Wenjiang Du

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Preface

Welcome to the proceedings of the International Conference on Informatics and Management Science (IMS) 2012, which will be held in December 21–23, 2012, in Kunming, China.

IMS 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 Informatics and Management Science. The conference will feature keynote speakers, a panel discussion, and paper presentations.

The objective of IMS 2012 is to facilitate an exchange of information on best practices for the latest research advances in the area of Informatics and Management Science. IMS 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 Informatics and Management Science.

There was a very large number of paper submissions (2351). 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 614 papers for presentations, reflecting a 26.1 % 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 Informatics and Management Science.

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
Kunming, China.

　　With our warmest regards.

December 2012   Wenjiang Du
                                                              Guomeng Dong
                                                  General and Program Chairs
                                                                    IMS 2012

Organization

IMS 2012 was organized by Electric Power Research Institute, YNPG, Yunnan Normal University, Wuhan Institute of Technology, Guizhou University, Chongqing Normal University, Chongqing University, Yanshan University, Xiangtan University, Hunan Institute of Engineering, Shanghai Jiao Tong University, Nanyang Technological University, and sponsored by National Natural Science Foundation of China (NSFC). It was held in cooperation with *Lecture Notes in Electrical Engineering* (LNEE) of Springer.

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Part I
Communication Technology and Applications

Chapter 1
Research of Botnet Intrusion Detection Technology Based on the Flow

Ling Jia

Abstract In view of the current Botnet attack turning frequently, this paper analysis the double-stage propagation model of intelligent botnet, and puts forward a botnet detection method. This method adopts the concept of flow; for the first stage of the propagation, the paper puts forward the small flow filtering method, and reduces the number of flows needed to detect deeply effectively; for the second stage of the propagation, the paper adopts the thought of flow call-back, and detect each suspicious IP on the terminal router when botnet attacks cause network congestion, and then ensure the detection of botnet in real time.

Keywords Flow · Botnet · Detection · Small flow filtering · Flow call-back

1.1 Introduction

Now, in order to gain the economic interest, technologies about malicious programs such as viruses, trojans, and worms have been improved increasingly, the security of network service is suffering from a great challenge [1]. With the emergence of botnet and the mature of its technology, more and more attackers are inclined to this attack mode. The attacker installs bot program on the host with poor protection with the methods such as deception and induction, and will steal users' private information, or send attack command to bots for mass attacks such as DDoS and spam mails attack, when the number of bots arrives to a certain value [2, 3]. Now, DDos attack is no longer the means of hackers and computer masters showing off their technologies, but the way of getting interests and extorting, stealing privacy information, and it has formed a complete industry chain!

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1.2 The Propagation Model of Botnet

Thanks to the invasion technology grown mature increasingly and terrible low security awareness of ordinary Internet users, botnet is becoming more and more popular in the Internet, and that bring attackers great economic benefits and technical achievement, but botnet has made serious damage against Internet and people's life and social economy suffered from the actual loss at the same time.

1.2.1 The Summary of Botnet

Botnet is a network where a host, which injects control programs into a large number of victim hosts by one or more spread ways, can control a lot of computers at the same time [4]. It is not the physical network which has the topological structure, but just the logic network having control structure.

As shown in Fig. 1.1, botnet has three main parts: the attacker, bots and command and control channel.

As shown in Fig. 1.1, the attacker in botnet is the host which can send all kinds of control commands to botnet, and carry out attack to specific IP or IP section by ways of IRC, P2P, AOL, etc.; the attacks contains types such as spam mail flood, DDOS attack. In most cases, to hide him and the channel of command and control, the attacker could make one or more bots as its springboard, and comprehensively use communication encryption and anti-tracking technology.

Generally, bots are the PCs Internet users' use, which are infused bot program by an attacker in various means. Bot program has functions of network
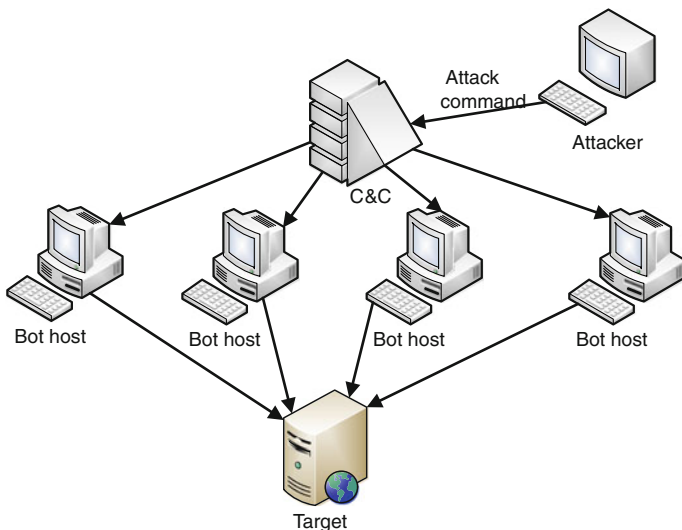
Fig. 1.1 Composition of botnet

communication, command control, information stealing, hiding and anti-tracking; it is normal for users when the host runs daily, but it will open command and control port, and carry out a series of operations after receiving attack commands. Command and control channel between the attacker and the bot host, is the center of botnet and the pivot of command and control distribution. In establishment and operation periods of the botnet, the command and control channels is generally stable, and command channel is fixed in the process of the attacker sending control command when the botnet is completed.

1.2.2 The 2-Stage Propagation Model of Intelligence Botnet

In the team of world honeynet project, Cliff zou analyzed the characteristics of worm's propagation and put forward the propagation model of the intelligent botnet based on a 2-stage honeypot detection, which considers that the worm is the mains way of current botnet spreading over the network; in order to conceal his tracking and prevent accessing into botnet by detection tools such as the honeynet, so construction of botnet is divided into the following two stages when botnet invades other hosts: the first stage is the "pure infection" period, and the hosts which have the poor protection ability is attacked by the invasion and attack program such as the worm, but we are difficult to distinguish the host which has been infected and the honeypot which is ready to detect botnet; the second stage is "malicious executing" period, and the attacker will send attack commands to the real host infected and download malicious attacks programs to the specified address at this stage, and then carry out the second infection or massive attack; but the honeypot will not perform attack, and do the same attack as the infected host, so intelligent botnet would clear up detection tools such as the honeypot out of botnet by analysising behaviors of all the infected hosts based on the 2-stage propagation. From here we see that the traditional detection method has been difficult to work on honeypot according to the 2-stage propagation of intelligence botnet. Consequently, we put forward a botnet detection technology based on the flow, and for the 2-stage propagation of intelligence botnet, analysis characteristics of the flow at different stages and study corresponding technologies respectively.

1.3 The Technology of Botnet Detection Based on the Flow

1.3.1 Botnet Detection at the First Stage of Propagation Based on the Small Flow

Netflow technology is put forward by Cisco, which is a high-performance exchange technology on network layer based on the flow sampling. Information sampled by Netflow is statistical data based on the "flow". Netflow sampling

method is based on the network protocol analysis function of network equipments (the router and the 3-layer switch, etc.), and can collect and sample all kinds of network protocol flows, and record into files according to the format of flow information [5]. This method does not need to add the extra hardware and spend more cost, and can also monitor the global network; it is suitable for a long-term, big flow under the environment of data collection and analysis because of its moderate size data and convenient configuration. Now, Netflow technology has applied in a wide range of the large-scale network traffic statistics.

Definition 1 Match pattern: six elements can distinguish a unique Netflow flow, (source IP, source port, destination IP, destination port, network protocol, service type), and each field can be can be a fixed value, or any value in the model.

Definition 2 Out flow on (IP, Port): in a period, for a given (IP, Port), match model (IP, Port, *, *, protocol, Port, *), where (IP, Port) is its source address, and network protocol is fixed and destination IP and destination port can be any value, is marked as OF(IP, Port).

Definition 3 In flow (IP, Port): in a period, for a given (IP, Port), matching model (*, *, IP, Port, protocol, Port, *), where (IP, Port) is its destination address, and network protocol is fixed and any source IP and source port can be any value, is marked as IF (IP, Port).

Definition 4 Number of network flows—NF: for a given network, the number of output and input flows it contains.

Definition 5 The average packet length of the flow—AL: for a given network, the average packet length of the flow can calculate by that the number of packets is divided by the total package bytes in a period.

According to definitions above, we monitored network applications of a bot host IP in a period, and sampled the flow information as Table 1.1.

According to statistics Table 1.1, we find that the bot program U-Storm has maximum number of output and input flows, but its average packet length is short; in this paper, we call the flow which has a big NF value and a small AL value the small flow. Here the small flow can be the output flow, or the input flow. According to statistics, we cannot make sure a host is the bot, although the bot host

Table 1.1 Flow information statistics on bots in a period of time

Network application	OF		IF	
	NF	AL	NF	AL
WEB service	16445	1038	18556	193
DNS service	126908	172	189312	64
Emule	3301	90	2764	78
BT	654	142	613	245
U-Strom	46361	56	43650	53
Http	8	122	5	677
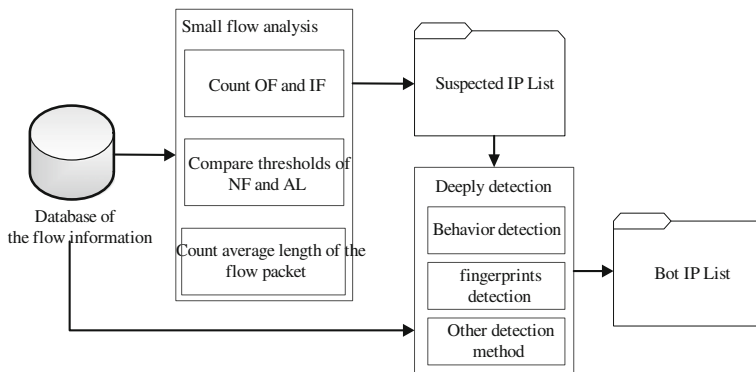
Fig. 1.2 Botnet detection based on the small flow

has characteristics of the small flow. As shown in Fig. 1.2, we can use the filtering method, and filter out IPs which are not the small flow firstly, and then detect a small amount of flows according to behavior, fingerprint and other methods; so it will increase efficiency and quality of botnet detection. This method filters out most of normal flows firstly according to characteristics of the small flow, which is implemented based on router equipment, and doesn't need to increase the computing cost; but it is only suitable for the first stage of the botnet propagation, because it needs the cooperative work of the entire network equipments and a long time to prepare.

1.3.2 Botnet Detection at the Second Stage of Propagation Based on the Flow Call-Back

If the attacker has infected a large number of bot hosts, then he will carry out the second stage of propagation, and try to attack some targets on the network, and monitor behaviors of all the bots, and finally find out the honeypot host; the method based on the small flow is no longer suitable at this time, because bots will send a lot of packets to the target and have no characteristics of the small flow. So we need to study the detection method on characteristics of the second stage of propagation.

As shown in Fig. 1.3, this is a simple botnet diagram. The attacker controls bots attack to network target S, and then the down link of the router R9 which connects to S happens to congest; right now, we can say that the network flow is abnormal. In view of this situation, we can use the "call back" method for suspected bots detection.

The basic process of "call back" is that: on the router which happens to congest, we can scan the flows which have the same source IP and a large quantity; each source IP of the flows is suspected IP, and then we "call back" the IPs to its
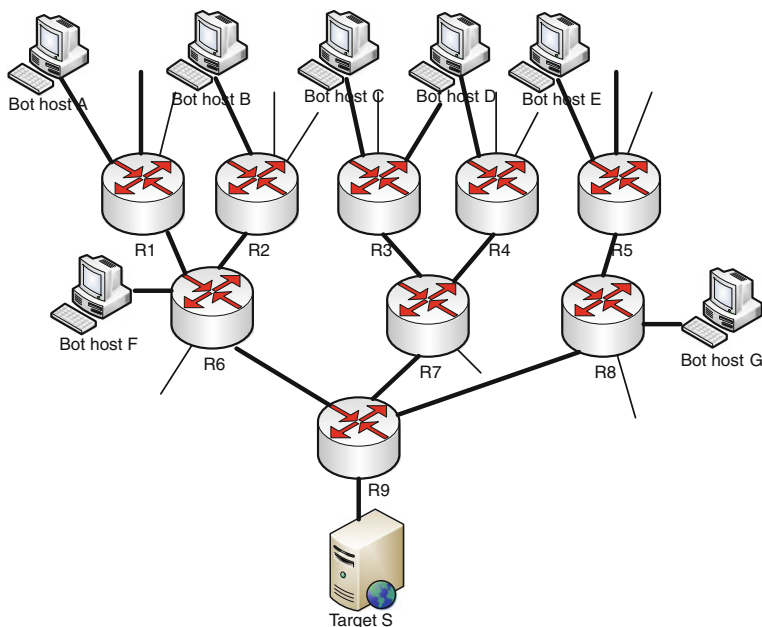
Fig. 1.3 A simple diagram of botnet

uplink router until we find the terminal router corresponding to the source IP; and finally each terminal router will check suspected IPs with various detection methods. As shown in Fig. 1.3, after R9 blocks, R9 scans all the flows, and finds that the flows which have the source addresses of A, B, C, D, E, F, G arrive to S at the same time and have a large quantity, so R9 will send the call back request to R6, R7, R8 until it finds out R1, R2, R3, R4, R5; finally R1, R2, R3, R4, R5, R6, R7, R8 will check A, B, C, D, E, F, G to make sure each attack bot host.

