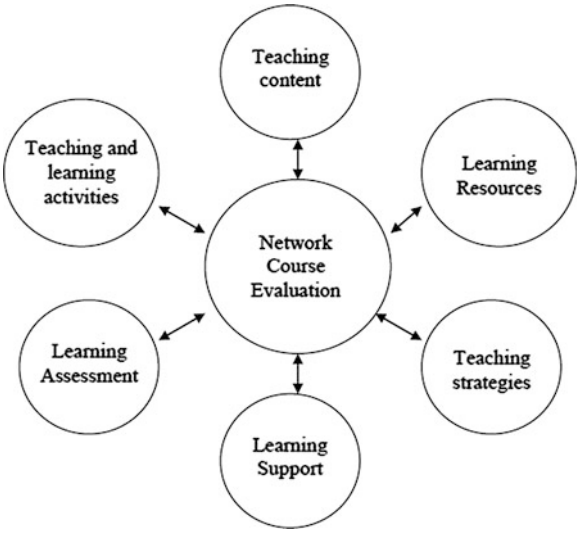

Fig. 90.3 Network course evaluation model

formation of the students on the proper motor skills, the teaching and learning interactive forms cannot be achieved "Inspiration".

School students through online learning modules, teachers ready courseware into the online course software system, students can conduct online learning, students' online learning sequence shown in Fig. 90.2. Students according to their needs through the network related courses of study [6], students applying for the program must first verify landing system, verification student status verified by the students to choose their professions, open the form of the professional courses, and then choose to learn the start of the course of independent learning.

90.7 Sports Network and Curriculum Evaluation

Network Education College Network courses training institutions marked by the appearance network education in China has entered a new stage of development. Sports Network Education and the fast pace of development in China's can be described as amazing! In addition to more than 40 colleges and universities identified by the Ministry of Education for pilot institutions of modern distance education, the field of basic education and some business units have been running a Web-based learning and training for students at different levels. How to evaluate the quality of online courses is to be the focus and not yet authoritative network of curriculum evaluation criteria. Many scholars have put forward their point of view, the formation of different evaluation criteria, but their starting point and the angle of thinking are different, the various evaluation criteria cannot be integrated, it is difficult to be a unified form, standardized criteria. Based on the above analysis, and based on the definition of online courses, we have established a network curriculum evaluation model established six dimensions of the evaluation Fig. 90.3.

90.8 Summary

Development of human resources through education, improvement of the people quality, has become the most important issue of education. Implementation of quality education for the twenty-first century challenges and educational status, strategy, implementation of quality education is the necessity of the social development and education reform today. Quality education for rational guidance, reform of the PE curriculum is the key to the quality of talent that school physical education to promote the healthy development of students. The current education situation, through the education of PE, combined with modern educational technology, clear the relationship between quality education and university sports network curriculum, reform the direction of development of university sports programs and the need for the course of the PE network in order to cultivate high-quality twenty-first century sense of innovation, spirit of innovation, the innovation capacity of sports talents.

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Chapter 91
Positioning Method for Automated Warehouses Based on RFID

Xiaoli Zhang

Abstract Students in the physical and mental development from immature to mature transition period, adult sense of enhanced self-control and self-regulatory capacity is weak. Their behavior is susceptible. The spread of junk culture in the network will lead to the Students' Value conflicts, diversification of its value orientation, thus weakening the educational function of the mainstream ideology on the students. Computer radiation, reduce the movement of time, such as Internet addiction has been seen as a threat to physical and mental health of the Netizens of the three major issues. With the dramatic increase in the number of Internet users and Internet users is increasing reliance on the Internet, the Internet syndrome has become a universal problem. Recommended that the departments concerned to correct the motivation of college students' access to the Internet, vigorously improve the quality of the network for the educators, while strengthening the university students' physical exercise time and projects.

Keywords Network · Physical health · Mental health

91.1 Introduction

As mankind enter the information age, the network in its own way involved in all areas of society. Students with a personal computer ratio has increased steadily, many colleges and universities have been established in a student dormitory Internet. It can be said that the development of networks and the growth of

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contemporary college students are inseparable. On the one hand, the network can induce the students to understand the enormous power of the knowledge-based economy, the desire and pursuit of scientific and technological development, an active part in the learning atmosphere, and strive to put their training to become a moral integrity and ability of college students; very rich, network information, college students physically and mentally is not fully mature stage, easy to indulge in some virtual online world, in real life, malaise, loss of self, seriously affecting the normal school life, abandoned their studies.

College students are the hope of the country, the future of the nation; their healthy growth and sound development have to do with people's livelihood. I play as a work of educators in the first line, direct-to-student class post, over the year's student has in-depth insight into their personal development tendency. To actively explore the impact of networks on the Health of University Students has great significance.

91.2 The Effect of Network on College Students

The students are physically and mentally in the development from immature to mature transition period, adult sense of enhanced self-control and self-regulatory capacity is weak. Facing this network tool with a strong appeal, many students with curiosity and thirst for knowledge into a magical online world, the face of an array of information, the target of choice at a loss here to see, where the station, and then get lost, and soon the passage from the fingers, leaving the network are online learning, check the information in the first place have not achieved.

College students are a group of youthful network and to provide them with a wealth of information and practice stage; many students must master the networks use technology, some immersed in the pursuit of the network technology. The college students like to explore the ever-changing network technology the pursuit of new things is undoubtedly full of temptation, and naturally there are many college students addicted to it. For the exploration of the network, surfing the Internet, some useful, some useless, and the slightest mistake produces.

Contemporary college students is more than one child, has a distinct personality, desire to enter university friends, and want others to understand themselves, but are unwilling to take the initiative and classmates Artesia truth, in the ambivalence of the state, many of the students to network, network the openness to meet the inner needs of students eagerness to communicate. However, coupled with the virtual and hidden features of the network, communication may not be responsible for the wrong or embarrassed words. Online can also be hidden truth and sincerity, with equal freedom of others to talk to a variety of topics, can appreciate the mass response of the sense of accomplishment. Network contacts and did not make the Internet Society of rapport with classmates in real life, but more closed. Studies have shown that social alienation and dependence on the network are positively correlated.

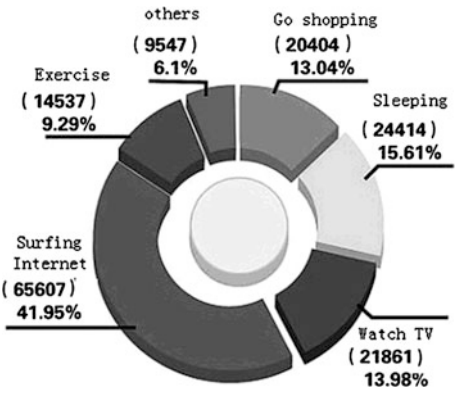

Fig. 91.1 Internet users in one day amateur life survey

Young college students are active in their thinking, and outlook on life and values of college students have not yet fully formed. The behavior is susceptible without a strong enough mental barrier and the ability to distinguish right and wrong . The spread of junk culture in the network will lead to the Students' Value conflicts, diversification of its value orientation, thus weakening the educational function of the mainstream ideology on the students.

The network has the characteristics of addiction than other easier to make. Types of online everything, anyone can find their favorite. Internet play can always find a suitable partner, which people are likely to linger and also want to play. Formed due to the long-term or inappropriate use of computers and the Internet, such as mouse hand, visual fatigue, vision loss, neck, shoulder, waist joint disorders, insomnia, forgetfulness, difficulty concentrating, anxiety, depression, networks rely on a lack of confidence and other physical and mental discomfort symptoms, as well as all related to this subhealth state (Fig. 91.1).

91.3 The Impact of the Network of University Students Interpersonal

Interpersonal relation is an important part of the concept of health. In a networked environment, the interaction between people base on the text, images, audio, and video for the carrier's nondirect contacts. Through the network, anyone can use a variety of ways in contact with others, even those in real life is difficult to find people of similar interests and needs can easily gathered in cyberspace to some people can find online support groups [1]. Network environment to the interests of making the students can face just to get to know contacts in bold confide their innermost secrets, speaks own troubles, rather than fear of the ridicule of others, a lot of time can get the contacts to enlighten. This will help the students to vent negative emotions, relieve inner pressure, and promote mental health.

However, interpersonal communication in the network, after all, is virtual. Lack of emotional contact and direct emotional experience, make the network more false contents. Students if for a long time to indulge in online exchanges would significantly reduce the participation in group activities and interaction with the students' time to make reality of interpersonal tensions. Interpersonal setbacks network interpersonal always choose to find comfort, unable to extricate them addicted to the Internet exchanges, passive treatment of reality in the interpersonal environment, indifferent to everything and everyone, in reality into an isolated position in the interpersonal, loneliness, boredom, depression, and other psychological problems. In addition, to the responsibility of interpersonal network, so that part of the natural properties of highlights, it is likely there will be some people with ulterior motives behind them will take the security of the network contacts affected, which tend to exacerbate the paranoia of some of the students anxiety to prevent other psychological problems.

91.4 Network Influence on Students' Healthy Personality

Contemporary college students grew up in the environment of rapid development of reform and opening up and socialist market economy, they have been the influence of the various ideologies and accept the impact of various trends at home and abroad. From their own, they are in the psychological, physiological synchronous development of the germinating period, although the physical and mental development to mature, but not fully mature; they had just entered the community, but also lack the experience of social life; their vibrant, for strong ability to accept new things, like fashion and trendy, but the cultivation and criticism of the lack of scientific theory, the identification, the ability to resist. Their personality traits showed many contrasts and contradictions that is also susceptible to the influence of various factors. With the rapid development of network technology, network market continues to expand, to those not yet formed a sound personality of college life, learning a tremendous convenience and fun, but also caused many negative effects on the formation of their healthy personality.

91.5 Effect of Network on the Physical Health

Reasonable access to the Internet can relax, but indulge in the internet is absolutely harmful.