1.4 Conclusion

As electronic commerce is booming increasingly, on the one hand, a large number of service requests cause great pressure to various Internet servers, and information system itself is already struggling to cope with all kinds of normal requests, If DDoS attack also attack the server, the result would be catastrophic; on the other hand, users have been using various bank account information, once the account information is stolen by botnet, it will cause the economic losses for users.

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Chapter 2
Research of Optical Fiber Communication in Relay Protection

Zhan Guo and Zu-ming Xiao

Abstract With the development of large grid, distributed, heterogeneous complex power network, the power grid management is more and more complex and its safety operation is more important. In order to effective control of power systems in normal operating conditions within the shortest possible time, the relay signal must be accurately passed to the communication terminal by the transmission channel. At present, optical fiber protection channel is widely used in many parts in China. It also has some problems, such as leakage of immature technology, lack of synchronous optical transmission signal protection performance indicators. In this paper, the basic content of relay protection is described, the application of optical fiber communication technology, as well as the problems exposed in the practical application in the signal transmission channel is introduced, the development prospect of new technologies and materials for optical fiber communication technology is analyzed.

Keywords Relay protection · Optical fiber communication · Application mode

2.1 Introduction

As a relay signal transmission medium, optical fiber communication has been a preliminary application, and it is the future direction of development of the relay channel. But within the industry to develop relevant standards and norms without

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some special business electricity private network taken into account, only taken into a variety of business in the public communication network. Because of this, the reliability that relay signal is transferred by fiber channel has been questioned. In order to make the fiber protection channel really get a wide range of applications, we must conduct a thorough study of the relay signal performance and fiber-optic application.

2.2 The Overview of Relay Protection

2.2.1 The Content and Basic Functions of Relay Protection

2.2.1.1 The Overview of the Relay Connotation

Power system is consisted by power plants, substations, and the organic whole of the transmission and distribution lines, including many complex high-voltage electrical equipment and protective, regulating, monitoring low-voltage automatic device. Usually power system at run time will inevitably appear short circuit, disconnection, ground fault caused by external factors, such as lightning, birds, and internal factors, such as equipment aging, the artificial and improper operation. Malfunction or abnormal situation, not only will affect the normal use and production of the client, but also damage to the device or even grid overall security breach, irreparable damage to the normal economic production. In order to reduce threats the abnormal situation towards the power system in the actual operation, strict regulation is needed for equipment's procurement, installation, operation and maintenance, the appropriate protection and automation devices should be equipped.

Relay protection device is the protection the power system to install and run, its function is to reflect the fault and abnormal operation. Protection devices for a certain distance away from each other, signal transformation should be valid and correct in order to maintain a synergistic action. Therefore, the relay signal transmission is essential for the normal operation of the power system or other public communication, to solve many technical problems that protection channel exists is the protection of the management and operation of modern long-distance power grid transmission.

2.2.1.2 The Basic Functions of Relay Protection

First, when the power system is failure, the relay protection component quickly and unequivocally sends trip command to recently circuit breaker, so that failure component can be disconnected from the power system in a timely manner, which minimize damage to the power system components and the impact of power supply system. Second, it could detect irregularities in the operation of electrical
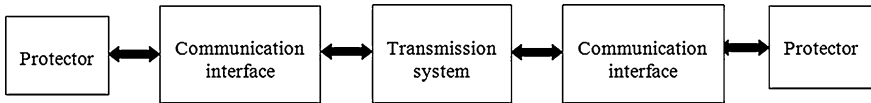
Fig. 2.1 The working principle of the protection device

equipment, and send signals to the management terminal according to the abnormal conditions and equipment maintenance requirements, so that staff can deal with in a timely manner or automatically disconnected electrical equipment which will cause accidents and given a degree of automatic delay.

2.2.1.3 The Signal Transmission Channel of Relay Protection

The relay protection device output the 2 Mbit/s or 64 kbit/s signal through the interface to reach the contra lateral terminal by transmission channel. The work process is shown in Fig. 2.1.

2.2.1.4 The Traditional Signal Transmission Channel

The relay protection signal can be transmitted through a variety of different communication channels, such as traditional power line carrier and microwave.

Power line carrier channel is a specific signal communication in power system. It has the advantages of short input duration, simple device, communication effect, communication lines usually corresponding erect where power lines lay. There are two application forms, specific carrier and reuse carrier, the application of these two forms is not very satisfactory. There is a poor anti-interference and anti-misuse ability.

Another microwave transmission phase has characteristic to separate self-fault with the power system fault, which provides a good communication channel to relay signals when failure event occurs. But there are also prone to fading in the actual operation, too many links on the intermediate transfer.

2.2.1.5 Transmission Channel of Optical Fiber Communication

In optical fiber communication system, the light waves' frequency as a carrier is higher than the radio frequency, to consider in terms of the transmission medium, fiber losses are much lower than cable and waveguide. Therefore, the optical fiber as a transmission medium can further improve the safety and reliability of power grid transmission. In actual operation, the optical fiber communication channel has many advantages: First, it has a high rate of the recognition error, and good transmission quality. This transmission characteristic makes the transmission channel have the media rate which the protection devices need. Through fiber

Channel transmission, terminal received information is exactly the same with the original information, there is no lack or change of the information. Second, it has the high anti-interference ability. Due to optical fiber communication media, it can effectively avoid the system-generated electromagnetic interference due to lightning and other natural phenomena. Third, it has characteristics of wide frequency bandwidth, large transmission. Due to the amount of information, and thus it increases the number of pass and make as much as possible to pass information between the originator and the terminal, thereby enhancing the correctness of the signal of protection devices.

2.2.2 The Application and Problems of Optical Fiber Communication in the Relay Protection

2.2.2.1 The Application of Optical Fiber Communication

The application of optical fiber communication channel is divided into dedicated connection and reuse connection.

Dedicated connection is connected both ends of the relay by fiber, generally when the distance is greater than 40 km, it is required to amplify the signal by relay equipment for transmission. It is shown in Fig. 2.2.

2 Mbit/s or 64 kbit/s

Multiplexing connection is the protection device connection that sucked terminal speed protection signal is transferred to end through fiber SDH network after multiplexing, and then demultiplexed into a low-speed signal transferred to the right side. General if the protection device interface rate is 64 kbit/s, the signal is needed to reuse by PCM equipment before SDH transmission. If the protection device communication interface output rate is 2 Mbit/s, it doesn't need PCM equipment for reuse. The process is shown in Figs. 2.1, 2.2 and 2.3.

It could be clearly seen from Figs. 2.1 and 2.2, a dedicated fiber connection has been widely used in practice because the transmission link is less and the system constitution is simple. But this connection is defective compared with reuse connections, optical core utilization will reduce, optical connector's change causes mixing increased costs. In addition, the grid structure and other public communications network changes more quickly, the pace of networking is faster and faster, a dedicated fiber connection cannot change with its structure. Compared with the traditional connection, the transmission performance of multiplexing, optical protection channel is better than power line carrier and microwave channel, and multiplexing optical fiber protection channel networks flexible; to meet the

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┌─────────────────────────────┐     ┌───────────────────────────┐
│ Originator protection device │─────│ Terminal protection device │
└─────────────────────────────┘     └───────────────────────────┘
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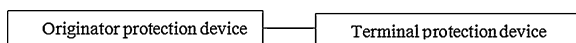
Fig. 2.2 Dedicated fiber connections
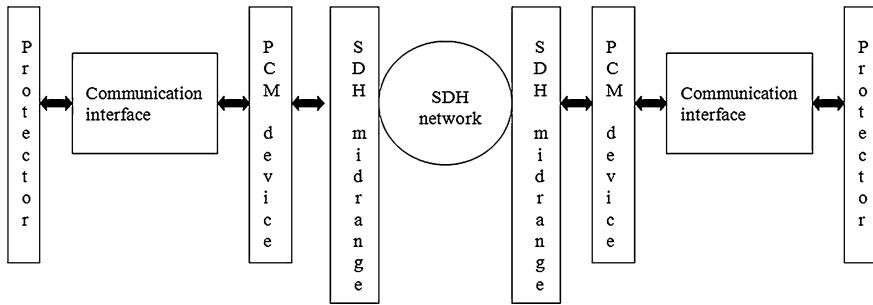
Fig. 2.3 Multiplexing optic fiber connection

rapid changes in the grid structure, also makes full use of resources and cost savings. By the above comparison can be drawn, multiplexed optical fiber protection channel is long-term development direction in the protection channel.

2.2.3 The Protection of Optical Fiber Communication Channel

2.2.3.1 Line Current Differential Protection

The basic principle of the line current differential protection is based on the current theorem to achieve protection unit, its principle is simple and not affected by run way, the two protection devices within the system are separate to improve system's reliability. In multiplexed channel application, the synchronization of protection and multiplexing device is essential for the correct operation of the optical fiber differential protection, therefore master and slave timing modes are used to ensure clock synchronization. In addition, the use of 64 kbit/s digital channel, the current differential protection channel not only ensure the current amplitude, but also ensure the synchronous transfer, which tends to affect the accuracy of the BER test, so most of the manufacturers have introduced line current differential protection channel with a 2 Mbit/s digital interface.

2.2.3.2 Fiber Blocking Scheme, Allowing Longitudinal Protection

Fiber blocking scheme, allowing longitudinal protection uses a stable and reliable fibre channel instead of the traditional high-frequency channel, thereby increasing the reliability of the protection action, its structure is developed from the original high-frequency locking structure. The traditional high-frequency locking structure needs regular to exchange of signals to ensure the normal and the sensitivity of the channel, frequency discriminator signal of fiber lockout protection channel eliminates the need for cumbersome inspection procedures by monitoring the fiber

channel protection. In addition, the transformation of the fiber latching only needs to replace the optical transceiver that could access the currently used high-frequency protection, which saves a certain amount of replacement costs.

2.2.3.3 Problems of Optical Fiber Communication Protection Channel

Since the optical fiber communication technology in China starts relatively late, the communication quality is gradually improved, but it needs a full range of coordination and communication among engineer, design, and communications in order to obtain a substantial development.

2.2.3.4 The Lack of Authoritative Requirements and Standards

Optical protection channel is not established technical specifications and industry standards in the initial design and application, so optical fiber communication could only plan and construct accordance with its own characteristics and practices in many areas when the rapid development of optical fiber communication. Due to the lack of uniform standards, optical fiber communication does not meet the requirements to play a protection channel in some areas, which is an adverse impact on the quality of the transmission channel, and thus constitutes the entire power system security risks. Thus, in order for greater integration of resources, reduce duplication building cost, development of uniform standards and norms of the industry is imperative.

2.2.3.5 The Synchronization of Optical Fiber Current

Towards synchronization problem of the vertical flow of the fiber-optic current differential protection devices, the current research manufacturers use GPS synchronization method and data correction method, but both methods have their own application defects. GPS synchronization method is to carry on the GPS-based applications, the sampling synchronization and communication route which could adapt to all forms of communication system that can achieve very high accuracy, and not be affected by grid frequency. But it will be subject to the constraints of the natural and social environment, especially the GPS satellites controlled in wartime.

Data correction method allows the freedom and independent sampling for all protective devices, if the communication route is fixed, after the channel delay measured, when the communication interference or communication interruption, it almost does not affect the sampling synchronization. As long as communication is restored, the protection device according to the received current vector packets can immediately carry out the differential protection algorithm process. The drawback is that each differential protection algorithm process following the data correction process and the comparison of the channel delay parameters. It is not suited to the

traffic routing changes, and the grid frequency changes will also affect its displacement vector result of the amendments.

2.2.4 Application Prospects of Optical Fiber Communication Technology

The optical fiber communication technology has advantages of no crosstalk confidentiality; low loss, long distance relay; frequency bandwidth, large capacity communication; anti-electromagnetic interference in practical applications, so it has good prospects. However, in accordance with the above-described problems, we still need to strengthen research on optical fiber communication. The future optical fiber communication technology in the relay protection should be the direction of ultra-high-speed system; this can increase the bandwidth and take full advantage of reuse. In addition, the optical fiber communication technology should gradually realize optical networking; optical networking could realize large-capacity optical networks and network scalability, reconfigurability, allow the growth of network nodes and business volume. Finally, the fiber material should be adapted to new development and need to develop a new generation fiber, at present, non-zero dispersion of light fiber and no water absorption peak fiber is the main direction of development.

2.3 Conclusion

With the development of communication technology, more and more fiber channels can be chosen for relay protection. At present, the formation of fiber-optic network provides a hardware foundation for relay protection using high-performance channel. How to effectively use it to make it better for the protection services is the crux of the matter. This requires various professional coordination and communication among engineering design, operation, maintenance, communications, protection, needs the accumulation of field practical experience, in the practical application, we should deal with new problems to actively explore, analyze and solve.