First of all, facing the computer monitor to accept the long X-ray radiation can cause rough skin. a few years later, it will be clear that is aging. And X-ray components of human blood leukocytes of mass destruction, reducing the number of white blood cells in human blood, which led to decreased immune function, so that the bacteria easily invade the body and cause disease. In addition, one position

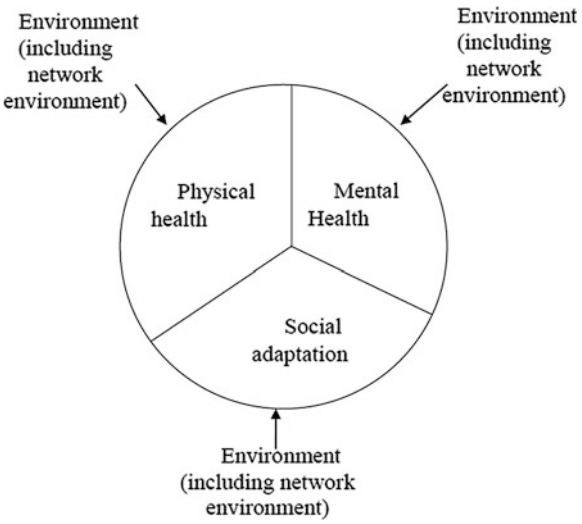

Fig. 91.2 Health and environment

for long time does not change, the head, cervical spine can occur in the part of the muscle fatigue, in the passage of time, muscle stiffness, shoulders rear Gang medial half of the pain, and trapezius neck is not comfortable, plus the lack of neck mobility, but also the extensive proliferation of cervical, cervical lordosis disappeared, further development may have finger numbness, radiating pain, vertebral artery compression syndrome vertigo, clinical called cervical pain syndrome or cervical spondylosis.

Second, Chinese medicine believes that the sedentary flesh wound, that long-term in a stationary state without the movement of people can take the weight loss into a "puffiness" in common is muscle atrophy. Chinese medicine, the spleen of meat, meat refers to the muscles [2], flesh wound involving the spleen, sedentary exercise can loss of appetite, slow weight loss. The spleen is the day after tomorrow, the source of qi and blood, the source of qi and blood, physical deterioration, low immunity, disease susceptibility. The puffiness is because the energy accumulation caused by the heat balance principle, a daily intake of heat must be close to the daily release of heat, so the weight will not be much change. Such as a day of life, enjoy the rest of the time outside of the three meals a day is a stationary state, the heat of the food intake cannot be fully transformed into heat and release, it will cause heat accumulation, so that the sugar into stored as fat body you will get fat, but fat just puffiness, fat gain, muscle atrophy. Therefore, long-term Internet allows students physical condition decline (Fig 91.2).

91.6 Reasonable Use of the Network to Improve Health Strategy

91.6.1 Improve the Network of Moral Education Resources

Improve the utilization of existing network resources for moral, increased funding and technical input, and promote the formation of moral education network. On the one hand, colleges and universities from the needs of college students, construction and learning, psychology, life channel, and manage chat rooms, forums, online psychological counseling, to communicate with the Internet Students at the same time, efforts to correct outlook on life, values and world view to guide them. On the other hand, schools should find ways to improve the conditions of the Internet by the students at the school. Can be set to the electronic reading room for students, electronic classroom, and the network corridors, both to increase college students' time spent online, but also the necessary technical guidance and supervision.

91.6.2 Strengthen Psychological Counseling

From school to university, the changes of learning ways and life environment, so that each college students are faced with the psychological process of adaptation. Strengthen students' Psychological counseling to help students new set learning goals, establish new relationships [3], and adapt to college life, reduce loneliness, boredom, you can prevent students from the network as to pass the time, and placed the spiritual tools. Second, extensive psychological education enable students to understand the physical and mental problems brought by over-Internet, and consciously adjust the online behavior of students generated network of psychological problems, psychological counseling, and treatment to enable them to gradually get rid of the psychological distress.

91.6.3 Correct Internet Motives of the Students

As we all know that motivation is the driving force of individual behavior. Therefore, the analysis of people's behavior, you must reveal the motives of their behavior. The purpose of most college students online is not limited to grasp the basic knowledge of the network, including the desire to get more information, curiosity, information released to the outside world to meet the need for interpersonal communication and emotional needs of catharsis. U.S. scholars have analyzed 396 worldwide network addicts and found that morbid seldom put the network as a tool to find information, use the network but on the network to seek

social support, sexual gratification and the ability to network to create the persona. Internet motives, therefore, decided to Students Internet, we must correct the motivation of college students' access to the internet, so that they can use the network to prevent the occurrence of mental illness.

91.6.4 Vigorously to Improve the Quality of the Network for the Educators

In the process of students' growth and education, family, school, society, respectively, plays a different role, plays a different role. From the perspective of school education, improve the quality of the thinking of educators network is a priority. We learned that the investigation, the relevant personnel, 32 % of people think that computer has little effect in student management, 30.2 % of people had not any contact with the network [4], 4.3 % of people do not use the computer. This case is difficult to adapt to the Internet age education and guidance to students. Schools and relevant departments should strengthen the network technology and hardware equipment and associated personnel of education training, the establishment of a thinker and ideological and political education, and also understands the faculty of the network technology.

91.6.5 Increasing Physical Activity

Physical exercise is conducive to human bone, muscle growth, improve heart and lung function, improve blood circulation system, respiratory system, digestive system function status, and is conducive to human growth and development, increased disease resistance, enhance the adaptability of the organism. Physical exercise can improve the regulatory function of the nervous system, improve the judgment of the nervous system of complex changes in human activities, and a coordinated timely, accurate, and rapid response [5]; the human body to adapt to changing internal and external environment, to maintain normal body life activities. Physical exercise can improve physical and psychological state, regain their strength and energy of the role of regulating the body tension; physical exercise can improve health, and fatigue the body active rest, energetic people into learning and work; relaxation, help sleep, and eliminate reading the pressure of sports exercise can mold their sentiments, to maintain a healthy attitude, give full play the enthusiasm, creativity and initiative of the individual, thereby enhancing self-confidence and values, and personality in a harmonious atmosphere, access to health, harmonious development.

91.7 Summary

The network is the tool of the process of human progress, spiritual satisfaction from the network and is easy to vent, but to seek psychological balance and vent their emotions, motives for college students has not yet formed a sound personality, but it will cause them to produce a network of psychological dependent, this dependence will cause them to over-indulge in the network. The relevant departments should strengthen the students' psychological counseling, correct Internet motives of college students, and greatly enhance the network quality of educators, while strengthening of university students' physical exercise time and projects; Network can play an active role in the help of the Internet, so that students grow up healthily.

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Chapter 92
Computer-Aided Sport Training Management Method for College Sports Team

Wenjie Zhu

Abstract This paper from the kinematics, biomechanics, sports medicine, sports physiology, biochemistry, sports training, information process, system identification and analysis Angle, the horizontal and vertical track athlete's technical training and physical training, with the development of the network course in the community, the rapid development of the network security technology, and coach continue to deepen understanding network, the application of the system will be used on the basis of network, in the future.

Keywords Sports training · Load evaluation · Computer-aided

92.1 Introduction

Scientific training plan and arrangement is based on scientific testing and analysis of sports training information, such as detection and analysis of sports skills, processing and management of sports training information, as well as the training of scientific method summarized. Based on this is a very important part to achieve full control sports training process. This process can be summarized as: using the modern testing instrument, equipment all aspects of information acquisition process of athletes in training and competition, use the relevant scientific theory and methods of obtaining data processing and analysis, establish the evaluation standard of sports training effects, then control the training process, according to the results of analysis, forecast and simulation design sports training. The realization

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of it will change the subjective one-sided sex, single, in the traditional sports training, it can be objective, multifaceted and comprehensive reveals natural law and sports training, and improve training efficiency [1, 2].

92.2 Analysis for the Status of Training Management for High Education Sports Team

Classic "theory" made a lot of training of the world's top athletes during, although the competitiveness of the athletes is very low, "theory" also can bring training period obtain good effect [3]. Therefore, the key issue is to distinguish between different physical (or other factors) and different stages of the athletes training, or study the application of various training theory [4]. This job need to be based on a large number of data collection and analysis; it must be done with the help of computer. Training important problem to be solved, is the athlete's training load control, because of the individual difference is very great, training as a general rule, the specific application training theory must be considered when individual differences in athletes. General rules of guidance are how to make between athletes according to their individual differences that training must be to face the reality [5]. At present, Dr Mader study predicts the blood lactic acid in Germany, and issue of the extensive attention, science choosing to return to personalized response training. It needs statistics and analysis of large amounts of data, to strengthen the learning of the individual difference, will be accomplished by computer.

92.3 The Structure of Computer-Aided Exercise Training System

For competitive sports training ultimate goal is to create excellent athletic performance, reasonable arrangement of the movement of athletes load is the most basic and controllable factors to improve the athlete performance, especially, this is the more important high level and elite athletes [6]. So, scientific and accurate solution of sports load testing standards for athletes, systematically carry out quantitative management for the movement of the athletes, load is an important way to improve the competition ability of the athletes [7]. As mentioned above, the system can record every training and the completion of the training content of coaches and athletes , it is material accumulation for sports load external index in the training process, considering the fluctuation daily training program, and to ensure that the training method is flexible input; In addition, ensure the real-time data acquisition the physiological function of the athletes, in data processing, in a long-term training data contrast analysis and athletic performance. The specific

design requirements can be divided into the following:every athlete's training methods shall be separately formulated, through the internal index to clear out which kind of energy system part effects, according to the actual situation of the training plan :, because , clear external index quantitatively analyzed exercise load; Internal index of the monitoring and exercise load guide the athletes' physical function; Training data can be accumulated and experience training can be summarized. Various data for measured athletes exercise load can be roughly divided into two parts, as shown in Fig. 92.1.

Part of the data available, the main content including on-site training exercise load external index, reflected through the training coaches, as well as contains blood lactic acid, heart rate, and other parts of the internal indicator monitoring of the movement of athletes strength, exercise training program, this is a kind of means, Chinese athletes training time, this part of the biggest needs should be flexible data input, flexibility is good, it can make the coach easy to enter variety of training method, data input function, it is not only training method of input, but also provide customized training method input coach. Blood lactic acid and heart rate of the two indexes can not only understand, but also the exercise intensifies out what kind of energy system played a role for training means, will help to understand the stimulation of athletes training methods of the coach. Another part of the data is based on the athletes conventional extraction training period, It includes the hemoglobin, urea nitrogen testosterone, platelets, morning pulse, and other physiological and biochemical indexes, through monitoring this internal index coach can learn to adapt to the athletes' physical mechanism is training exercises and competitive load. Comprehensive display and system of data input module should contain the above two parts. System analysis focuses on trends and training data analysis, in a period of time. Trend analysis mainly refers to a specific training data changes with time curves and athletic performance curve, it is a macro-comparison, more analysis refers to any two sets of data extraction changes with time related analysis and calculating correlation coefficient and a series of statistical parameter, this is a micro-comparison [8].