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Chapter 3
Research of Single Photon Detectors Applied in Quantum Communication

Shiji Yang, Lixing You, Ming Zhang and Jianyu Wang

Abstract Single photon detector (SPD) is one of the key components in quantum communication (QC). To compare the capabilities of SPDs, this paper discussed the current technology of different SPDs and took some experiments. The results show avalanche photodiode (APD) can't satisfy the development of QC. The count rate of Superconducting nanowire single photon detector (SNSPD) is much higher than APD and the other SPDs, which proves that SNSPD is feasible for high speed QC. And the lower dark count rate of SNSPD makes the lower error rate and the safer communication. Though there are some technical challenges in applications, SNSPD will have broad prospects in QC.

Keywords Quantum communication · Single photon detector · Superconducting nanowire single photon detector · Avalanche photodiode · Count rate

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3.1 Introduction

Along with the rapid development of the operation rate of computer, the ordinary encryption technics is not safe anymore [1, 2]. Quantum communication (QC) is the best substitute. Its information is taken by photons coded in phase or polarization. Owing to quantum mechanics, QC is considered as the safest communication by most scientists [3, 4]. Nowadays, more and more researchers are trying their best to improve QC both in experiments and applications. To form the network of the global QC is the ultimate goal of the departments in China, America and Europe [5].

Single photon detector (SPD) is one of the key components in QC, and the count rate of SPD decides the bit rate of QC. In the former cases, avalanche photodiode (APD) is widely used as SPD because of the maturation of APD technology. But the count rate of APD is no more than 25 Mc/s.

Superconducting nanowire single photon detector (SNSPD) is a new kind of SPDs [6]. Because the count rate of SNSPD can be more than 1 Gc/s, the bit rate can be raised compared with the QC of APD. And the error rate caused by dark count rate is much lower, owing to the lower dark count rate of SNSPD. So it's available to apply SNSPD in QC.

3.2 The Comparison of the Different SPDs

3.2.1 The Semiconducting SPDs

The semiconducting SPDs detect the photons by the photoelectric effect. The main kinds of the semiconductor photon detectors are photomultiplier tube (PMT) and APD.

3.2.1.1 PMT

PMT is a kind of photoelectric components by the external photoelectric effect. It usually includes a cathode, several dynodes and an anode. The cathode absorbs the photons and excites photoelectrons. The photoelectrons, accelerated by electric field, get to the first dynode and cause the second electron excitations. The electron excitations repeat some times. Finally, the anode receives a much large current. We can get the number of the absorbed photons by the number of the electric pulses received at the anode.

PMT only works for the visible light and ultraviolet. The quantum efficiency of the infrared amplified PMTs is still not high at the infrared wavelength.

3.2.1.2 APD

APD is a kind of photoelectric components by the internal photoelectric effect. In the single photon detections, APD works in the Geiger mode. When the photon arrives at the APD, electron excitation emerges. The photoelectron, accelerated by electric field, collides with lattice atom, and the atom ionizes to new electron-hole pairs. Then the new electron-hole pairs collide with lattice atoms, and the atoms ionize to new more electron-hole pairs. This process repeats again and again. When the gain is large enough for detecting, APD quenches the avalanche effect by the quenching circuit.

Si-APD works mostly in the range of 400–900 nm, and can't respond at the wavelength more than 1 um. In the infrared range, In GaAs-APD has the best capability of the APDs.

3.2.2 The Superconducting SPDs

The superconducting SPDs detect the photons by the superconducting thermal effect. There are three kinds of the superconducting SPDs: Transition Edge Sensor (TES), Superconducting Tunnel Junction (STJ) and Superconducting Nanowire Single Photon Detector (SNSPD).

3.2.2.1 TES and STJ

The maximum count rates of TES and STJ are both about 100 Kc/s, though the dark count rates are none. And they must work at the temperature of 0.1 K. So they are not suitable for QC applications. We don't discuss them more here.

3.2.2.2 SNSPD

SNSPD is submicron bridge structure constituted by superconducting thin film. Its work temperature is much lower than the temperature of the superconducting transition. When the superconducting nanowires absorb the photons, quasi-particles turn up and form a hot zone in the superconducting thin film, which increases with the spread of the quasi-particles. Then the electricity density around the hot zone increases, and the phenomenon of sidewalk emerges. When the electricity density increases so as to more than the critical electricity density, SNSPD forms resistive domain. The superconducting nanowire turns back to the normal state, and the resistance increases rapidly. A voltage signal, proportion to driven current, engenders on the nanowire. SNSPD detects the existence of the photons by producing an electrical pulse. After the voltage engenders, the resistive domain

diminish gradually so as to disappear, and the nanowire turns back to the super-conducting mode. The time of this process is about 30 ps theoretically.

Its response wavelength range is 400–2400 nm. Its quantum efficiency is about 10 % in the range of near infrared usually, but the team of Rosfjord improved it up to 57 % by coating the reflecting film and adding the reflecting cavity.

3.2.3 The Comparison of the Capabilities

Present-day quantum communications usually work in the infrared range (800–2400 nm), due to the lower attenuation of the channels and some other reasons. Some capabilities of SPD are important for QC: the quantum efficiency, the dark count rate, and the count rate. The quantum efficiency and the count rate both decide the bit rate of QC. The dark count rate influences the Signal-to-Noise and the error rate in QC.

Due to the excessively strict conditions of TES and SJT, we just discuss the capabilities of the other SPDs, and showed them in the Table 3.1.

The data of IR-PMT, In GaAs-APD and Si-APD are respectively picked up from the products of Hamamatsu, Fujitsu and Perkin Elmer companies. The data of SNSPD are picked up from the results of the team of Rosfjord [6].

From the table, we can obviously find the capabilities of SNSPD are ascendant compared with other SPDs for QC. IR-PMT is not suitable due to the high dark count rate.

3.3 The Experiment

We took APD to compare with SNSPD in the experiments in the laboratory. The Perkin Elmer SPCM-AQRH-13-FC is chosen for the experimental APD. The count rate of this APD is up to 25 Mc/s; its quantum efficiency is 40 % at 850 nm; and its dark count rate is 150 c/s.

The SNSPD components were produced by Scontel Company, and the SNSPD system was designed by us in the lab of Shanghai Institute of Microsystems and

Table 3.1 The comparison of the capabilities of SPDs

SPD	Count rate (c/s)	Quantum efficiency	Dark count rate (c/s)
IR-PMT	9 M	0.5%@1300 (nm); 10%@850 (nm)	20 k
InGaAs-APD	5 M	20%@1550 (nm)	500
Si-APD	25 M	2%@1060 (nm); 45%@850 (nm)	25
SNSPD	>1 G	57%@1550 (nm)	10–2

Fig. 3.1 The system of the SNSPD

Information Technology, showed in Fig. 3.1. The count rate of this SNSPD is more than 100 MHz; its quantum efficiency is related with the dark count rate: when the dark count rate is 100 c/s and the other conditions are optimized, the quantum efficiency is 4 % at 850 nm, 2 % at 1310 nm, 0.5 % at 1550 nm.

The experimental source we chosen is the narrow-pulse laser produced by Hamamatsu. Its wavelength is 850 nm, so it can be detected by both the APD and the SNSPD. Its repetition frequency is alterable and the maximum is 100 MHz. The Beam Splitter (BS) and Polarizing Beam Splitter (PBS) were produced by Thorlabs. The power meter was produced by Coherent.

3.3.1 The Validation Experiment for the Count Rate

We turned the laser to the maximal frequency 100 M mode, and attenuated the signal to a proper level. The attenuated signal was split to two parts of the same energy by the BS. One part was detected by the APD and another part was detected by the SNSPD. The outputs of the APD and the SNSPD were showed on the oscilloscope. The proper energy made sure that every pulse was detected by the APD and the SNSPD. The experimental system is showed in Fig. 3.2, and the results on the oscilloscope are showed in Fig. 3.3.

We can find in Fig. 3.3 that the APD could not respond all pulses and the dead time was about 35 ns. However, the SNSPD could respond all pulses at this

Fig. 3.2 The experimental system for count rate
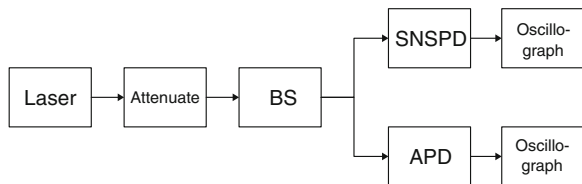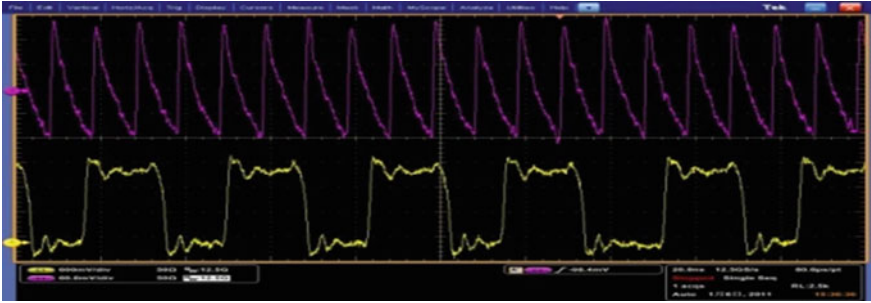
Fig. 3.3 The response results of SPDs

frequency, and we can expect that the SNSPD can respond the signal at the frequency more than 100 MHz.

In former QCs, the bit rate is so low that QC can't be applied widely. If we want to improve the bit rate to expand the scope of quantum communication, we must improve the frequency of the signal and the count rate of SPD. Obviously, SNSPD is better than APD at this point.

However, on the oscilloscope we also find the falling edge of the SNSPD waveform is just over. This means if we increase the frequency, the quantum efficiency of the SNPSD will fall.

3.3.2 The Groping Experiment of SNSPD Application

We turned the laser to the maximal frequency 100 M mode, and attenuated the signal to proper level. The attenuated signal was polarized by polarizer and split to two parts, horizontal polarized component (H) and vertical polarized component (V), by the PBS. Every part was respectively detected by the SNSPD and counted by the counter. We used polarizer to polarize the signal to H and V, and got the SNSPD counts respectively. We attenuated the energy made sure that most H polarized pulses were detected by the H SNSPD. It simulates the process of polarization coding and encoding signals in QC.

Then we took the APDs to instead of the SNSPDs for another experiment. We turn the laser to 1 M mode and adjust energy to make sure most H pulses were detected by the H APD.

We also took a classic experiment for comparison. In this experiment, we didn't attenuate the signal, and replaced the SNSPDs and counters by the power meter.

The experimental system of SNSPD is showed in Fig. 3.4. The results of the experiments are showed in Table 3.2. The contrast is the proportion between the energy of the larger polarized component and the energy of the smaller. The average error is the average of the H error rate and the V error rate. The H/V error rate is the probability of the wrong encoding the H/V coded signal, and the
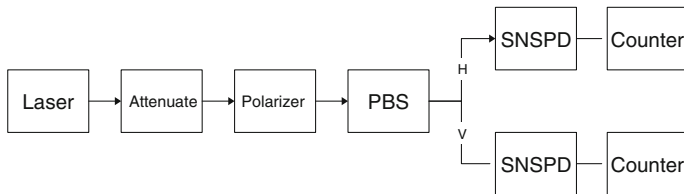
Fig. 3.4 The experimental system of SNSPD

Table 3.2 The results of classical and quantum experiments

Experiment	Polarized direction	H component	V component	Contrast	Average error rate (%)
Classic	H	42 (uW)	200 (nW)	210:1	0.51
power meter	V	30 (nW)	5.5 (uW)	183:1	
Quantum	H	5,000,000 (c/s)	7,500 (c/s)	667:1	0.45
SNSPD	V	15,000 (c/s)	2,000,000 (c/s)	133:1	
Quantum	H	420,000 (c/s)	1,400 (c/s)	300:1	0.61
APD	V	450 (c/s)	50,000 (c/s)	111:1	

reciprocal of the H/V contrast in math. The lower average error rate makes quantum communication safer.

Generally, the average error rates of Classical, SPSND and APD experiments are similar. It means SNSPD and APD roughly fulfill the needs of QC at the experimental bit rates.

We also find in Table 3.2 that some small differences of the error rates also exist. We know the average error rate is caused by the polarization capability of the PBS mostly and the background of the detectors partly. Because we used the same PBS in experiments, the differences of the error rate are derived from the differences of the backgrounds of the detectors. Compared to the received energies, the dark count rate of the APD had the largest impact. It made the average error rate of APD largest. But we notice that the count of APD is smallest as well.

The average error rate of SNSPD is smallest. Because its dark count rate is 200 c/s in the experiment, and it's much lower than the count of the smaller polarization components. But the count of smaller polarization components may be much lower in applications, due to the better polarization capability of the optical components and the lower bit rate. In these conditions, the influence by the dark count rate of this SNSPD will be more serious. Fortunately, the capabilities of our SNSPD can be improved much compared with the job of the best in the world and the theoretical level. If we can make the dark count rate less than 1 c/s, the influence will be reduced to the ignored level again in most conditions.

The results indicate that SNSPD is feasible in the condition of the high bit rates, which has broad prospects in QC applications.

We find a problem yet in the table: the SNSPDs H contrast is higher than the classic, and the SNSPDs V contrast is lower than classic. Originally, we have thought they were similar respectively. By the analysis, we think it's because the quantum efficiency of SNSPD is related with the polarized direction of signal and the sharp of nanowire. We used short fiber to induct signal into SNSPD in the experiments. The polarization character was mostly holding when passing through the fiber. If we want to solve this problem, we should use polarization-keeping fiber and assure the direction of nanowire related with the macro axis of the signal.

And we also can't ignore that the quantum efficiency of this SNSPD is lower than the APD, though this capability of the best SNSPD in the world is much more excellent.

3.4 Conclusion

The development of quantum communication brings along the needs of human. We expect the bit rate can be higher, so we will apply the quantum communication widely. But the bit rate will be limited by the count rate of SPD: the APD used usually can't be applied for high bit rate situations. Obviously, SNSPD is a better choice in the further applications.

We took the capabilities of different kinds of SPDs for comparison and find that SNSPD is better in all capabilities needed by quantum communication application.

We used the APD bought from Thorlabs and SNSPD designed by ourselves for validation. At the frequency of 100 MHz, the SNSPD respond all pulses, but the APD can't. We expect the utmost response frequency of the SNSPD will be much higher by the results.

We also took the research experiment for the SNSPD and APD application in the quantum communication. We find that SNSPD has more advantages than APD in the high bit rate conditions and SNSPD has broad prospects in quantum communication applications in the future.

However, there are some problems in the SNSPD applications for us. The exact relationship between the polarization direction of signal and the sharp of nanowire is needed to be explored. And we should design the structure to compensate for the imbalance of different paths. Another job is that the technical level of SNSPD is much low in China. We have much work to do to pursue the advanced team and improve the SNSPD application in the quantum communication.

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Chapter 4
Simulation of Space Quantum Communication Tracking System with Matlab/Simulink

Hao Jiang, Liang Zhang, Jianjun Jia and Jianyu Wang

Abstract This paper proposed a model of the tracking system for space quantum communication. The entire model includes a coarse tracking system and a fine tracking system. In matlab/simulink environment, simulation is done with this model in different working conditions. The result of simulation is compared with the experiment result of the actual developed quantum communication tracking system, it confirm the validity of the proposed model. According to the simulation, the performance of the space quantum communication tracking system can be evaluated.

Keywords Quantum communication · Simulink · Coarse tracking system · Fine tracking system · Simulation

4.1 Introduction

Quantum communication is a special kind of optical communications, which using the quantum states of photons to transport information [1]. There are two terminals in quantum communication, the Transmitter and the receiver. Transmitter coding and launching the photons, receiver receive the photons and get information form them. It is considered as the current safest communication method [2]. Space Quantum Communication works between the satellite and the ground. Because of the motion between them, both terminal need acquisitions, tracking and pointing

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system to maintain the optical link. Ordinary, track system using a beacon light for tracking. Both terminal launches a beacon light, the other side detected the beacon light to determine the optical axis angle, adjust the direction of the optical path to achieve the tracking [3, 4].

The tracking system directly determines the effect of space quantum communication. It is necessary to simulate or test its performance in the process of development. Therefore, based on the actual tracking system we developed, a model of the tracking system is established, in Matlab/Simulink environment. The performance of the tracking system in different working conditions is simulated, and the result is compared with the test data of actual system in some experiments.

4.2 Structure of the Tracking System

Tracking systems are generally designed as compound axis [5]. Using two series servo systems, known as the coarse tracking system and the fine tracking system. Coarse tracking system works in the wide angle range, it is used to maintain the stability of the optical link, achieve a certain precision tracking, to promise that the axis of the beacon light get into the tracking range of the fine system. The fine tracking system is used to correct the residuals of coarse tracking system, achieve
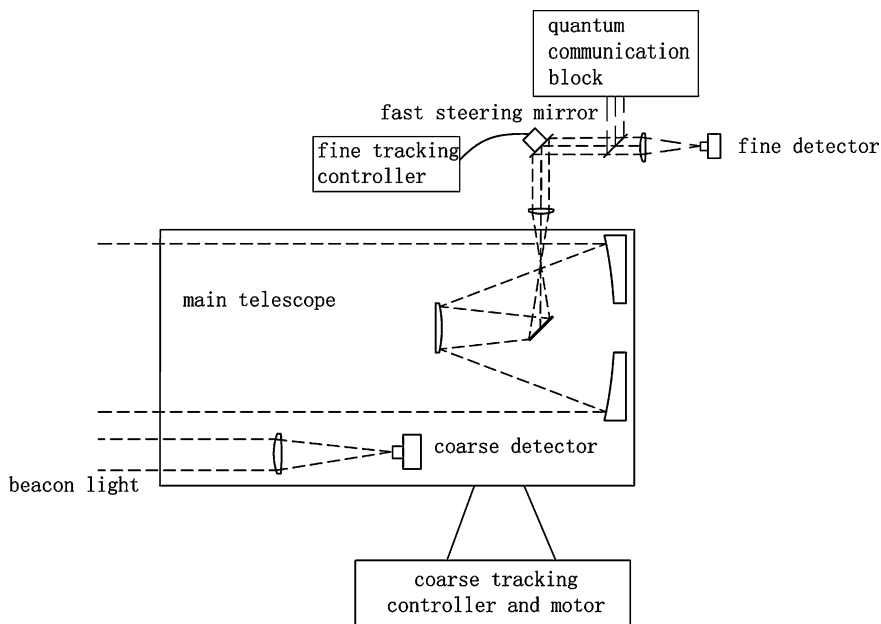
Fig. 4.1 Structure of the tracking system

high-precision tracking results. Figure 4.1 shows the structure of the tracking system.

Coarse tracking system is composed of the main telescope, the coarse detector and the course tracking controller and motor. The main telescope is responsible for receiving the beacon light and the photons for quantum communication. On the telescope's optical path, there are fine tracking system for further tracking and quantum communication block for quantum communication process.

The coarse detector is a CMOS detector with lens. The lens and the main telescope are coaxial. It is responsible for detecting the beacon light and determines the direction of it. With the position of the imaging spot on the detector, it can determine the angle between the axis of the beacon light and the axis of the main telescope.

Coarse tracking controller and motor are used to drive the main telescope, rotate it to adjust the telescope's optical axis, complete the course tracking process.

Coarse tracking system drives the main telescope tracking the beacon light, introduce the beacon light into the fine tracking detector, which is also a CMOS detector. According to the direction of beacon light determined by fine detector, the fine tracking controller drives the fast steering mirror to adjust the optical path, introduce the optical path into the quantum communication block, and finish the entire tracking process. Fast steering mirror is a piezo mirror, it can move in a very high frequency up to 1 kHz, the accuracy of fine tracking system is better than 10 urad, but its working range is small, only 1 mrad, so the accuracy of the coarse tracking system must be better than 1 mrad [6].

4.3 Modeling and Analysis

The tracking system works in both azimuth axis and pitch axis. These two axis are independently and almost the same in modeling. So this paper only discusses the modeling of azimuth axis. Build the model of coarse tracking system and fine tracking system separately, and then put them in series to get the entire model.

Figure 4.2 shows the model of coarse tracking system. Coarse target is the input of the model, which is the direction of beacon light detected by coarse detector. Coarse error is the output; it is the error of coarse tracking system. The coarse tracking system is using the multi-loops controlling method, from inside to outside using current loop, speed loop and position loop to control the motor.

In Fig. 4.2, Kt is the torque sensitivity of the motor; Coarse Load is the mechanical model of motor and the main telescope. The torque give a angular velocity to the telescope, with Integrator in the figure, we get the angular position of the telescope in the model. In speed loop, using the resolver to measure the angular position of the telescope, difference the angular position we get the angular velocity, as the feedback of the speed loop. Resolver error is introduced in the model.
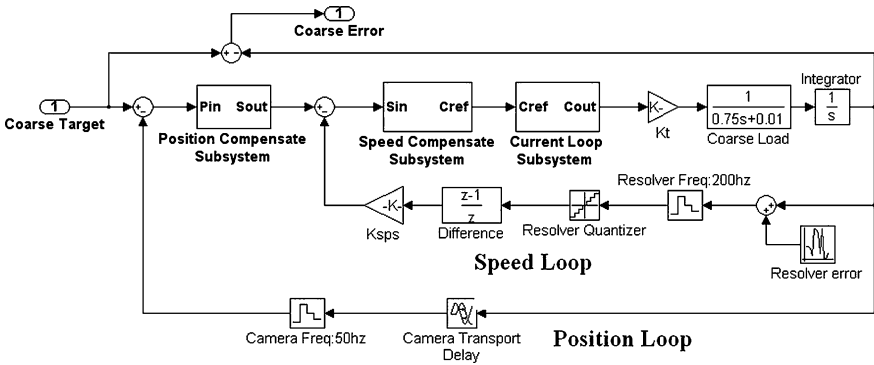
Fig. 4.2 Model of coarse tracking system

In position loop, CMOS detector is used to measure the angular position of the telescope, as the feedback of the loop. The frame of CMOS detector is 50 Hz, with a transport delay introduced in the model.

In the model of the coarse tracking system, there are three subsystems, Position compensate subsystem, Speed compensate subsystem and Current loop subsystem. Figure 4.3 is the inside structure of current loop subsystem.

In Fig. 4.3, motor electric is the armature model of the motor. Cref is the input of current loop subsystem, it is the motor current system wants to generate. Cout is the output; it is the actual motor current. Use the current sampling circuit to measure the current, as a feedback, comparing with the Cref. The error of current sampling circuit is introduced.

The PI controller is used as the current compensate, its operation frequency is 10 kHz. The Kcp and Kci are proportion coefficient and integral coefficient. In the actual tracking system, it is necessary to limit the maximum current value to ensure the safe of motor. Therefore, in the model, introduce the limit into the model, as integral saturation and voltage saturation in the figure.

Figure 4.4 shows the coarse tracking speed compensate subsystem. Using the PI controller, Ksp and Ksi are proportion coefficient and integral coefficient. The operation frequency is 200 Hz. Spd Saturation and Integral Saturation is introduced.
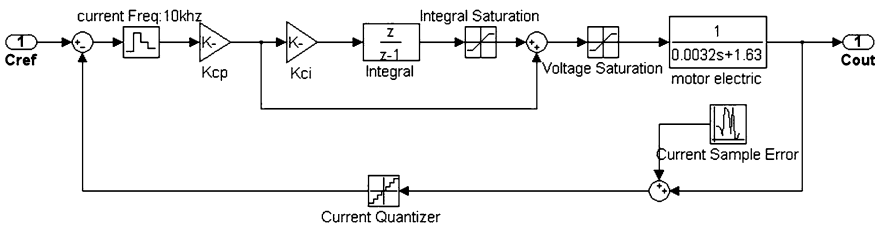
Fig. 4.3 Current loop subsystem
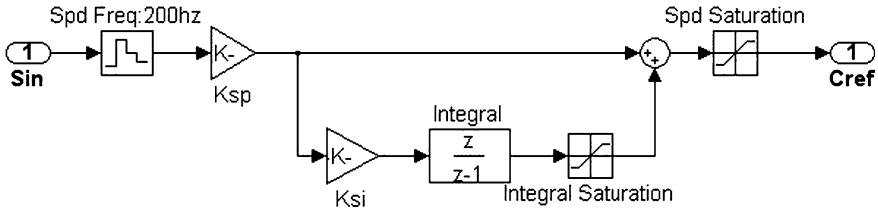
Fig. 4.4 Current loop subsystem
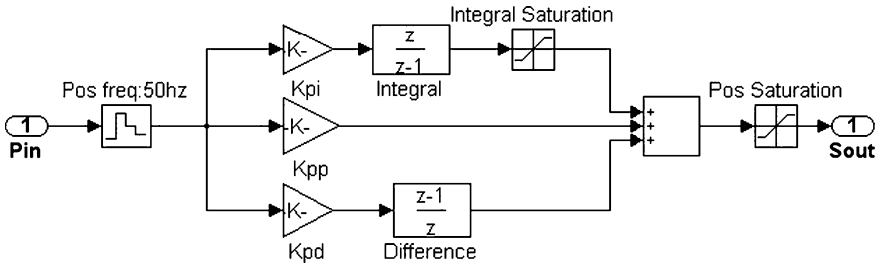
Fig. 4.5 Speed compensate subsystem

Figure 4.5 is the position compensate subsystem model. Using the PID controller, Kpp, Kpi and Kpd are proportion, integral and difference coefficient. The operation frequency is 50 Hz. Pos Saturation and Integral Saturation is introduced.