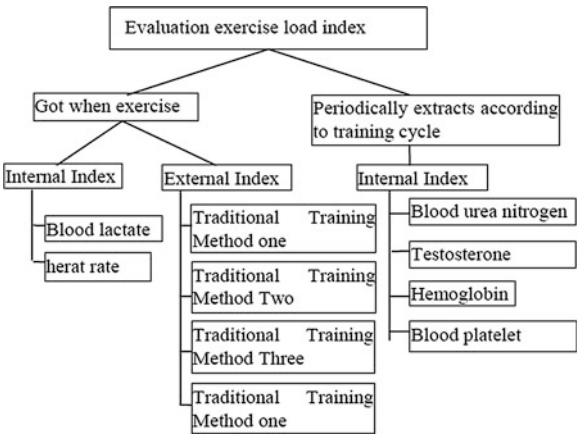

Fig. 92.1 The data structure of exercise load index

92.4 The Design of Subsystem of Wushu Training Management

Evaluation and diagnosis of the athletes fitness coach [9], mainly in the following questions: how to train practice athletes physical condition, how to determine the player's strengths and weaknesses in physical training, and how to implement the comprehensive evaluation and comparison, athletes on the basis of physical health level, how to determine the personal diagnosis a reasonable sports training strategy for athletes according to diagnosis and evaluation results [10, 11]. To answer these questions, the use of physical measurement and evaluation principles, theory and methods of assessment of the implementation of the system is required.

Every coach has his own set of training idea and method, form his own unique understanding the whole training according to the normal process of accumulating. These ideas embodied in the designated training plan. Therefore, the purpose of this system is the manager's requirements for sports training programs and related confidential, it is studied from the personal use of the coach. The function module mainly completes to identify users. Only the user name and password come into enter the system operation. Login module can achieve the purpose of system safety content [12].

Input training data input function module complete the main system. The design purpose: module content should include the sports training and all participants' valuable data in the competition, interface should be clear, friendly, and the operation simple and flexible. With a feature: module provides a calendar function in order to easy coach training data record every day. Because the coach let training programs, and every day the completion status of record player the athlete's training mission, module provides a simple calendar can be easy to enter the date coaching each time. After logging in, calendar to display the date the time according to the computer system. If the coach wants to let the training period of time, which can combination selection of the year, month, day, input training program each day. This module can be divided into three contents. Based on the study of the fully, in-depth understanding of sports training theory [13], and on the basis of the following data set, these items, including: name, date of athletes training course, less than 150 m, load operation quantity of run, run, the total amount help speed, endurance running race of the total amount of ability, run, jump, kind of time standing in era, deep jump time, the obstacles to jump frame frequency, steps, surmounts the type of time, time is the level of the era, jump, jump frequency level of the weight of the bench press kilograms, clean jerk kilograms, snatch kilograms, upper body strength coach kilograms, total upper limbs load, full-squat kilograms, squat kilograms, lower limb strength coach kilograms, always lower limb load, short-range jump time, full-hop era, the cast time of lamps and lanterns. In addition, is the collection remarks column to fill a number of other training data, for example, the shortage of the athletes after subjective reaction load and strength training? In order to avoid accidental change on coach training plan, just enter interface data can not be any material column, the coach needs to fill in the input, and then click on the button can fill all kinds of data

items, if there are errors in the process, the coach can click on filling the clear button to enter again. In order to ensure that the data is correct, space is full of digital cannot fit for any other symbols, can fill in the Numbers. Fill in the date of the training course is very convenient, just choose write on the left of the calendar date, and then click the ok button. After completion, and click ok button, the record has been successfully into the database. In the bottom of the interface to data control, it can be used to easily achieve inquires the function of simple training plan. Of course, this can only achieve inquires the in neighboring some records the current record, it can not complete the more complex queries function. In addition, interface also offers a modification and deletion function, for the displayed data has written in the database, click edit and delete button to complete the corresponding function. Interface lists all the commonly used training means of martial arts coach. In this system, fill in the required the content of the training data items, other unused training data don't need to be met, and the system default initial value is 0.

Monitor the physiological function of the athletes, and prevent the occurrence of over-for for years and to complete the training mission, the manager must be regularly test the physiological factors regularly monitor athletes, physiological and biochemical index is an important means to measure and exercise load internal record all the coach can easily common physiological and biochemical indicators, the main data projects include: the name of the athletes, monitoring data, height, weight, white, red, hemoglobin, blood testosterone, platelet hematocrit, creating kinas, urea nitrogen, urine 10, etc. Project not testing in one time, it cannot fill in the database, system the default value is 0.

Every game is the best means testing for the training effect, the importance of the previous period of time speak for themselves. The result of the game may of course, monitoring a number of other game data is very important in the process of competition; it is worth long-term accumulation and in-depth research. These things are generally used for some training materials, including name, game time, athletes, and sports programs results, technical, footwork, balance, jumping, rotate, be dismayed, and so on. The various events different game data inspection, the coach can choose different items of data according to the various events. Fill in These data do not be filled, the system default value is 0.

92.5 The Effect Analysis of Simulation Operation

This module is on the main data analysis of two or more physical training in a single period of time the player. At present, the implementation of the trend analysis method is shown in the chart of time axis, use the analysis method can clearly see the trend of training data correlation between and briefly determine training data and athletic performance. As shown in Fig. 92.2 shows, comparative analysis results for three drills athletes, their data in the following data practical training data, it can only see the trend, but do not look to give the related data between data.

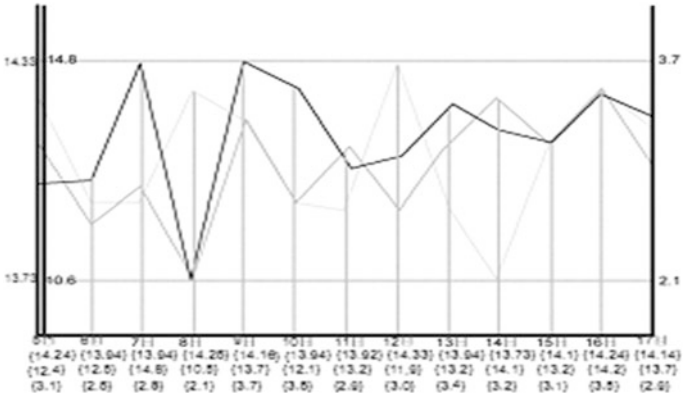

Fig. 92.2 Data analysis about single person's multi-training item

As shown in Fig. 92.2, horizontal axis time axis, as the day as a whole stretch of the horizontal axis, the coordinate unit said the fifth day a day from 17. Because select three items of data are analyzed, the corresponding vertical axis is displayed as three line coordinate system, poly line is also 3 lines, get together the line color and color coordination under the chart data and graph respectively for distinction. Maximum and minimum value is each gate 2 marked on the three vertical axis.

92.6 Conclusion

Through computer aided training sports training and information science research and improve training efficiency and training. In this paper, diving and track and field sports teams training university has become a management information system, through the human scuba diving detection and analysis of information technology movement design and simulation, research project through the accumulation of track and field training data and analysis, and the sports and sports of masses athletes training load control theory, establish the concept of sports load evaluation system and evaluation index. This paper studied the university physical education team training information management system for the high level sports teams training, scientific research and auxiliary support, and sports discipline and scientific research has important practical significance.

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Chapter 93
Web-Based Top-Quality Course System Design

Xinyan Liu, Zhe Wang and Zhenkai Xie

Abstract The top-quality course system is the typical management information system. The browser/server three-tier architecture design is adopted for this course system, which are the data layer, the business logic layer, and the presentation layer, respectively. The system development is strictly conducted based on the process required by the software engineering. Specifically, the system is developed based on the process from the demand analysis, preliminary design phase, and detailed design to test and release. In this process, it is also necessary to combine the unified modeling language technology; in the demand analysis phase, the demands are captured through the illustrations; in the preliminary design phase, the class diagrams are used to aide for the design of the database entity relationship figure; in the detailed design phase, the designs of the classes are implemented.

Keywords Management information system · Software engineering · Unified modeling language

93.1 Introduction

The main purposes of the top-quality course system are to realize the online education, make the teachers interacted with students and get a real-time control on the teaching data, and implement the online expert evaluation function.

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Therefore, through the designs of the teaching content construction, teaching method, means construction, system construction and the modern teaching means, the modernization level of teaching is increased.

93.2 Demand Analysis

Take the course modules for an example to give a specific introduction to demands in the following.

93.2.1 Application for Courses

The teachers or teacher teams can carry out the application for the top-quality courses in accordance with their own major courses. Actually, what the teachers apply for is the authority to make courseware; if the application gets an approval, the teachers can use the applied course ID and password to sign in the system backend to make the courseware online [1]. Besides, the teachers can inquire their application states and the previous application histories.

93.2.2 Course Evaluation

First, it is the administrator to operate the approval for the application for the authority to make courseware, so the teachers can log in the system backend to make their courseware online after getting an approval. An important node of the top-quality course evaluation is that the experts will make an evaluation on the made courseware. The experts, based on the standards, grade a course's basic information, material and quality of the online test questions, and then input the comments. The information will become the important references for evaluating the grades of the course.

93.3 Courseware Making and Maintenance

After the approval of the administrator on the application, the principals will immediately make the courseware. The default course-principals possess all the authorities including the management of the teaching member teams, the setting of the permission and the instruction of the tasks. In addition, the teaching member teams can make and maintain the courseware based on their authorities.

93.4 Browsing Course Information

The students, experts and teachers all can review the course information by searching the courses. The information mainly includes the principal information, the teaching member information, and the course basic information such as the introduction, teaching conditions and methods. The search of the course data includes reviewing and downloading the teaching plans, courseware, and data, and browsing the teaching videos of the course online.

93.4.1 System Architecture Design

The system can be mainly divided into these modules: login, registration, news, course, and BBS. As for each role, the related modules are listed specifically. The general module structures of the system are as shown in the following.

The student sub-system is mainly composed of the course query, website investigation, browsing course information, and the participation in the online test questions. Its logic structure is as shown in Fig. 93.1.

The teacher subsystem is mainly composed of the course application, course making, browsing course information, and website investigation. Its logic structure is as shown in Fig. 93.2.

The expert subsystem is mainly composed of browsing course information, website investigation and course evaluation. Its logic structure is as shown in Fig. 93.3.

The administrator subsystem is mainly composed of the students, teachers and experts registration, the school and department registration, adding and deleting news, launching website investigation, approving/denying the application for the authorities to make courseware, evaluating the course grades, and the operation of the website maintenance. Its logic structure is as shown in Fig. 93.4.