Figure 4.6 is the model of fine tracking system. The input of the model is Fine Disturb. The output is Fine error; it is also the final error of the tracking system. In this figure, FSM is the mechanism model of the fast steering mirror, Driver is the model of the fine tracking controller. PID controller is used to control fine tracking system.
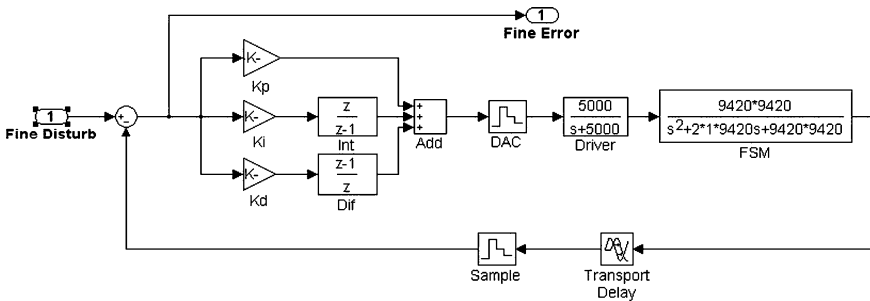
Fig. 4.6 Position compensate subsystem
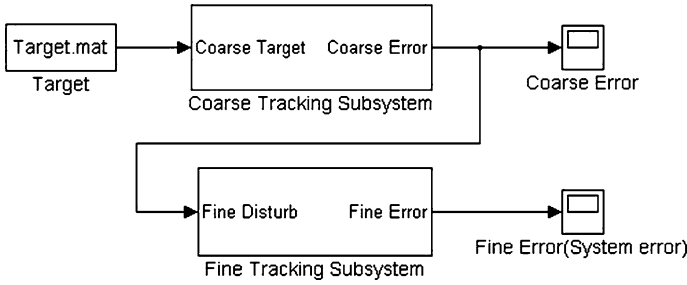
Fig. 4.7 Model of the entire tracking system

Put the coarse tracking system and the fine tracking subsystem in series, the whole tracking system model is finished. As shows in Fig. 4.7, input the tracking beacon light angle with the file target.mat, the simulation of this model is done in simulink. The coarse error and the fine error is provided as results.
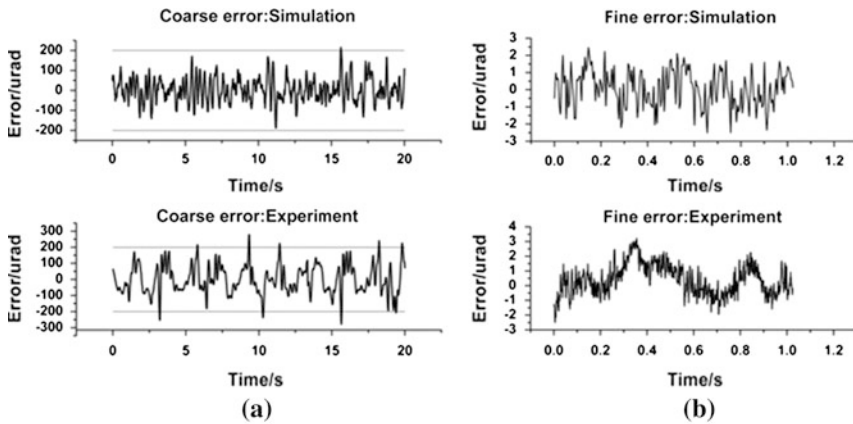
	Simulation	Experiment
coarse peak-to-peak value	539.54urad	557.89 urad
coarse standard deviation	79.175 urad	86.968 urad
fine peak-to-peak value	4.97 urad	5.73 urad
coarse standard deviation	0.975 urad	1.020 urad

(c)

Fig. 4.8 Simulation and satellite tracking experiment result

4.4 Simulation and Experiment Results

The model of tracking system is simulated. The working conditions of the system are determined by the input target. Consider about the working condition of space quantum communication. The motion between the quantum communication satellite and ground is approximately constant angular velocity motion, the angular velocity is about 1.2 °/s. Therefore, in the simulation, set the target input with a constant angular velocity of 1.5 °/s. At the same time, design an experiment for the actual tracking system we developed, make it tracking the target with a constant angular velocity of 1.5 °/s and record the result. The comparison of simulation and experimental results are shown in Fig. 4.8. Figure 4.8a is the coarse tracking error; Fig. 4.8b is the fine tracking error. The top part in each figure is the simulation result; the bottom part is experimentally measured tracking error.

Figure 4.8c is the statistical results of the data. In this condition, the simulation and the experiment results are very close; the discrepancy is less than 10 %.

With the tracking system we developed, helicopter tracking experiment is done. The tracking system is fixed on the flying helicopter, tracking the target on the ground. The moving, rolling and vibration of the helicopter introduce great disturb to the tracking system. In simulink, input the helicopter moving and rolling data to
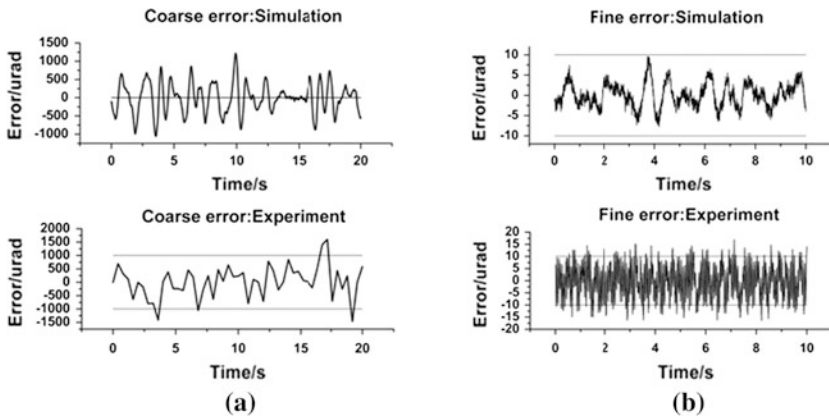
	Simulation	Experiment
coarse peak-to-peak value	2957.25urad	3241.19urad
coarse standard deviation	537.088urad	583.377urad
fine peak-to-peak value	20.25urad	30.36urad
fine standard deviation	2.840urad	5.392urad

(c)

Fig. 4.9 Simulation and helicopter tracking experiment result

the model of tracking system, get the result of simulation in helicopter working condition. Compare the simulation result and the helicopter experiment data in Fig. 4.9.

According to Fig. 4.9, In this condition, for the coarse tracking system, simulation result and the experiment result are very close; for the fine tracking system, the simulation is not conform with the experiment very well. This may because the simulation hasn't considered the vibration of the helicopter, which give high frequency disturb to the fine tracking system. However, the simulation and the experiment data is similar in peak value. Generally speaking, the simulation can reflect the tracking system well.

4.5 Conclusion

We proposed a model of the tracking system for space quantum communication in matlab/simulink environment. Discuss the structure of the model and take full account of the unlinear facts and measurement errors. Simulation is done in different working.

Conditions, the simulation results are compared with the actual tracking system experiment data. The comparison results confirm the validity of the proposed model.

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Chapter 5
Electronic Chart Based Dynamic Vessel Information Display System

Juanfei Shi, Yongjian Chen, Xiaofeng Ma, Hui Zeng, Huaiyu Zheng and Kai Liu

Abstract With the development of global economy and the rapid increase in maritime activities, China has established vessel traffic services (VTS), automatic identification system (AIS), and many other information systems applied to the maritime administration. However, these systems are independent of each other so that their data is scattered, and printed charts in paper version cannot provide comprehensive, rapid and uniform maritime information. To resolve the problem, this paper designs an electronic chart based dynamic vessel information display system. The system integrates existing information resources such as the information of VTS and AIS, visualizes the dynamic vessel information by electronic chart display platform, and queries the emergency information in real-timely. System test results show that it is not only conducive to the vessel management and safety navigation, but also improves the efficiency of emergency command and rescue.

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5.1 Introduction

With the advance of globalization, countries develop maritime activities rapidly in the field of maritime defense, marine development, and marine transportation. In order to enhance maritime emergency command capability, China has established vessel traffic services (VTS) and closed-circuit television (CCTV) along the coastal; established the automatic identification system (AIS) in Bohai Bay, Yangtze Delta, and established a vessel reporting system [1, 2].

China's maritime emergency command is still not optimistic, it is mainly through the information provided by the police, combining with the human experience to analyze the various systems one by one; the specific locations of the vessels in distress are speculated using printed charts [3]. This process has two major problems: (1) the dynamic vessel information cannot be real-time and accessed intuitively; (2) the data information is scattered in various systems. The timeliness of emergency response is extremely low in this case, which could easily lead to program errors, cost increase, and poor operational effectiveness.

To resolve the problem, this paper designs an electronic chart based dynamic vessel information display system. This system is connected to maritime data exchange platform to access to the VIS information, the AIS information, the vessel reporting information and other available information resources, then stores and integrates them in the electronic chart database; through the electronic chart display platform achieves real-time display of dynamic vessel information and the emergency information's accurate and quick query, so as to improve the efficiency of emergency command and rescue.

5.2 Electronic Chart Based Dynamic Vessel Information Display System

Electronic chart based dynamic vessel information display system is designed to achieve maritime emergency command information resources storage, management, analysis and real-time display. The system collects the information which is needed by the emergency command from VTS, AIS and other existing information systems through the data exchange platform; converses and integrates collected information to that the electronic chart could identify and stores it in the database; then visualizes and operationalizes the database information by the electronic chart display platform. As shown in Fig. 5.1, software architecture of dynamic vessel information display system is deployed in the two levels: the electronic chart database system of Ministry of Transportation of Maritime Safety Administration (MSA) and the electronic chart database system of directly affiliated to the MSA.
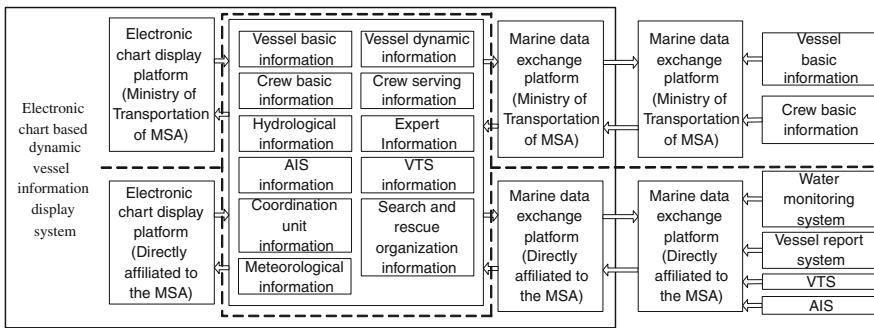
Fig. 5.1 Software architecture of dynamic vessel information display system

5.3 System Design

The electronic chart platform based dynamic vessel information display system consists of the electronic chart database and the electronic chart display platform. The electronic chart database which completes the information storage and conversion is the data source of the electronic chart display platform; the electronic chart display platform obtains the data from the chart database for display [4].

5.3.1 The Electronic Chart Database

Electronic chart database makes the format conversion for the recorded information in a particular format (such as the Raster or the Vector) to generate chart file, so that the electronic chart display platform can read and display.

As shown in Fig. 5.2, the electronic chart database is divided into two parts: existing information and new information. The former which contains vessel dynamic information, crew basic information, VTS information, etc. is collected from the existing system as a source of information of the electronic chart database through data exchange platform. The latter that includes expert information, hydrological information, etc. needs to develop appropriate software to achieve the acquisition and query. These two parts are managed in database.

The electronic chart database receives AIS, VTS and ship reporting information, etc. through the data exchange platform. The data processing is shown in Fig. 5.3.

Data access. The kinds of data accessed by the electronic chart based dynamic vessel information display system through the interface of the electronic chart system are as follows: GPS device information, Inmarsat-C/F device information, GSM/GPRS/CDMA device information, ARPA device information, AIS device information and VTS device information, etc.
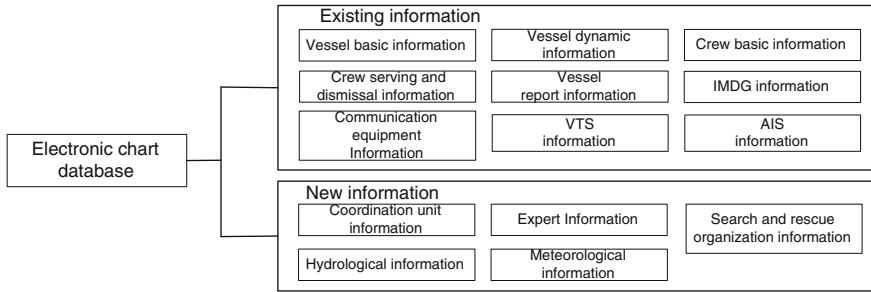
Fig. 5.2 Electronic chart database
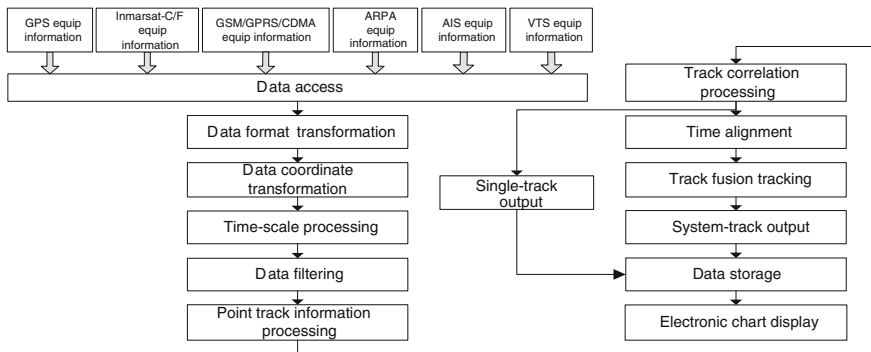
Fig. 5.3 Data processing

Format conversion the system converses the received data's format to that the display system required. For the electronic chart data, it needs to be converted to ENC and SENC data in the standard S-57 [5]. When the number, length or format of the received data packet is abnormal, it will be processed.