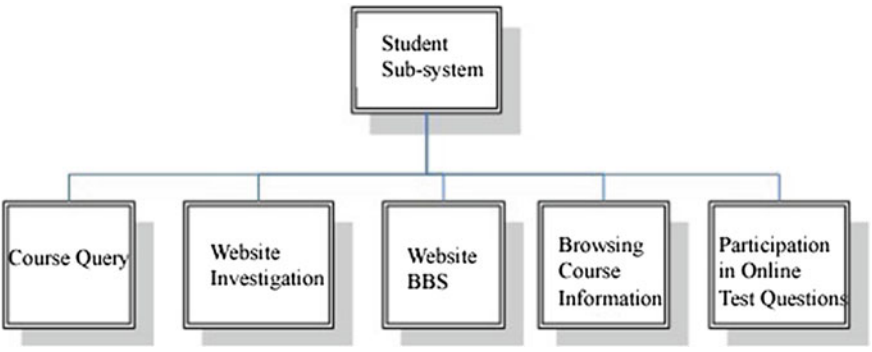

Fig. 93.1 The general module structure for students

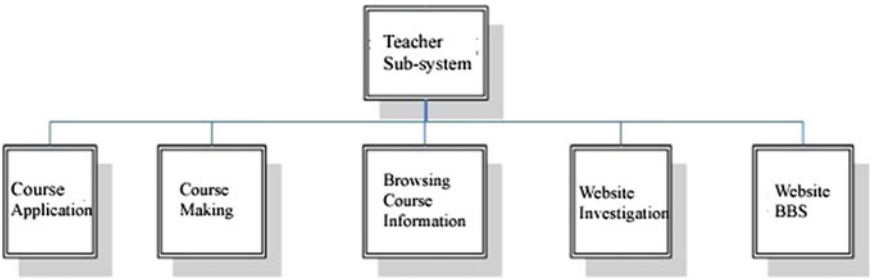

Fig. 93.2 The general module structure for teachers

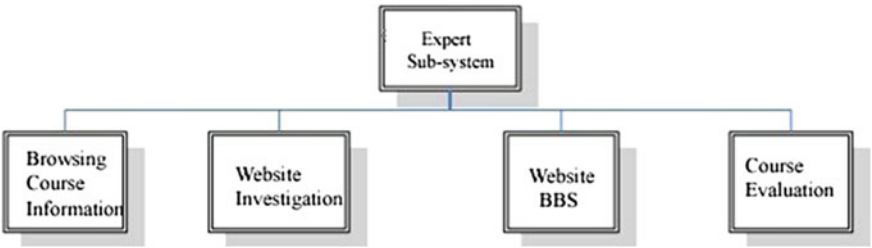

Fig. 93.3 The general module structure for experts

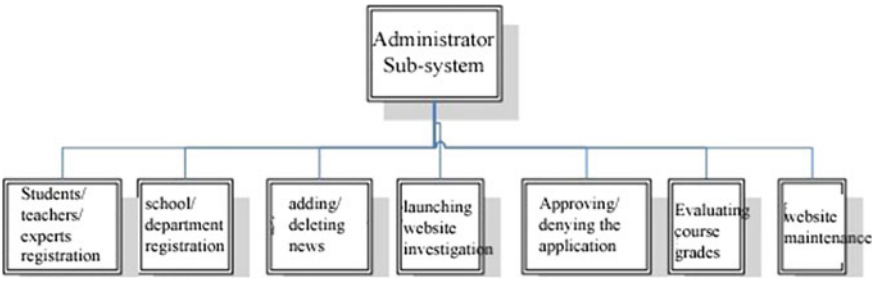

Fig. 93.4 The general module structure for administrator

The system uses the .NET platform, the C# programming language, the SQL2005 the database. In the top-quality course system of this paper, the B/S three-tier architecture design is adopted, which are the data layer, the business logic layer, and the presentation layer respectively.

In the three-layer structure, the user interface is implemented via a web browser; extremely few business logics are implemented at the front end, but the main business logics are implemented at the server. This greatly simplifies the computer load at the client, and reduces the costs and workload of the system maintenance and upgrade [2]. Therefore, the total costs of users are lowered.

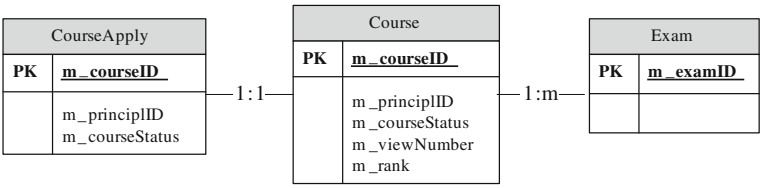

Fig. 93.5 The three class diagrams related to the course modules

93.4.2 Designs of the Main Functional Modules

The course modules are mainly composed of three classes which are the Course Apply class, Course class, and Exam class. The three classes are respectively corresponding to the course application and verification, the course browsing and making, and the online answer function. In the following Fig. 93.5 diagrams of the three implementation classes are introduced in details (i.e., the three class diagrams are related to the course modules, which are course, course application and exam classes respectively).

93.4.2.1 Course Apply Class

The Course Apply class can implement the course application, the examination and approval of the course making authorities, and the operation to grade the course.

The attributes of the Course Apply class suggest that the m coursed represents the course number; the m principled represents the ID of the course principal who applies for the course; the m course Status represents the status of the course.

93.4.2.2 Course Class

The Course class can implement the course making, maintenance, and browsing functions.

The attributes of the Course class suggest that the m coursed represents the course number; the m principled represents the ID of the course principal who applies for the course; the m course Status represents the status of the course. Among them, the m course Status is used for the judgment in the log-in.

The class methods in the attributes of the Course class suggest that the Course represents a constructed function; the Set Course Password represents the application for the new authority to make the course; the Validated is used to judge whether the ID and password are effective or not in the logging-in; the Get Current User Authority represents the authority of the current log-in users in the teaching team; the is Exits In Team is used to judge whether a teacher exists or not in the

teaching team; the is Score Exists is used to judge whether an expert grades and writes comments on the courses or not, which is a judgment before the evaluation of the course [3].

93.4.2.3 Exam Class

The Exam class can mainly implement the making and maintaining the online test questions, as well as the functions to participate in the online test questions.

The attributes of the Exam class suggest that the m exam represents the examination ID.

The class methods in the attributes of the Exam class suggest that the Exam represents a constructed function; the get Exam Detain is used to get a list in which the detailed test questions of an online examination are listed; the crest Exam is used to create a new online test question; the Add Question is used to add questions for a certain examination; the Delete Exam is used to delete a certain online examination, which will delete all the information related to this examination; the Delete Question is used to delete a question; the record Result is used to record the results (scores and answers) of students participating in the online examination; the record Exists is used to judge whether a student has participated in the examination, and will not record his results if the participation exists [4].

The analysis and design stage can be used to capture the user demands which drive the development tasks of all stages after the demand analysis. This not only ensures all functions of the system implemented in the development process, but also used to verify and detect the developed system, hence exerting an influence on all the stages of the development and all the models of the UML.

Next, the top-quality course module will be used as an example to introduce the relevant UML diagrams. The top-quality course module has four use case diagrams which are course application, course maintenance, browsing the course information and online test questions, which are used to describe the external roles interested in the system and the functional requirements on the systems (use cases).

The Use Case Diagram of the Course Application: This use case is mainly used to describe the course application, cancelling course, approving/denying the course application, the operation to grade the course, in which the participants are teachers and administrators. In the use case, the relationship between the course application and the filling of the course application information lies in the “use”, namely, it is necessary to write the course application information first when the application is submitted.

Course Maintenance: This use case is mainly used to describe the operations of the course making and maintenance, in which the main participants include the team members with all authorities and the teaching members only with the uploading authority, which is as shown in the Fig. 93.6.

The online examination of the course describe creating the online test questions, modifying/deleting the questions, adding questions, modifying/deleting the

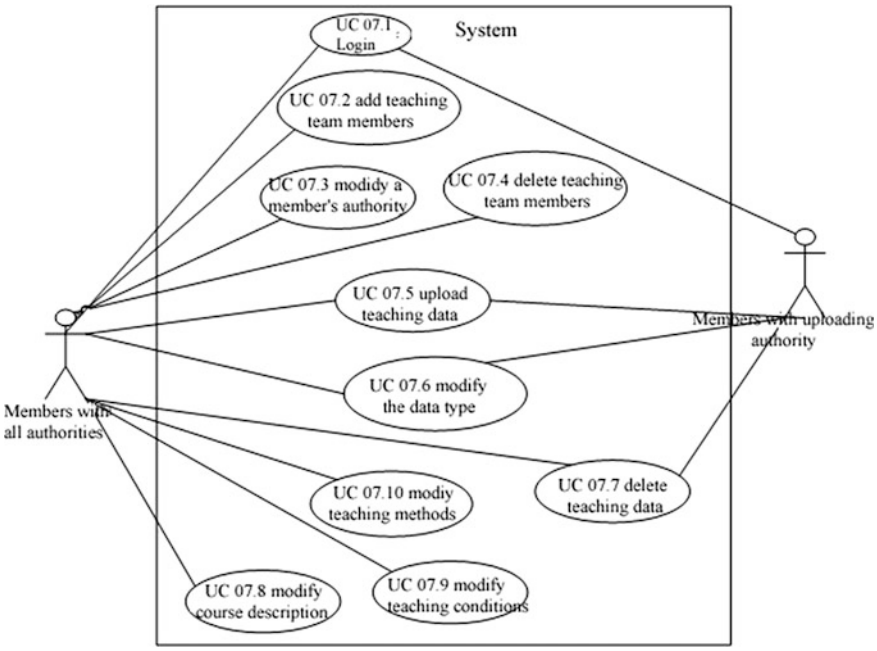

Fig. 93.6 The use case of the course maintenance

question information, and answering questions online, and browsing the question information [5]. The participants include the teaching team members, students, and other viewers with all authorities. In this use case, the relationship among the modification, deletion ,and creation of the online test questions lies in the "use", but the modification and deletion can only be operated after the creation; the relationship between the modification of the questions' answers and scores, the deletion of the questions, and the adding of the online questions is the "use" as well, but the modification and deletion of the questions can be only be operated after the creation of the questions; the relationship between the recording of the student scores and answers and the participation in the online questions is extensible, in which the recording of the student scores and answers extends the participation in the online questions.

93.4.2.4 Browsing the Course Information

This use case mainly describe the operations of the users to browse the course information, including the basic information, teaching team information, course material, and online video [6]. The participants include the teaching team members, the visitors (student, other teachers, and experts). Among them, the experts with authorities can grade the courses.