Point traces data processing. The point trace data should be converted to the track data. As the point trace data is discontinuous points, the speed and heading cannot be calculated from the original data. So the system allocates track number for these goals, and calculates the speed and heading, etc.

Track correlation processing. The track correlation decision rule is: the objectives that meet the same relevant conditions are regarded as the same one and allocated the same track number.

Single-track output after formats transformation, coordinate transformation, time scale processing, data filtering, point traces handling, and track processing, the data is sent to the database.

Time alignment. Time alignment is to calculate the location of the target in the current time according to the target's position, speed, heading and report time for the integration of computing.

Track fusion tracking. The system uses the dynamic weight and static weight combining algorithm to calculate the fusion weights, in which the static weight is read from the configuration file. According to the deviation of the test objectives of each device, the equipment data delay, and the single device covariance data, the dynamic weight of each device can be calculated. The Kalman filter algorithm is used to do the track filtering and tracking processing to make the target's location closer to the actual location, and to prevent the target's suddenly position hopping.

The system-track output the system can output the track information within the circle with the specified center point and the specified radius. Do the coordinate transformation for the target information of the coordinates of the center relative to the system, to form an integrated track with the specified point as the center point, and to filter the targets out of the specified radius before the output.

5.3.2 Electronic Chart Display Platform

Electronic chart display platform is consist of chart display subsystem, chart operating subsystem, chart correction subsystem, spatial database management subsystem, information query subsystem, interface subsystem, and ship dynamic tracking subsystem, etc.

Chart display subsystem. Chart display subsystem has the functional modules of the chart selection, the chart roaming, the schema management, the positioning display, the magnifying glass display, the cursor reset, the depth correction, and the charts saving, etc. The chart selection module allows users to choose a variety of chart data stored in the spatial database, by which way the system will immediately report the chart data the user selected; the schema management module can display the different chart data and map data in accordance with S52 model, the Air department chart display mode and the map display mode; positioning display module allows the user to enter the geographic area center coordinates (or a rectangular region coordinates) in the dialog box, and displays the chart scale or automatically position and display according to the alarm location. In addition, the port channel, the berth information, the tidal information, the weather information, currents and sea state information, etc. all can be superimposed on the electronic chart display.

Chart operating subsystem. Chart operating subsystem contains the function modules of the azimuth and distance measurement, the polygon area measurement, the chart plotting and modifying, the routes drawing and management, and the typhoon plotting. Electronic chart through the operating function directly display the typhoon future direction, speed and range, etc.; plot the relevant parameters; draw and modify the planned routes. The users can query the attribute information of any elements on the chart. And the query results will be displayed to the users with the form of a dialog box.

Spatial database management subsystem Spatial database management system includes four functional modules of the authentication, the spatial data import, the

spatial data correction, and the spatial data backup. Though the spatial data import module, using the data import tools, the chart data and map data, etc. are imported into the spatial database.

Information query subsystem. The information query subsystem can achieve the detailed information inquiries of the vessel dynamic situation in the designated area, including dynamic vessel information, crew basic information, dangerous goods regulations information, and communication equipment information of the selected ship. And meanwhile it can query search and rescue organization information, hydrological information, weather information, expert information, etc.

Interface system. The interface system includes function modules of GPS device interface, AIS device interface, VTS device interface, etc. The dynamic vessel information given by the GPS devices can be directly read through the GPS device interface; the AIS equipment operating parameters can be configured, modified and saved through the AIS device interface, and the information of other AIS vessels can be received through AIS, to achieve the two-way communication and the collision avoidance.

Vessel dynamic tracking subsystem The vessel dynamic tracking subsystem can simultaneously display the vessels' motion (speed, heading, location, etc.) on the electronic chart platform, where multi-vessels can also be displayed as well as one; The target vessels can be displayed differentially by category and nature, and the dynamic and static information can be queried; For the history of any target vessel sailing record, it can show its trajectory according to the time period.

5.4 System Test

Figure 5.4 shows the works of the electronic chart based dynamic vessel information display system on a drowning search and rescue program on a bay of the South China Sea.

The main interface of the electronic chart displays the detailed geographic information of the Gulf, including the coastline shape, the water depth, the sea water flows, the hydrological and meteorological information, etc. This part is the use of the chart display system and the information query system.

On the right of the electronic chart, It shows a vessel's position information (including the latitude and longitude, the ship heading, the speed, and the draft, etc.) in the region. And the system tracked the locations of 14 distress terminals, with diagram below showing the 14 distress terminals' specific information, including the latitude and longitude, the ship distance and direction, the moving speed, the data reception time, the expected rescue time and the actual rescue time. The part is the use of the ship dynamic tracking subsystem function, which greatly reduced the time of the emergency command authorities to collect the necessary information so as to achieve the real-time access to search and rescue information and the data auto-complete operation and improved the predictive ability of command work and search and the rescue efficiency.
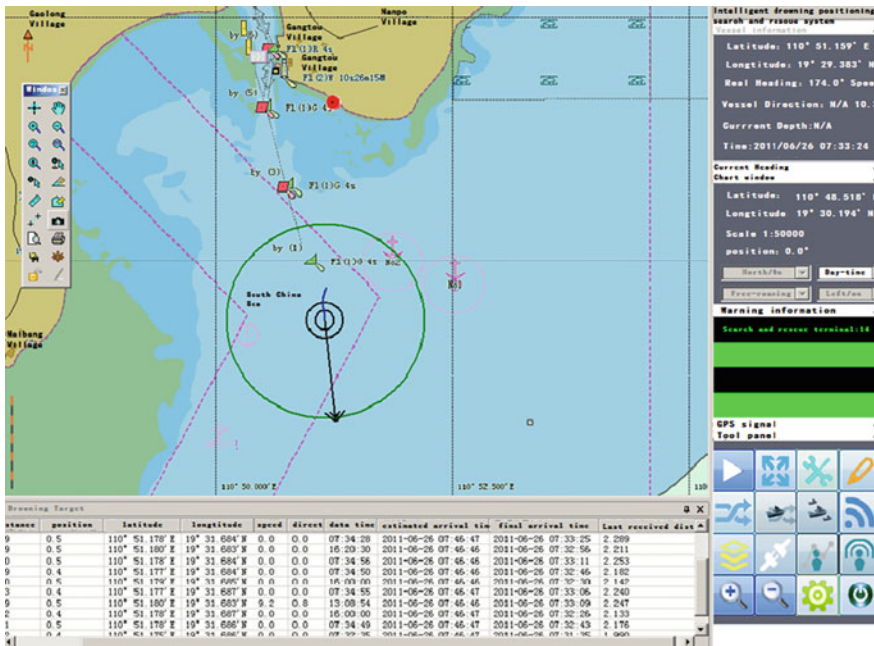
Fig. 5.4 Electronic chart display of dynamic vessel information

The tool panel on the left side of the interface electronic chart can achieve the specific operation of the electronic chart, such as select, drag, zoom, query, ranging, painting, screenshots, as well as file read, save and print. This part is the use of the operation function of the charts. This function effectively increases the chart readability and operability, so as to make the emergency command more convenient.

The temporal characteristics and accuracy of the system are as follows: the loading time of the electronic chart platform is less than 10 s; the single chart downloading can be completed within 2 s; the time interval of the vessel position plotting is 1–2 s; the precision of the orientation and the heading (degrees) is one decimal; the range of the chart editing scale is 1:500–1:5,000.

5.5 Conclusion

To against the situation that the dynamic vessel information cannot be accessed intuitively and the data scattered in various systems, we designed an electronic chart based dynamic vessel information display system. The system consists of the electronic chart database and the electronic chart display platform. Through the data exchange platform, the system can analyze, converse and integrate the data

resources from the existing information systems, to achieve real-time display of dynamic vessel information in the chart display platform and emergency information's integration and quick query, so as to provide a powerful information support to improve the efficiency of the emergency command.

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Chapter 6
Integrated Communication Systems for Maritime Distress and Safety

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Abstract In order to improve the dispatch, command and response ability of Chinese maritime emergency search and rescue, by using modern communication, computer and computer telecommunications integration (CTI) technologies, this paper design and implement an integrated communication system. In the system, the switching and radio adapting scheme is adopted to achieve the seamless connection among all wired and wireless communication systems, integrate all various satellite terminals, voice telephony, video systems, etc. of maritime search and rescue into one operating seat, provide professional and convenient communication methods for searching and rescuing staff, and improve the accuracy and efficiency of command and decision-making.

6.1 Introduction

Since the implementation of global maritime distress and safety system (GMDSS), the GMDSS play a key role in maritime emergency search and rescue. In line with the implementation of the GMDSS, the state planning commission in China

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approved allocating special funds for the construction of the Chinese maritime distress and safety systems engineering in 1991 [1]. After years of construction, maritime distress and safety communications system has built ship management system, crew management system, passenger and cargo ship-borne system, navigation management system, vessel traffic management system (VTS), automatic identification system (AIS), ship reporting system and etc., which related with maritime emergency command information system [2]. Chinese maritime search and rescue emergency response and processing capacity has been largely improved and have achieved remarkable success.

Because of the lower integration of terrestrial communication system equipments, pilots and simulator developers often only familiar with one device, lacking the overall quality of coordinated manipulating of the entire ground system [3]. Li and Li proposed the coordination of communications in [4], has a reference for the development of GMDSS. Chinese various communication systems are constructed in different age and emergency communication equipments lacking integration and coordination, which result in the overall low efficiency. Therefore, combined with the research of INMARSAT, VHF, DSC, and NAVTEX, NBDP and other equipment in the GMDSS, we designed and implemented a maritime distress and safety system [5]. It not only seamlessly connected wired communication systems like 12395 Line, search and rescue duty phone, regular phone and fax with wireless communication system like the MF/HF, VHF and SSB, but also have the ability of receiving and parsing the text of the DSC packets, the NBDP packets and NAVTEX packets and recording various types of voice communications in real-time automatically, which achieve a unified control and command of the maritime emergency search and rescue work.

The rest of the article is organized as follows. Section 6.2 gives the design scheme of the system.

The specific implementation of every part is described in Sect. 6.3. Section 6.4 gives the test results. Conclusion is finally drawn in Sect. 6.5.

6.2 System Design

System Structure, Currently, communication systems used by maritime search and rescue center include wired communication systems, wireless communication systems, and video communications systems. Wired communication systems includes 12395 Line, 110 Line, earthquake relief hotline, fax Line, maritime satellite telephone Line, and the Maritime Safety Administration Office Phone. Wireless communication systems include the MF/HF/VHF radio and a number of Digital Selective Calling (DSC), SSB/800M/110 radio. Video communication systems include CCTV surveillance system and wireless video transmission system.

In this paper, the proposed communication systems provide the maximum degree of integration of existing communications equipments, which achieve a
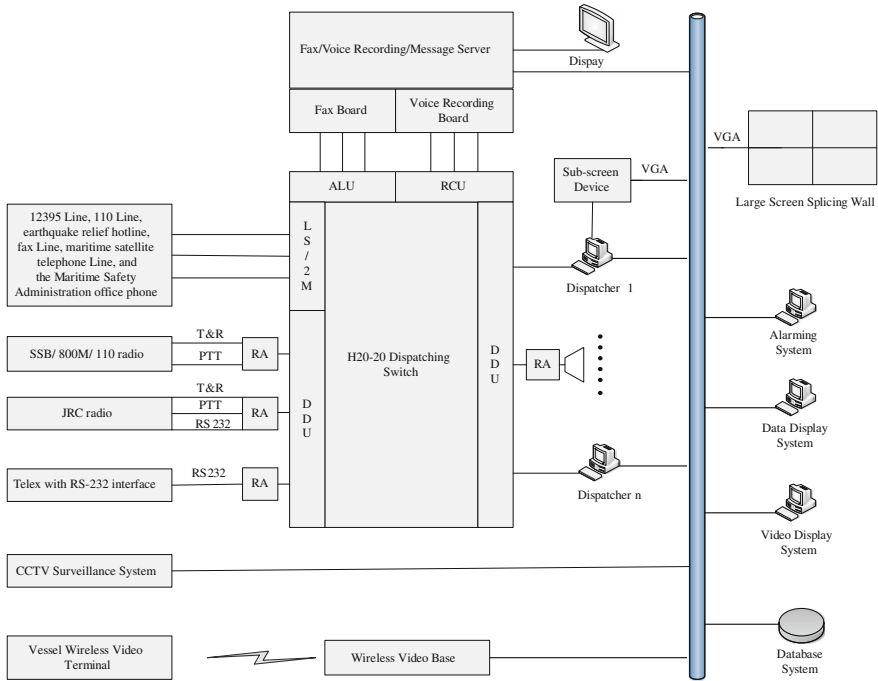
Fig. 6.1 Integrated communication systems for maritime distress and safety

unified control and command of maritime emergency search and rescue. The overall system architecture of the entire communication system is shown in Fig. 6.1.

In this communication system, the H20-20 Switch provides integrated access interface to wired and wireless communication equipments; radio adopter provide a variety of interface integration, including voice alarm, command and control, fax scheduling of packets, video navigation controls, etc.; fax, voice recorder, and packet fax server provide fax services, recording services, as well as temporary data storage management of fax voice recording and packets telex.