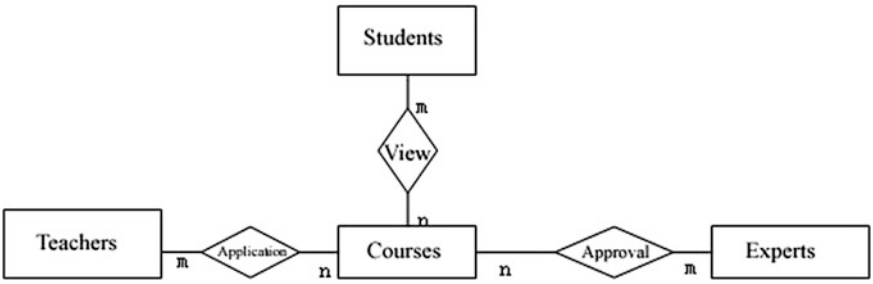

Fig. 93.7 The e-r of the main roles

93.4.2.5 Database Design

The tables and basic relationship structure of the database can be defined based on the modules and basic functions divided by the demand and preliminary designs, and the UML class diagrams. The database design is centered at the students, teachers and experts who are the main three types of users, and connected multiple relevant tables. This is shown in Fig. 93.7.

93.5 Conclusion

In this paper, the author mainly introduces the demand analysis and designs of the top-quality course system. This system adopts the .NET platform, the B/S three-tier structure, SQL Sever2005 database, and the C# programming language. The actual development is started with the demands, and then the demands are described in details through the UML use cases, and finally the system design is completed through the preliminary design and database design stages.

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Chapter 94
Study on the Value Orientation of the Students in Colleges Under the Negative Network Environment

Yufen Wang, Fangfang Sun and Minglai Yu

Abstract At present, the influence of the network, which has obtained a rapid development, may have changed the behavior patterns, the value orientation, and the psychological development and moral values of the students at the higher learning schools. In this paper, from the perspectives of the negative network environment and the characteristics of the students at the higher learning schools, the authors conduct an analysis on the influences of the negative network environment on the value orientation of the students at multiple aspects. Hence, this paper can provide a powerful theoretical and practical foundation for the educational workers at the higher learning schools to strengthen the education and guidance to their students.

Keywords Network · Negative environment · Value orientation

94.1 Negative Network Environment and its Characteristics

The negative information of network refers to all kinds of information which can exert the passive influences on the ideas of the individuals and groups, the images and reputations of the behaviors, society, or enterprises. However, the network negative environment is a nonphysical combination of the network resources which are composed of the negative information with the network tools. Its characteristics can be concluded in the following.

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94.1.1 Virtual Network Information

Virtual characteristic of the network information means that the existence status and external performance of the information productivity are invisible and widely spread in the network spaces with the forms of the sound, image text, and numbers. Besides, the network connects the websites from all places of the world together, and hence forms a virtual space. However, the virtual characteristic of the Internet can give rise to the emergences of multiple digital people, and subsequently tend to make the young people to be nonhumanized. What's worse, if the young people are addicted into the network for a long time, it is highly possible to impose obstacles on the developmental rights of their cognitive, thinking, and logical abilities.

94.2 Disordered Network Information

Owing to the shortage of the consistent control, the network information is highly irregular in its quality, and is in a disordered distribution state. At the mean time, the freedom and arbitrary rules to release the network information are also in shortage of the necessary quality verification procedures, which makes the network information different. Thus, there are not only high-quality information resources, but also a great deal of information "dirt" and "junk" intermingled, presenting to be highly uneven [1]. However, currently, the disorder of the network space, the enhancement of the information releasing ability and the expansion of the information releasing range have added greater difficulties for the state to get a control on the information, and simultaneously have posed huge threats on the security of China's ideology to a great extent [2].

94.2.1 The Criminality of Network Information

The criminality of network information mainly includes the writing of the fraud programs and the release of the false information, the anonymous login through the electronic spaces to steal information and data, the establishment of websites or special channels to clone other normal websites so as to release the "dark horses" recommendation stocks or predict a lottery winning as a bait, or attract network users to implement some fraud activities [3]. All these criminal activities exert a serious influence on the fairness of the network information.

94.2.2 Value Orientation Characteristics of the Students Currently at Higher Learning Schools

The value orientation refers to the direction of value standard, and also is the selection of people on the value goals and the fundamental attitude orientation; in other words, people take advantage of what attitudes to deal with the values of things and will make a choice finally [4].

94.2.3 Values are Complex and Diversified

The diversification of the value goals of the students at the higher learning schools can be mainly reflected on the realization of individual values, because these students attach higher importance to the maximization of their individual values and also more greatly manifest their own values in order to gain recognition from society. Generally , the three major value orientations of the students at the higher learning schools at the present stage are "growing into an useful talent", "seeking interests", and "self-reliance" respectively. However, for the life beliefs, some people believe in the "money is supreme"; some seek the "spirit of contribution" and the "the pursuit of the ideals is higher than money"; and the others concentrate on the "all for one and one for all".

94.2.4 The Realization of the Self-Value and the Acquisition of the Practical Interests are Stressed

As the market economy has received a rapid development and the independent position of individuals has been recognized with a gradual step, the senses of competition, efficiency, innovation, and self-support of the students at the higher learning schools are intensified to different extent; but there are some students to be unilaterally in pursuit of the realizations of the individual values, interests, and demands, which makes the individualism spread widely in many places and the value deflected to a certain extent, and impose restrictions on the further development of these students.

94.2.5 Standard for the Value Evaluation is Dual and Diversified

The standard for value evaluation on the modern students at the higher learning schools is of a dual characteristic. In other words, the value standards of both the collectivism and altruism are used to evaluate these students and the standard of

the egoism is adopted to judge ourselves. They will identify with the positive acts such as the righteous behaviors in concept, but lay a larger stress on the self-protection when necessarily converting these acts into their own practices in which the consciousness is not high as well. This contradiction and the dual standard are able to mirror the corrosive influence of the bad social concepts on the ideas of the students at the higher learning schools at the present time.

94.3 Influences of the Negative Network Environment on the Value Orientation of the Students

The network is a "double-edged sword". It exerts some negative impacts on the thinking ways, values, and behavioral patterns of the students at the higher learning schools, although it has actually widened their visions in the real world.

94.3.1 Easy to Cause the Conflicts and Anomies of the Young Students

The network has promoted the different cultures to be mutually exchanged and integrated. Simultaneously, the western countries have occupied the highest positions in the politics, economy, technology and values through the network, and also have seized the chance to construct the new cultural hegemonies by their dominant cultures. Besides, there are some lawless persons to make use of the advanced information technologies that they know well to vigorously advocate the bourgeois political views and push forward the values output and ideological penetration with all kinds of forms to the utmost efforts [5]. All these negative network cultures are just the important carriers of the completely-bare "cultural hegemony" in the network age. Surrounded by such a kind of negative network environment, the spirit of hard work and plain living, the collectivism and the value of serving the people in Chinese traditional education have been corroded by the money worship, the pragmatism and the self-centered value with a gradual step; hence, there are tendencies that Chinese values are to be westernized, the ideals of life are debased, and the value orientation is to be utilitarian, etc. [6]. However, the students at the higher learning schools have not been completely finalized in values, and hence are easy to lose their bearings under such a negative network environment, which are mainly reflected on the contradiction between the conventional constraint and the free personality, or between the core of the self-interest and the core of serving the people, or between the stress on the individualism and the persistence in the collectivism. Also, the cultural conflicts and contradictions make the young students at the higher learning schools easy to feel anxious in ideas. Worse, the more intensive this anxiety is, and the stronger their

blindness and impulsiveness will be, which will eventually push them to blindly worship the western values and civilizations, weaken or lose their socialism political ideas, and deviate from the mainstream values.

94.3.2 Easy to Weaken the Ideological and Moral Consciousnesses of the Students

The free, optional, and independent characteristics of the network information can give prominence to the life and work modes which are majored at the individuals, and hence have changed the traditional collectivism values to different extent. Great numbers of modern students at the higher learning schools like to speak randomly and emotionally, and seldom take the social norms and ethics into account. However, in the real life, it is necessary for everyone to act in accordance with the moral principles and standards of a social person, and accept the supervisions from the public opinions. The "dual moral standard" inside and outside the network is extremely easy to make these students who are still babes in arms disordered in ideas and confused by the superficial phenomenon, and hence they are highly perplexed to select their values.

Furthermore, the garbage of the network information is able to weaken both the ideological and moral consciousnesses of the students at the higher learning schools. Moreover, the "pornographic, violent and evil contents" are the most harmful "weapons" to affect the juveniles under the today's network environment. Relevant experts have made some investigations to find that the 47 % of the online information have a close connection with the pornography, and about 60 % of the students at the higher learning schools can be in touch with the pornographic information online by chance easily.

94.3.3 Disturbing the Initiative Practices of the Students in the Value Goal

The network negative environment exerts a passive influence on the right value orientation, the increase of the value judgment ability and the establishment of scientific value standard of the students at the higher learning schools. All these will be certain to push the students at the higher learning schools to feel blind, contradicted, and unstable during the process of practicing their values, and subsequently will exercise a negative effect on the initiative practices of the students in the value goal. For instance, there are a great number of the students at the higher learning schools to extremely suffer easily from the psychological disorders such as the "Internet addiction disorder" and the "infantile autism" because they abandon themselves to the network and become demoralized without any

enterprising spirits and responsibility senses. Thus, there are often inconsistence between their ideas and behaviors and the value orientations and the motivation to go forward are lost in their minds as well. At present , the number of the students learning at the higher learning schools, who have dilapidated their studies and even moved toward the online crimes owing to the addiction into the online games, shows a rising trend. Therefore, it is urgently necessary for the moral educational workers at the higher learning schools to actively take feasible measures to cope with these harms which are brought by the negative influences of the network.

94.3.4 Making the "Honest" Values of the Students Lose

On the Internet, the information in the virtual world is commonly provided by all network culture subjects. Like the cultural life in the reality, it can be divided into good information and evil information. The information giving expression to the good is a self-discipline performance that the subjects comply with the moral orders in the Internet culture, while the evil information refers to the self-abandoned or intentionally destructive announcement of the subjects. In addition, these performances will be more apparent than the cultures in the reality due to the virtual characteristic. In the Internet society, there are great numbers of self-abandoned subjects such as the hackers, rumor mongers, and virus makers to take the damage to the orders of the Internet culture and the enjoyments of other subjects in the activities of the Internet culture as their own satisfaction capitals. If the massive overflowing and untrue information and spam are accepted by the students which are still not stereotyped in the value orientation at the higher learning schools, the "honest" concept in the previous social and cultural value systems will be morally degenerated.

94.4 Conclusion

From the above analysis, it can be seen that the influence of the negative network environment on the value orientation of the students at the higher learning schools is significant. For this reason, it has changed into a very important content and task in the current ideological and political work of the higher learning schools to effectively eliminate the negative influences, and construct the right value orientation for the students at the higher learning schools. However, in order to reduce the passive influences of the negative network environment on the young students at the higher learning schools, the most important point is constructing a network environment with Chinese characteristics. Therefore, it is necessary for the higher learning schools to provide right guidance to students in their ideological and political education work, really promoting the network environments to convert into the effective carriers which are able to drive the all-round development of the modern young students at the higher learning schools.