6.2.1 Integration of Communication Equipments and Operating Terminals

A variety of complex terminals on the desktop brought great inconvenience to the operation. How to integrate various types of terminals on the attendant desktop is a comprehensive reflection of the integration of the entire communication communications. In this paper, we use the H20-20 switch and radio adapter
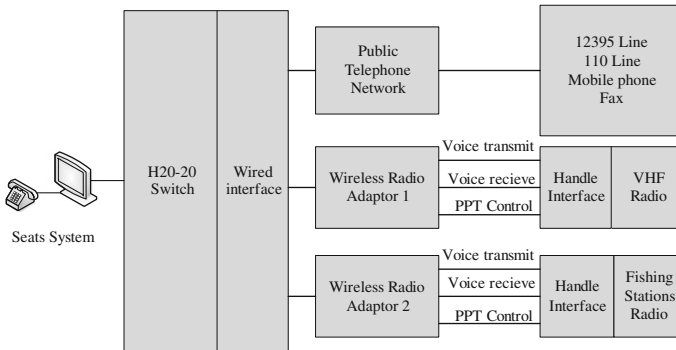
Fig. 6.2 Integration of communication equipments and operating terminals

scheme to achieve seamless connection of wired and wireless alarm radio. The structure of the integration of communication equipments and operating terminals is shown in Fig. 6.2.

Seats system integrate various data, voice messages, all kinds of maritime satellite terminal stations, voice calls into an integrated access platform, which provides convenient duty and emergency command means for the commanding officers.

6.3 Specific Implementation of the System

In this paper, we use H20-20 switch and the radio adapter to achieve the seamless connection of wired communication systems and wireless communication systems, and the integrated communication system has the abilities of receiving and parsing packets and automatic recording of voice communications. Specific implementations of the system are as follow.

H20-20 Switch, in this paper, we use 2B + D digital subscriber communications technology to connect H20-20 switch and dispatcher or RA. Its hierarchical structure is shown in Fig. 6.3.

2B + D have a three-tier structure—the physical layer, link layer and application layer. The U port 2B + D digital interface board (ADIB/RDIB) and U port 2B + D digital dispatching board (DDU) of dispatcher or RA provide the physical interface to connect H20-20 switch. We use 2B + D digital subscriber communications technology to achieve voice alarm and command scheduling, message telex scheduling function. DDU board can connect ADIB or RDIB-board through audio cables when the distance less than 4.3 km. When the distance between the dispatcher or RA and H20-20 switch over 4.3 km, we can use the U port extension device (MUX) and digital transmission network to extend U port.
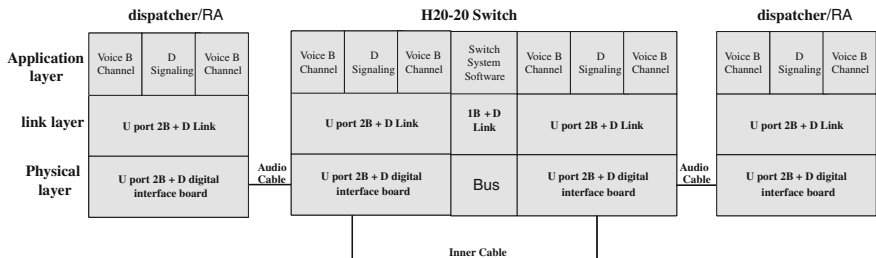
Fig. 6.3 2B + D digital subscriber communications technology

Fig. 6.4 Functional block diagram of radio adapter
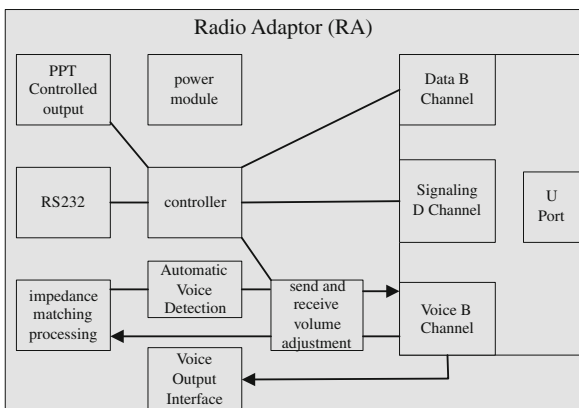
6.3.1 Radio Adapter

As shown in Fig. 6.1, wired means of communication like 12395 Line, earthquake relief hotline, duty phone, office phone directly connect switch through the standard LS loop trunk or 2M digital relay network. Wireless means of communication like SSB/800M/110 radio, JRC radio stations connected to cable voice communication by RA through PTT control to ensure dispatcher receive and confirm the election for the JRC radio frequency, NAVTEX and DSC distress messages. RDIB is a key component of RA. The functional block diagram of RA is shown in Fig. 6.4. The RDIB consist of CPU controller circuit, power module circuit, U-interface circuit, PTT control interface circuit, RS-232 interface circuit, impedance matching processing interface circuit, send and receive volume adjustment circuit, voice output interface circuit, voice activity detection circuit and so on. The CPU controller circuit is core of RDIB the control. RA match the radio audio transceiver cable interface through RDIB impedance matching processing interface circuit, so that the voice interface impedance line with 600 Ω standard.
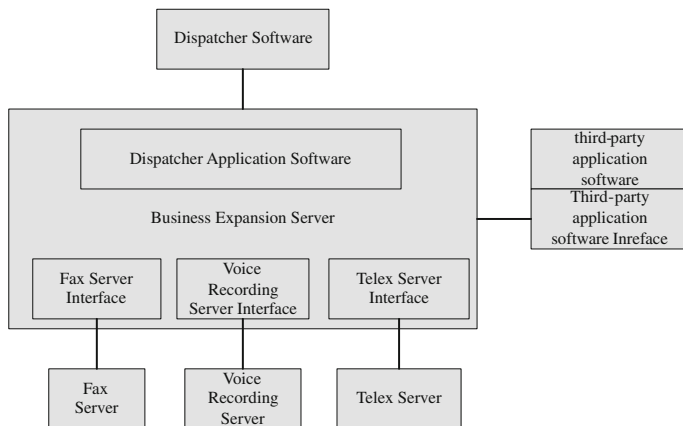
Fig. 6.5 Connection of message severs

6.3.2 Receiving and Parsing Packets

Packet fax server accept the NAVTEX flight information text, the DSC distress messages and telex from the dispatcher, and provide temporary storage and retrieval management of the data through the message server. It can also communicate with fax server, recording server, packet fax server and third-party application software through the call interface. The connection of message servers is shown in Fig. 6.5.

Message servers use fax service call interface, the recording service call interface, packets telex service call interface, and dispatch application service call interface to accept scheduling data or services from the fax server, the recording server, the packet fax server, and to provide application service for third-party application software interfaces for third-party application software associated treatment or take control of dispatch calling.

6.3.3 Voice Communication

This paper uses the most advanced CTI technology to achieve real-time recording of the calling, this enhanced recording retains the advantages of digital recording systems and get the support of the powerful features of the CTI platform, which greatly strengthen the recording overall system performance. As based on distributed network platform, the new generation of recording can not only support for perfect digital recording quality, but also provides multi-point interconnect, remote query, integration of the Internet, the integration of call center, integration of third-party systems.

6.4 Test Results

In this paper, we designed an integrated communication system for maritime distress and safety, and had some tests on this system.

6.4.1 Basic Function Tests and Results

Basic function tests and results of the system are shown in Table 6.1.

As shown in Table 6.1, all the basic functions have been achieved.

6.4.2 Image Video Transmission Tests

Image video transmission tests include maritime transmission test, the terrestrial video transmission test as well as real-time amphibious transmission test. The test sites are near-shore wireless base station. The test results show that the Marine patrol boats and rescue vessels can achieve on-site image signal transmission from the sea area A1 to MRCC (contains various MRSC). In the Yantai-Cheng shantou test, vessel traffic management system (VTS) Tower install a wireless base station antenna, the patrol ship install a wireless shipboard station, the patrol ship can transmit scene image signal transmission to Cheng shantou wireless base station through wireless mobile systems, then through the Cheng shantou VTS to Yantai MRSC green to achieve the task of image transmission to Yantai MRSC.

Table 6.1 Basic function tests and results

No.	Function of private branch exchange (PBX)			Result
1	Automatic call	Call back	Call forward	Achieved
2	Call transfer	Call hold	Call hold/alternation	Achieved
3	Call restriction	Preemption service	Call waiting	Achieved
4	Preemption service	Direct pickup	Co-group pick-up	Achieved
5	Do not disturb	Distinctive ringing	Three-way calling	Achieved
6	Conference call	Hotline	Abbreviated dialing	Achieved
7	Override	Override access denied	Call on holds	Achieved
8	Pickup shelved	Radio paging	Keep extensions secret	Achieved
9	Busy line up	Call screen	Line-tracking	Achieved
10	Malicious call trace (MCT)	Caller ID (CID)	Two numbers on one phone	Achieved
11	Fixed time call	Interactive voice response (IVR)	Audio broadcasting	Achieved
12	Centralized attendant service (CAS)		Data communication	Achieved

6.5 Conclusion

For the coexistence of a variety of means of communication in maritime search and rescue, we integrated different types of communications systems based on different technology systems and communications protocols in the field of maritime emergency search and rescue. Using the existing wired communications, wireless communications, satellite communications and other types of means of communications and integrating a variety of available communications resources, we establish an all-weather search and rescue communications system with a three-dimensional relationship between ships and maritime distress search and rescue center which achieve a maritime search and rescue communication systems with unified communications accessing and command.

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Chapter 7
Simulation Training Method of URAV Based on Google Earth

Zengyan Li, Xiaomin Li and Zonggui Zheng

Abstract In order to solve the difficulties of traditional simulation training method on unmanned reconnaissance aerial vehicle (URAV), such as the low environment fidelity, difficulty of modeling and long cycle of development, a simulation training method based on google earth (GE) is put forward. The six degree of freedom (DOF) motion system of URAV is established through Matlab/Simulink and the real-time delivery of the flight conditions data through the serial interface is realized. Meanwhile, it also provides a solution to the problem of focal change in analog camera. Experiments show that the method has satisfactory effects and its functions also can be strengthened, therefore it has good value of application and it provides reference to related researchers.

Keywords Unmanned reconnaissance aerial vehicle · Google earth · Simulation training · Visual simulation

7.1 Introduction

UAV has already become a very important method to obtain intelligence in war, and it has unique advantage such as zero casualties. It has been largely applied in battlefield scout, intelligence collection, object tracking and fire shoot, etc. However, the training of the URAV operator will takes a long time and needs huge

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expenditure. In order to reduce flight risks and damages brought by frequent use of equipment and decrease the cost of training [1, 2], the simulation training method which can present the flight process of URAV is necessary, and the simulation method has many merits such as less cost, greater safety, repeatability and adaptability [3].

Simulation training system introduced in the paper is mainly used to train operators of UAV (unmanned aerial vehicle). The reality degree of simulation is very important to the simulation system. In the traditional simulation method, the view of operators in manned aerial vehicle (MAV) is adopted mainly, and flight scenes are simulated by virtual technology with the software of VRML, WTK, Creator/Vega, Direct 3D, OpenGL [3, 4]. The flight scenes of the traditional simulation method are formed by texture mapping; therefore, it has low fidelity, the modeling process is also complicated and its development cycle is quite long. Because the terrain information is hypothetic so it is difficult to realize the consistency between flight process and real terrain environment. Now it is very hard for flight simulation system to achieve the consistency between flight characteristics and real flight conditions. Sometimes the difference of them is so great that it is very harmful to operators' simulation training.

There are some difference between simulated images and the real ones. In the paper [5, 6], the method of selecting photomaps of different terrain objects on the basis of previous flight task videos is proposed and the algorithm of texture merging is applied to simulate aerial image in corresponding region according to object features. Then the simulated aerial images are pasted to plane griding as image texture and image walkthrough algorithm is adopted to make simulated visual scenes range in simulated aerial image in the light of flight attitude and platform attitude. The method has same theory with method of GE in the data source. However, because the number of UAV flight task is small, its aerial scope is determined by the place where UAV takes off, its flight distance and the performance of video camera. It is difficult to collect enough aerial image data and the task of work is huge. So in this method simulated environment is subject to certain areas, operators will feel bored if they are trained in the same terrain for a long time.

It applies the information of Google digital global to establish a high fidelity dynamic aerial image scene in the paper which can intercommunicate with the data of UAV flight. Simulated scene is consistent with the attitude, velocity and position of UAV, thus the different visual effects can be realized such as moving, scaling and ranging.

7.2 System Structure

The basic principle of URAV simulation training method based on GE is as shown in Fig. 7.1. Operators send remote control orders by operating control panel, the orders are calculated by the Simulink model of URAV and the data of flight
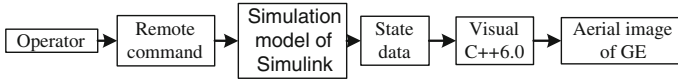
Fig. 7.1 The structure of simulation training system

conditions is sent through serial interfaces. The data from serial interfaces are read though Visual C++ 6.0 so as to display the scene in real-time though GE under present conditions.