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Chapter 95
Web Animation Design Teaching Based on Reverse Analysis Method

Ying Gao

Abstract Given the present condition and the existing problem in the course of Web animation, the major point of teaching will be emphasized by the invocation of courses, the ability of creative thought will be cultivated by the means of "from static to dynamic", and the college Web animation course will be innovated by means of display of inverse movement in order to form the scientific structure and methods of professional course. Meanwhile, teaching of course is sophisticated and systematical, so it requires continuous coordination and corporation among every phrase of teaching instead of simple mode and means for the differences between majors and courses.

Keywords Web animation design · Reverse analysis · Reverse movement

95.1 Executive Summary

The animation is an interdisciplinary discourse, which is the fusion of science and art, and whose origin can be traced back to the Stone Age [1]. It has been widely used in various fields, where it becomes a creative cultural industry. With the rapid development of society and economy, the Internet has become an important means of information delivery and personal exchange. Now pictures become an essential way of communication, the economic development accelerates the pace of social life, both of which has made writing and language expression no longer meet the requirement of information transmission. Information can be acquired in various

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ways and animation has its special advantages, among which include visual and vivid image and a great deal of information, which has made animation a strong artistic appeal and made it widely used in Web for delivering abundant information quickly [2, 3]. Web animation is a branch of animation, which can be used and played for Web use, and with which Internet page become interesting and moving, so Web animation has become the major part of the web page, which can help attract more attention and guide user's browse. Numerous online advertising are delivered in the form of animation. Nowadays, Web animation has become a symbol of network culture and also be widely spread.

Web animation course is a professional course which is generally offered by the animation major, art design major, and industrial design major. It has become highly valued and welcomed by the teachers and students since the beginning of this course [4, 5]. It creates certain effectiveness and experience in training students' technical and artistic skills. But as a new course, Web animation still needs continuous study and discussion.

95.2 Current Situation and Problems on Web Animation Teaching

Web animation design needs to organize a lot of information, obtain master and use techniques. The design process is to integrate the text, graphics, images, color, audio and other media [6–8]. During the teaching process, we not only enable the students to master the application of some software, but also more importantly to understand the characteristics of the Web animation, creative way of thinking, and how to design and operate rather than simply put the animation into the web page.

The misconception that Web animation design teaching is the mix of the artistic creation and computer software is the biggest obstacle in teaching professional courses. If the professional teaching is only a mix of the two, there is no difference between the college education and general social animation training class. It is against the basic objective of the high education organization, which its original goal is to cultivate integrated person with rich knowledge and specialty. If not, students will master a rather limited range of knowledge.

Current situation and problems on Web animation teaching [9–12]:

It is a cramming approach and does everything what the books says, which causes lack of extra-curricular knowledge and vivid communication. In this way, the students' interests cannot be stimulated but also the ability of students to the practical application of the computer can't be improved.

Too much emphasis on the computer operations rather than fostering the artistic design ability.

Weak in teaching practice. Students cannot achieve the transmission from the computer theory and operation to the design of the finished product, thus affecting the ultimate teaching goal and the teaching quality.

95.3 Integrate the Teaching Content Systematically and Highlight Major Points

We dedicated to focus on the design awareness and cultivation of artistic quality. It is of decisive significance to focus on design ability instead of operation of computer [13]. Based on a wide range of basic comprehensive knowledge of education, we must grasp this course connotation systematically by reducing its academic content appropriately.

Starting from the system, we divide the course into three modules in accordance with the course curriculum. See Fig. 95.1.

95.3.1 Knowledge Module

Based on some basic knowledge of Web animation design, this module includes an overview of animation, introduction of popular software, the form of Web animation, sound processing, and publishing, etc [14, 15]. By using this module, it stresses teachers leading role in the classroom, and let the students learn academic knowledge by the example of teachers.

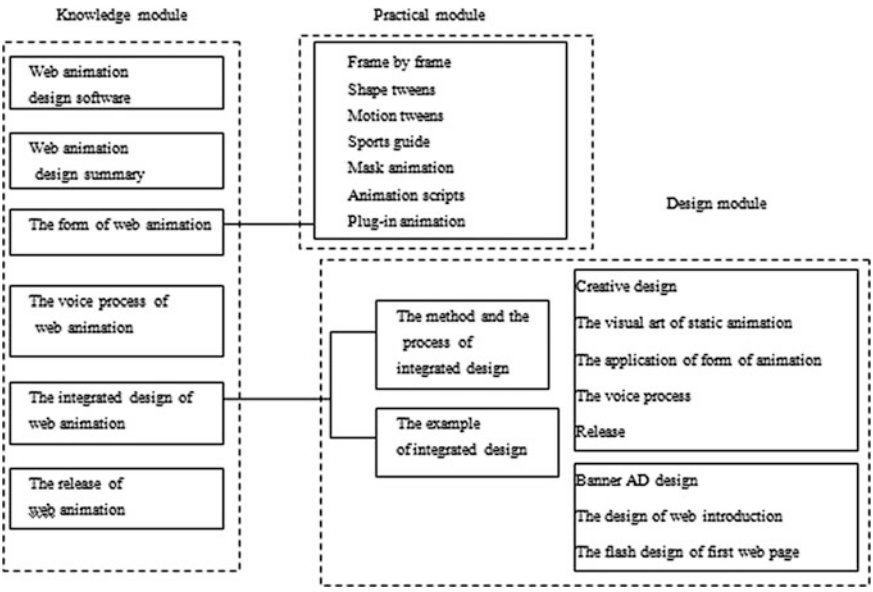

Fig. 95.1 Course modules

95.3.2 Operation Module

The thesis of this module is the students' operation process. Web animation design is an applied subject which needs to master certain computer skills. In this module, there are seven forms in the Web animation: frame -by-frame animations, shape teens, frame by motion teens, sports guide, mask animation, dynamic animation scripts and plug-in animation. Each form needs to be mastered by taking a lot of example practices considering different situations. This is the major point of this course. For many changes in Web animation cannot be without these forms, we must learn these basic forms of animation so that we can create animation and express our thoughts freely.

95.3.3 Design Module

With the designing methods Web animation and designing processes, by integrating synthetic design examples, and by emphasizing the expression of artistic creativity, teachers should guide and inspire the students during the overall process. After all, the creativity of the students is crucial to teach effectively.

95.4 To Train Innovative Ability of Students by Using "From Static to Dynamic Design" Method of Reverse Thinking

How to acquire the correct way of thinking is one of the fundamental issues in education and to explore the associated teaching. Reverse thinking, also known as thinking in an opposite way, is a way to define customary things in reverse or from another angle. That is to think in the opposite direction, to explore it from the opposite side in depth, and then come to new answers. The characteristics of reverse thinking are using anticonventional way of thinking, deducing deliberately from the results and from the reverse perspective of a thing, and moving backward in a particular situations in order to achieve their specific purpose. It breaks the limitations of forward thinking and creates new concepts and ideas. Using properly, people can have a feeling of a refreshing effect from a familiar to a strange way.

95.4.1 Animation is the Motion Picture

Animation is the process of a series of animated images and dynamic visual image in successive positions to create life-like movement. Animation means giving life

to the picture. According to the research, the human has a persistence of vision of a picture within 1/24 s. Using this principle, it will give you a smooth visual effect if you roll next picture before last one sustains.

Animation comes out from a large number of images. Since the human eye's has a feature of persistence of vision, we can play a continuous session pictures in order to make people have a feeling of real and hallucination. Figure 95.2 is a picture of a group of animated segments, demonstrating the process of a running person. We can see this man makes different movement but watching them in a slide, you can find dynamic visual effects of running.

95.4.2 To Create Web Animation with Reverse Thinking from Static to Dynamic Animation

The application of animation on a web page is different from the cartoon design. There are not much difference in animation design for the Web animation and the traditional cartoon. They both need script writing, styling design, scenic design, sub-lens screen design, animation production, dubbing and post-synthesis. But as component of the web page, the Web animation differs greatly from that of traditional cartoon. It is quite different because its design process starts from a static vision to a dynamic visual, and it is derived from the planar design. Web animation design principle, methods and the page forming are very similar to the planar design. The difference is that they use different media and the animation in web pages is dynamic and interactive. As one part of the web page, the animation should bring in an approach that is based on the static with the dynamic visual and interactive element that make the animation into a dynamic visual one and attract more attention.

Web animation design process is a static vision into a dynamic vision, yet traditional cartoon plays "from end to beginning" in a row as shown in Fig. 95.3, from the firs frame to the last one.

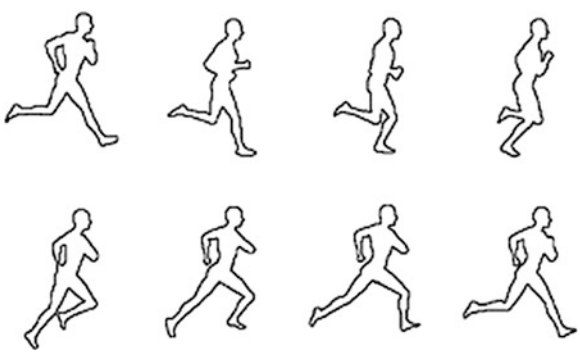

Fig. 95.2 The animation of running

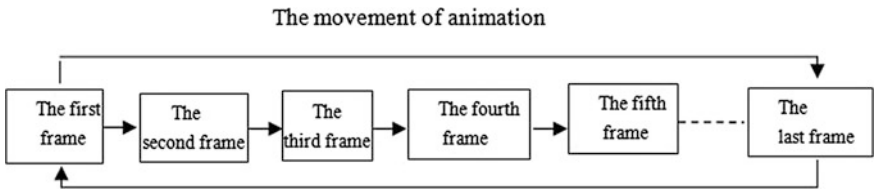

Fig. 95.3 The movement animation and creative design process

In the creative design in animation, it is required to use the reverse way of thinking and from the opposite direction. It follows the principle "from end to beginning" that means you define an action at the end of the static visual image, then complete the rest animation effects in reverse. Namely, draw a picture first, then make a feeling of moving. In the process of designing animation, you can add some graphics, images, text, color, and other visual elements to express animation themes and you will achieve visual impact. The aim is to attract audience and all elements we mentioned would be flipping around with the purpose of conveying information. In this way, we draw their attention to the creative ideas at the beginning of their learning before they start to drill their skills.

95.5 Use Reverse Movement Method to Improve Operating Skills

We need to flip the pictures after the completion of the static visual pictures. First, we put the elements into different layers so that we separate them into the independent element in the picture frame. The elements in the last frame in a static visual could be background, graphics, images, text and other elements. Second, perform them in various animated forms, such as frame by frame, shape teens, motion teens, sports guide, mask animation, animation scripts, plug-in animation, etc. Finally, put them together and comes out the animation in the last step. As shown in Fig. 95.4.

Let us take a rolling ball as an example. What we have seen is, there is a ball rolling slowly and we see the ball from left to right and suppose to start from first frame to the last frame. Actually, we locate the ball in the final position, and then back to the first frame where it starts rolling. Then, we fill up the middle frame. It is the demo animation production with the reverse thinking. As shown in Fig. 95.5, we can easily master this skill by using this method.

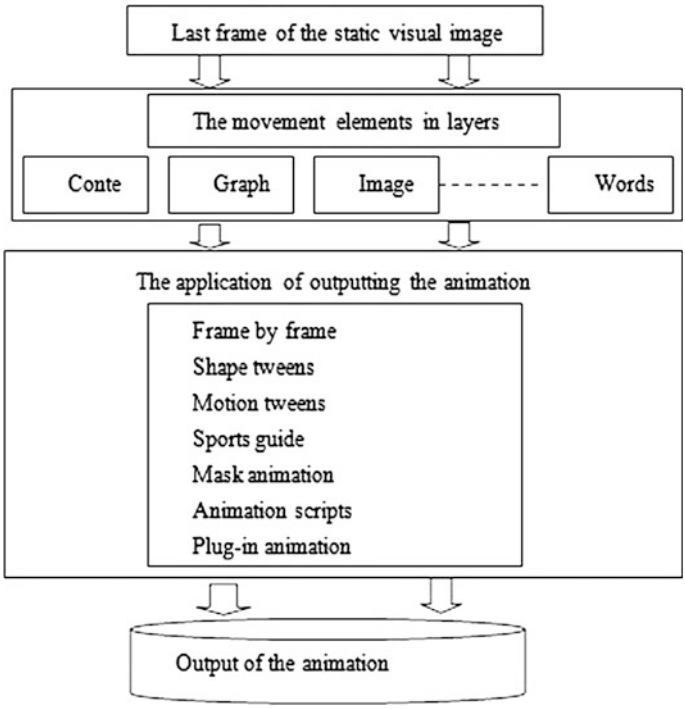

Fig. 95.4 The inversion process in making animation

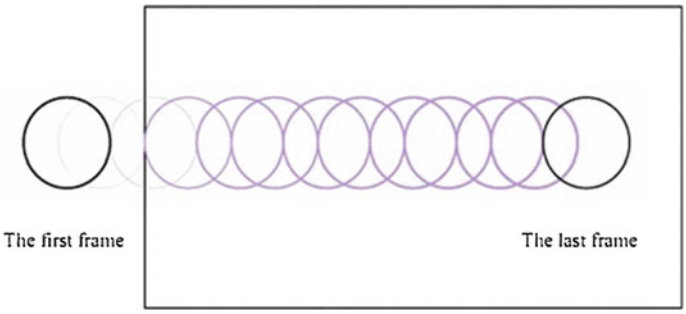

Fig. 95.5 The process animation of a rolling ball

95.6 Conclusion

Only by carrying out positive discussion and exploration during the teaching process, absorbing the latest fruits, caring about teaching methods, and continuously improving the scientific and research quality level, can the quality of teaching be improved.

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Chapter 96
New Pattern of College English Teaching Based on Networked Multimedia

Jing Wang

Abstract The new pattern of college English teaching based on networked multimedia advocates the concept that is learner-centered and gives full play to the interest and initiative of students' learning. From the beginning of rationales, this article analyzes the advantage of this pattern and pays more attention to implement it.

Keywords Network · Multimedia · College English teaching · New pattern

96.1 Introduction

After colleges increase the enrollment, most of them use the way of large-class teaching in which communication between teachers and students is less and they lack cooperation, as a result, it is hard for teachers to master the individual difference of students, and all of these have put forward a severe test for the college English teaching [1]. Obviously, the traditional pattern of teaching cannot adapt to these changes any more and solve problems of large-class teaching [2]. With the development of networked multimedia, the college English teaching will have to make use of the development tendency to reform of the traditional teaching mode and build the new pattern of college English teaching based on networked multimedia [3, 4].

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96.2 Theoretical Basis of the New Pattern: The Education View of Constructivism

From the 1990s, the educational view of constructivism has been popular with more and more researchers and practitioners of educational theories, which has become the guidance idea for public education and elite education in many countries. The educational view of constructivism emphasizes that students can acquire knowledge with constructing significance actively but not teachers' teaching, which means that the process when students acquire knowledge is to constantly assimilate, index, and construct new knowledge structure. Compared to the traditional education theory, the educational view of constructivism requires students to change them from passive knowledge receiver to active constructor of own cognitive structure, and teachers to change from pure knowledge disseminators to promoters and assistants to help students construct knowledge. As for education, the educational theory of constructivism requires dual purpose that we not only need to teach students to have a correct cognition of the world but also tells them how to cognize the world and cultivate their initiative to explore different ways for each individual to cognitive the world so that students can learn to use these methods to enrich their own cognitive structure constantly. As for relations between students and teachers, constructivism advocates to be learner-centered and pay attention to the teacher's leading role at the same time. Teachers' teaching methods, skills, and the pattern should be used for establishing a good learning environment but not for the educational environment service. In the teaching process, the teacher should not force students to learn but to give proper and patient guidance to all students.

96.3 Advantage of the New Pattern

The teaching process of networked multimedia is a interaction full of openness, sharing, alternation, autonomy, and cooperation which has well reflected the advantage of the new pattern of college English teaching based on networked multimedia that first create conditions for teachers to implement multiple teaching methods. They can use extremely rich network resources, with combining teaching syllabus and teaching content organically, teachers can also diversify the teaching design. Second, it is good for realizing students' autonomous and individual learning. With the infinite open space network, students can choose contents which are related to teaching and they are interested in according to their own specific learning and cognitive level to improve the learning interest and study by themselves. Third, it practices the teaching philosophy that teaching is student-centered with the teacher as the supervisor. Teachers can use networked multimedia to transfer the teaching design to students comprehensively, intuitively, and vividly to help to bring about the resonance and good communication habits between

teachers and students. At the same time, in this pattern students can also conveniently couple back the learn effect to teachers, according to which teachers will tutor students timely and with pertinence. With constant and repeated exchanges and feedback, students can find lack of learning by themselves to adjust their learning methods timely and improve the learning quality according to teachers' tutoring.

So the new pattern of college English teaching based on networked multimedia can raise students' learning interest effectively and cultivate their consciousness and habits to explore actively. With complementation and promotion for the teaching material from media, the teaching structure and teaching environment will be optimized. Multimedia brings a mass of information and spread quickly so that teachers can provide various, flexible, and targeted teaching methods to save the teaching time, improve teaching speed and increase teaching density, which is good for students to communicate and cooperate. With multimedia network technology more and more intelligent and interactive students' single learning process is transferring to multidimensional study with class, teachers, and machines which will cure the common failing of Chinese students that they do not dare to talk in English during English learning process.

96.4 The Implementation of the New Pattern

As most colleges use the way of large-class teaching, we should make use of the new pattern of college English teaching based on networked multimedia to improve students' learning interest and enthusiasm and maximally realize the hardware facilities and software conditions for individualized teaching.

96.4.1 Good Multimedia Network Teaching Environment

Complete hardware facilities and excellent teaching equipments are basic material guarantee for implementing the new pattern based on networked multimedia. To satisfy the needs of multimedia teaching task such as teachers and students' oral training, audio-visual teaching ,and scene simulation, multimedia speech classroom must be equipped with sufficient facilities and should be constantly constructed and perfected.

96.4.2 Hierarchical Teaching

Large-class teaching may ignore students' individual differences, and the traditional teaching mode adopts the same teaching method for different students, which makes the teaching design not to meet demands of good students while the

poor students feel hard to study and keep up with teaching progress. To realize individualized teaching, first we need to classify students and adopt different teaching methods, different learning design difficulties and put different teaching requirements for students in different levels to achieve different teaching goals. We can classify students to three different levels like A, B, C according to English scores in assessment results and college entrance examination . Students in level A have best English foundation, so requirements for them are the highest, in addition to the usual teaching task, extracurricular expansion is essential and they should continue to strengthen viewing, listening ,and speaking ability of English. Meanwhile, CET 4 is the task that students in level A need to get ready for all the time. Students in level B have poorer English foundation, and teaching should focus on studying the course knowledge. Teaching goal is to grasp textbooks firmly, finish the basic teaching task and have some extracurricular expansion. Students in level C have the poorest English foundation, and the learning effect of English in middle school is not ideal. Therefore, in the early half time of teaching, we should pay more attention to strengthening their basic knowledge of English, and teachers should assist the students' entrance work for college English.

96.4.3 Selection of Teaching Material

When we select the teaching material, we need to pay attention to one thing that is whether it has the function to cultivate students' comprehensive ability of viewing, listening, and speaking. The teaching material selected must have two versions like network course edition and single course edition, and teaching materials must be equipped with the corresponding audio-visual courseware and provide diversifiable question bank to form evaluation and final evaluation. The teaching goal reflected in textbooks should accord with curriculum requirements for college English, and teaching material contents must be diversiform and innovative, what's more, the arrangement of teaching material should be able to satisfy requirements of students in different levels.

96.4.4 Distribution of Class

Distribution of class should be according to both arrangement of textbooks and teaching regularity of the new pattern. Take New Horizon College English for example, According to the suggestion of teaching material on cultivating ability of reading, writing and listening, and speaking, teachers teach for 2 class hours, students study by themselves class hours, audio-visual course for 1 hour class, and audio-visual exercises and tests for 1 hour class, at the same time we can open speech classroom and multimedia network multimedia classroom for free to extend time for students' autonomous learning and training, which not only

reflects the teaching ideas that we should take students' autonomous learning as a center, but also pay attention to teachers' leading role, second, we can fully implement the classroom teaching and make students actively use extracurricular resources. At last, the method can also test the reading and writing skills of students and train the audio-visual and speaking ability.

96.4.5 The Design of Teaching Contents

As for students' autonomous learning, multimedia network teaching pattern can provide students with a good autonomous learning environment, but we still need to pay attention to one thing that when students learn independently, they should not choose the study content is only according to their interests, which will break away from teaching syllabus and teaching goal and has an opposite effect. So teachers need to raise corresponding requirements for students' autonomous learning and conduct necessary supervision and inspection. Teachers can also design corresponding themes according to each teaching unit and put forward the study tasks through unit contents to make students explore their subjectivity and construct own cognitive structure to improve the effect of learning knowledge and skills. In order to save the teaching time, teachers can transfer theme material to each student after school and decorate the study task through the network technology like BBS tribune of study. Meanwhile teachers can have real-time communication and exchange with students through chat software so that they can find the shortage in students' autonomous learning to put forward the improvement methods. Students can also communicate with teachers for problems in students' autonomous learning to solve problems quickly. Finally, students feedback the learning effect to teachers with E-mail to improve teaching efficiency.

When teachers impart and teach knowledge, they should adopt various flexible teaching methods to fully embody teacher's leading role in 2 h. The primary purpose of learning foreign languages is to use the foreign language to talk freely, so teaching contexts should pay attention to strengthening the students' communicative ability and large optimum input of language during 2 h of classroom teaching. Krashen thinks that optimum input must satisfy three conditions that the language input must be able to understand and vast and also correlative and interesting. First teachers should use courseware to give students large simon-pure English input. Then teachers should build open and lively and relaxed classroom environment and encourage students to talk boldly and give effective language output, for example they can have discussions, debates and lectures about teaching topic. Teachers should pay attention to the cultivation of students' English learning skills, such as all kinds of reading skills, writing skills, and communication skills to guide students to take diverse learning methods and strategies and stimulate the students' learning initiative.

The new pattern of college English teaching based on networked multimedia is not only a change of the teaching method for adopting new multimedia technology, but also a fundamental reform for teaching philosophy, and it establishes the student-centered personalized teaching pattern, which plays an important role in promoting the cultivation of independent learning ability and language skills of Chinese students.

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Chapter 97
Research of Interactive Media Techniques in Undergraduate Distance Education

Ning Zhang

Abstract The article emphasizes on introduction of synchronization/asynchronous technique based on computer network, video, or audio conference system function based on computer network technique, interactive television system, and streaming media editing technique.

Keywords Undergraduate distance education · Interactive media technique · Problems

97.1 Introduction

The essential character of separation of teaching and learning in undergraduate distance education decides that the key point of distance education practice is to reintegrate teaching and learning. In the distance education, as teachers and students separate in time and space, teaching and learning are separated. Under the circumstances that teachers and students are separated from each other, students cannot go to classroom according to timetable and listen to teachers, from which they can get direct and constant learning instruction from teachers. Though undergraduate distance education does not repel short-term face-to-face instruction, mostly learning and teaching behaviors in undergraduate distance education are realized through media. Face-to-face interpersonal interaction is no longer the

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main teaching method of undergraduate distance education. Therefore, interaction with media as intermediary is the key process of realizing the integration of teaching and learning in undergraduate distance education.

97.2 Advantages of Undergraduate Distance Education

It is convenient for students in undergraduate distance education. Students need not go to classroom in specific time. Instead they can open their computers and log on internet at any time in any place and start to learn from any chapter and choose any course as they like. Competition is fierce in current society and time is valuable. But as long as students bring their computers or 3G cell phone, they can log on Internet and begin with undergraduate distance education when they are waiting for bus or in the metro. Because of the sharing and permanent character of network resources, undergraduate distance education can be applied by students to learn to old age.

Undergraduate distance education is colorful. From aspect of pattern, it breaks the constraint of time and space. Students and teachers do not interfere with each other. Teachers can organize courses according to their thought without interference from students while students can choose time, space, and courses that they like according to their own characteristics and hobbies. Meanwhile, students will not have too much pressure. Instead, they can have fun in the process of learning. As for content, undergraduate distance education can apply audio, media, voice, animation, and other forms as network has changing forms and contents of network are diversified and rich. Undergraduate distance education can also simulate 3D animation through network, combing pictures and characters. In addition, listeners can come from different countries in different ages, which can promote understanding and broaden their horizon.

Expenses for undergraduate distance education are relatively few. Undergraduate distance education does not need a large scale of teaching buildings and dormitories. It can organize decentralized students to learn, which can save resources and increase efficiency. For teachers, they can freely choose time to record contents without delay. Fro students, they do not need to occupy "school resources". Therefore, different from regular high colleges, undergraduate distance education save building expenses such as desks, chairs, classrooms, canteens, and so on, and also extra tuition and training fees, which are not few. The success of American MBA distance education becomes the model of undergraduate distance education. Domestic colleges and universities also put forward the slogan "developing undergraduate distance education for realization of expanding colleges and universities with low cost". With the development of technology and the progress of products, informatization and technology tide are sure to bring the slowdown of communication expenses and computer and cell phone expenses. Undergraduate distance education is sure to embrace a broader space for development and broader market prospect.

97.3 Synchronization/Asynchronous Network Course Based on Computer Network

In the practice of undergraduate distance education, interaction as the process of interaction between teaching and learning is often misused or neglected. Rose points out that interaction are a very complicated concept, which has dual nature of being privileged and neglected: (Rose 1999). Misunderstandings of interaction concept in undergraduate distance education practice mainly reflect in the following aspects: first, interaction technique is one-sided valued in the media development while the actual demands of undergraduate distance education are neglected; second, operational media interaction is one-sided pursued while media contents interaction are neglected; third, media interactive functions in practice can not effectively improve teaching quality; fourth, scientific design of interactive activities is lacking, and interactive activities fail to provide actual help for learning.

97.4 General Introduction of Interactive Media Based on Information Technology

97.4.1 Fundamental Principles of Interaction

Fundamental principles of interaction mainly involve three aspects: functions and intension of interaction; classification theory of interaction; and relations between media and interaction. Liang Bin points out that interactive function can be simply defined as a two-way communication. In teaching process, it is represented as the two-way communication between learners and teachers, learners and learning resources, learners and learners. On the macro level, the thought of teaching design is used to understand the usages of media while on the micro level, applicable conditions and means of different media are studied and certain media is chosen based on specific teaching demands.

97.4.2 Interactive Promotion in Undergraduate Distance Education

From now on, practitioners in undergraduate distance education no longer focus on the development of self-learning materials, but begin to pay attention to carry on learning support through all kinds of interactive activities. During the same period, undergraduate distance education which takes collective spread teaching model has made good results. One feature of the collective spread teaching model is to

organize a large number of teachers and learners for face-to-face interaction. It is totally different from the theory of independence and autonomy put forward by westerners. Chinese practice in undergraduate distance learning proves that independence and autonomy are not necessarily the requirements of undergraduate distance education, but can be the result of undergraduate distance education.

97.5 Synchronization/Asynchronous Network Courses Based on Computer Network

Undergraduate distance education network system applies three-level system structure of browser/web server/database server. In this three-level system structure, web browser is the main application software of client-side. This structure unifies the client-side, and put core parts realized by system functions on web browser, thus simplifying the development, maintenance and use of the system. User interface is completely realized by client web browser. Partial work logics are realized in client-side, but main work logics are realized by web server. User interface sends out requirements to web server distribution points through browser. Web server will handle the requirements after receiving them from the browser, and return the results and required information to the browser through network distribution points. Three-level b/s structure simplifies the workload of the client-side. Client-side can simply install web browser without special maintenance. Expansion of the system also becomes easy, which relieves the burden of the server and increases interaction.

Design and development of network courses provide overall solution for certain course. It is carried out based on the mastery of the demands of learners and teachers, reflecting dynamic interaction feature of network. Learners can gain supporting learning service for one course after registration, instead of some segments or chapters. General presentations are no match for it in the systematic and integrity of the curriculum system and intelligentzed provision of learning support.

97.6 Video or Audio Interaction Technique Based on Computer Network Technique

97.6.1 Video or Audio Conference System Function Based on Computer Network Technique

We consider that under platform system framework, taking knowledge points as basic units, and applying small presentations, modules, streaming media, and integrable ware presentation should be greatly the starting point of developing self-learning platform.

97.6.2 Streaming Media

Streaming media refers to the technique and process of transmitting video and audio for appreciation in real time after compressing a series of media data and transmitting the data through network. By stages.

97.6.3 Effects Processing of Post Audio Editing

Though general digital video have simple effect shooting model, it is hard to operate and its effect is not good. Applying software for post editing can realize big effects and also process materials of any stages.

97.7 System Technology of Interactive Television

The so-called interactive television is a television controlled by audience. During interprogram and intraprogram audience can make choices. It is a new television business with asymmetric full-duplex communication mode. Interprogram interactive television can be called video on demand (VOD), which can be divided into true video on demand (TVOD) and near video on demand (NVOD). Intraprogram interactive television is also called entire interactive television. It can transmit users' requirements and decisions to users. For interactive films, one scene should be switched to another, which needs high editing expenses, so it is seldom used.

Our undergraduate distance education is undergoing a new generation of undergraduate distance education model with network undergraduate distance education as main body after experiencing correspondence education and radio-television education. This model breaks the constraints of space and time of previous model and changes the old teaching model that teachers set time and space for teaching. Students can allocate their free time and apply all forms of sharing resources provided by network undergraduate distance education at any time in any place. They can also search for learning contents that suit them in downloaded form or video-on-demand to accomplish their learning plan and learning goal. This relieves teaching and management stress of undergraduate distance education departments. They can spare more efforts to improve teaching contents and methods, update knowledge timely, improve teaching quality, and save human resources, materials and money.

97.8 Existing Problems

Factors of network system are compared to road (hardware), car (application software system), commodity (education resources), and driver (teachers and learners). If there is car and road but no commodity, it will lead to a lot of waste. Our network education is still in its infancy, with a lack of education resources, and incompatible sharing of construction. Resources in database do not have corresponding assessment and maintenance. Therefore, resource contents do not come up with curriculum reform, increasing invalid resources.

Network education system does not rely on modern communication technology, network technology. It should be guided by teaching design theory which suites its characteristics to reach the goal of cultivating learners' creativity and quality-oriented education. Some network education system is not based on modern cognitive learning theory. Neither does it take learners' cognitive development rules into consideration. It either emphasizes technology and interaction of network education or emphasizes contents, resulting in low quality of network education. And students doubt about the quality of network education and even the development of the whole industry slows down.

Seen from these phenomena, whether we can provide much more service for learners is an important measurement in evaluating the quality of network education in modern network education field. In network education, only when the service concept of centering on learners and the market principle of centering on users are encouraged, network education can develop rapidly. Teaching process of undergraduate distance education does not only convey information but also support students' learning from all around through interactive activities in all forms.

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Erratum to: Network Security Awareness Modeling Based on Data Mining Method

Yunhong Guo and Guangyao Lu

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The chapter is retracted because the findings have previously been published elsewhere (i.e. redundant publication).

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Author Index

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