7.3 Simulation of the Flight Data

AeroSim toolbox in Simulink environment is the model tool to establish nonlinear six-DOF dynamics model of airplane [7, 8]. The toolbox includes various modules of airplane, such as kinematics' equation model, aerodynamics model, propulsion system. It also includes different environment modules, such as wind, atmosphere, earth, magnetic field and several complete airplane models. URAV model can be established on the basis of complete plane models through configuring corresponding plane parameter with the help of configuration files. The method can be used in different kind of UAV simulation trainings and it can reduce development time and difficulty of the training system.

The URAV model made through AeroSim toolbox is shown as Fig. 7.2, in the model, the remote control order to drive plane model and outputs of flying posture angle and position information are based on S function as shown in Fig. 7.3. The data of the system are transmitted through serial interface with using Serial Send toolbox in the software of Instrument Control. In order to make the simulation data more convenient for observing, the data of the system are shown in the picture and digital form.

7.4 The Control of Simulation Video Camera

The simulation of video camera is an important part of simulation training system; because the video camera is adopted in the URAV system. When focal length changes, flight height determines image of the scene; when flight altitude is constant, the simulated scene will be changed according to focal length and enlarging and compressing effects will be presented. Because video camera of the URAV is fixed on stable platform, the motion of posture angle of URAV can be isolated [9]. GE is equivalent to the video camera and its optical focus zoom is one. So the change of focal length only can be realized through changing the height of view, thus the viewpoint of simulation video camera must be independent from the flight height of URAV.
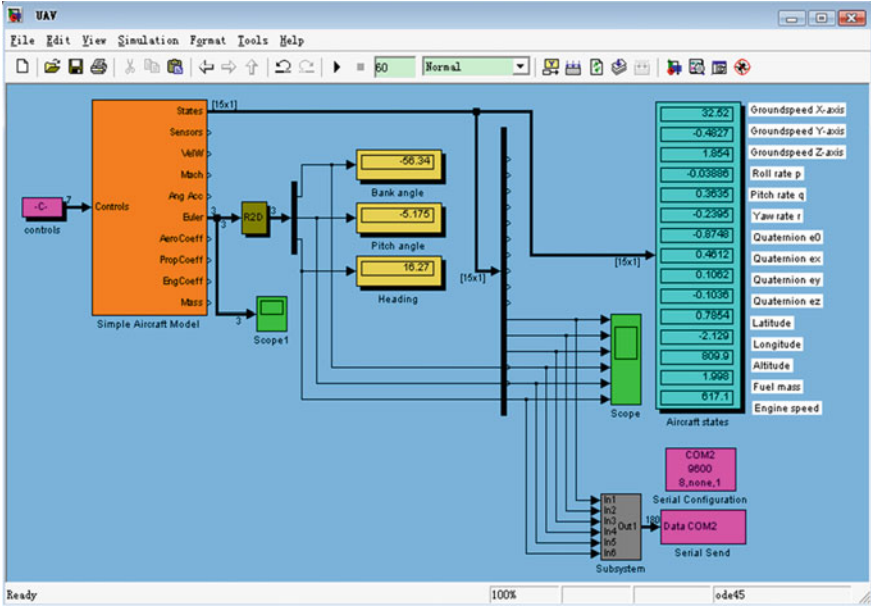
Fig. 7.2 The URAV model through the software of AeroSim
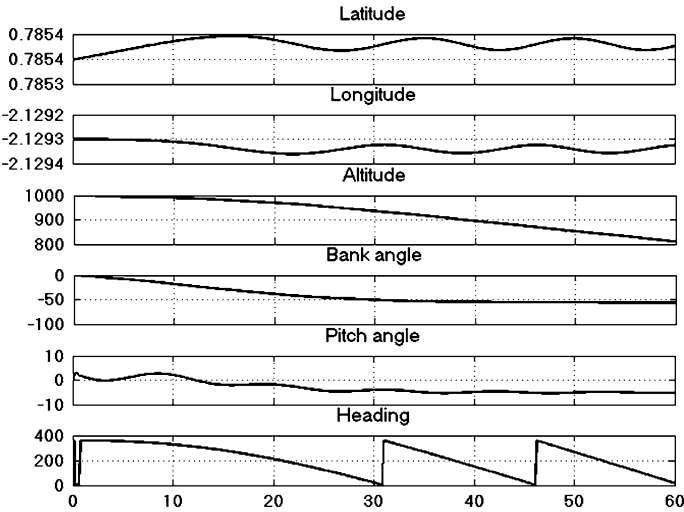
Fig. 7.3 The flight condition data of UAV with six-DOF

From Fig. 7.4, it can be known that the actual coordinate position of UAV is (x, y, z), the video camera is in the position of centroid and the central point position of aerial image is (x_1, y_1, z_1), then the distance between the two points is as below (7.1), where H represents the distance.

Fig. 7.4 The method of simulation video camera
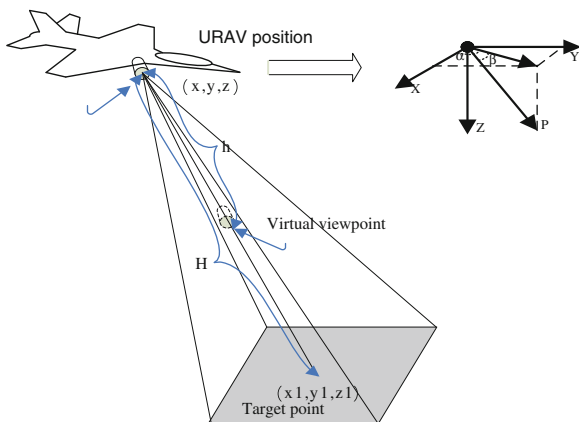
$$H = \sqrt{(x - x_1)^2 + (y - y_1)^2 + (z - z_1)^2} \tag{7.1}$$

If the azimuth angle of video camera is α and pitching angle is β, then (7.2) is obtained.

$$\begin{cases} x - x_1 = & H \cdot \cos \beta \cdot \cos \alpha \\ y - y_1 = & H \cdot \cos \beta \cdot \sin \alpha \\ z - z_1 = & H \cdot \sin \beta \end{cases} \tag{7.2}$$

$$R_g = \frac{R_s f}{z - z_1} \tag{7.3}$$

In the (7.3), R_g represents ground scope of the pixel and it is determined by height and the focal length of video camera. The value of f is one in GE and R_S denotes system's resolution. If the resolution of ground scope is changed to R_g,

$$z' = \frac{R_s}{R_g'} = z_2 - z_1 \tag{7.4}$$

The actual focal length is (7.5),

$$f' = \frac{R_g'}{R_g} = \frac{H}{h} \tag{7.5}$$

$$\begin{cases} x_2 = \dfrac{x - x_1}{f'} + x_1 \\ y_2 = \dfrac{y - y_1}{f'} + y_1 \\ z_2 = \dfrac{z - z_1}{f'} + z_1 \end{cases} \tag{7.6}$$

Then the coordinate of the virtual view changes into (x_2, y_2, z_2) and the type (7.6) can be obtained.

7.5 Simulation Environment

As known that the visual image data of GE is integration of satellite image and data of aerial photo. The highest resolution of GE can reach 0.5 m. It makes use of servers with great volume to integrate image data and other related information such as elevation information together; its volume can reach T-Bit level, which can provide a large quantity of data for the simulation training system. The image displayed in GE depends on viewpoint, height, visual angle and bottom. The scope of image will change as height changes, if bottom is move in parallel, the image of corresponding area will appear in the view.

From the analysis of the performance and characteristic of URAV, it can be known that the investigation task of URAV are mainly carried out through video cameras and the rotation of video camera can be realized in two degrees of freedom and focal length can be changed accordingly. The definition and resolution of aerial images are determined by the performance of video cameras. When the visibility of the circumstance is 10 km, the identification distance of a 6 × 4 m object can reach 5 km or more with the colorful video camera.

Because of the similarity between GE image and camera-shot image of URAV, GE image is adopted in the paper as the scene of simulation training. Because the GE scene is the scene of the real world, it is realistic and the terrain matches the real terrain environment strictly compared with simulated environment. So operators can improve operation skills and will be more familiarized with environment at the same time through the training. The number of training scenes is not limited, so it enhances operators' enthusiasm of training.

The software of GE-COM-API provides great convenience to the development of GE [10]. Based on GE COM API, orders can be sent to control image translation and changes of 3D viewpoint through Visual C++ 6.0.

7.5.1 System Initialization

Firstly, it needs to judge whether the client is started and connected to the server through module of IsInitialized () and IsOnline (). If it is not started or connected, the function of CreateDispatch () in COM library is applied so as to start the program and make it connected. Then, the handle of the main window, obtained through function GetMainHwnd (), can be used to set up the size and position of the window. Accordingly to training requirement, the image should be displayed in full-screen and projector or large screen display.

7.5.2 The Selection of Training Task

The related terrain environment should be used according to different training tasks; the method of the preserves data in the paper is though the high-speed cache by browsing GE. When training task is changed, the files of cache in different part should be used. The method is easy to be operated and controlled; therefore it has a wide application.

7.5.3 Control of Flight Environment

The simulation data of UAV is transferred through the function of Set Camera Params in the paper so as to realize the free control of flight environment. The grammar of the function is as follows:

BOOL setcameraparams (double lat, double lon, double alt, AltitudemodeGE altmode, double range, double tilt, double azimuth, double speed).

Among them, lat, lon and alt represent latitude, longitude and elevation of UAV in flight process respectively. When focal length of the camera is changed, lat, lon, alt denote the actual position of simulation video camera after calculation, tilt is the motion angle of video camera in vertical direction, and azimuth represents the motion angle in level direction. Speed represents the time of the image change to object position. The parameters are updated in real-time by the data received in serial interfaces so as to achieve the change of different scenes, Figs. 7.5 and 7.6 are scene effect of the different positions.

Fig. 7.5 The scene effect in vertical position
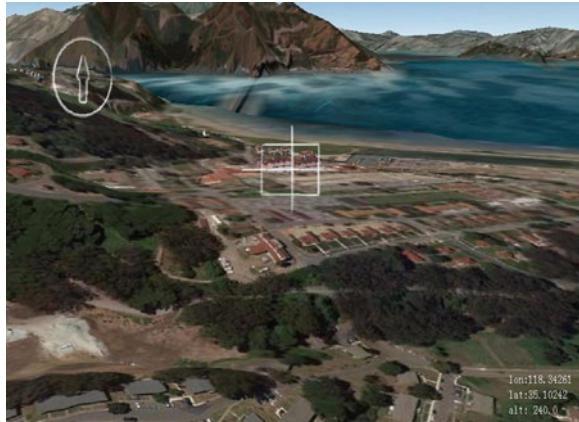
7.6 Conclusion

The basic principles of GE-based URAV simulation training method and its realization process are presented in the paper. A visual control interface is edited by Visual C++ 6.0 and it passes the test in laboratory, which is displayed as in Fig. 7.7.

The method can realized the simulation of different UAV through changing 3D simulation models of UAV and the data of serial interface, therefore the method has strong portability and adaptability.

The system provides a more vivid operation environment and visual scene. Flight simulation in different terrains can be realized by making use of large number of scenes in GE, so it can avoid repetitive and monotonous training. It also
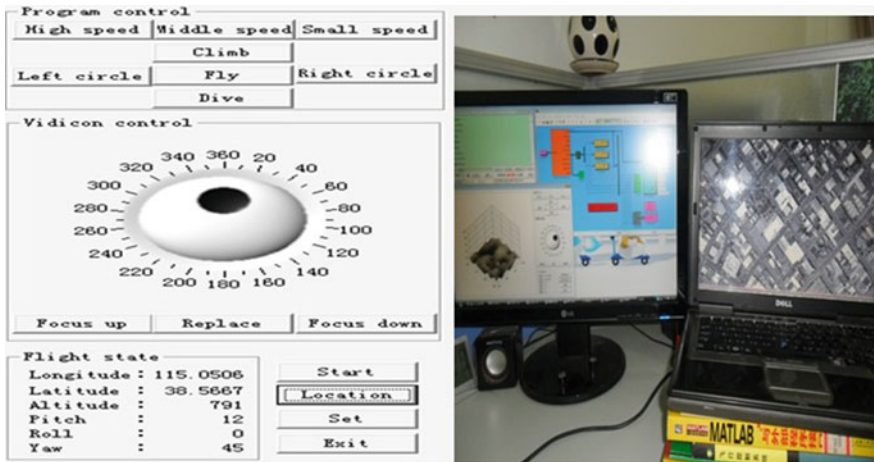
Fig. 7.7 Interface of task control, testing environment of Lab

can help operators to familiarize terrain environment and relevant terrain in the training process, therefore the reality and indulgence of training is strengthened.

The method describes flight process vividly, which contributes to the evaluation of operators' training and increases training efficiency.

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Chapter 8
Research on Simplified Algorithms for LDPC Decoding in High Order Modulation

Li Xu, Daoxing Guo and Chunqiang Shi

Abstract Traditional LDPC decoding algorithm such as bit-LLR algorithm has the disadvantage of computational complexity, so the paper studied two simplified algorithms, which were constellation soft decision algorithm based on symbol phases and constellation soft decision algorithm based on symbol distance. These two algorithms calculated each bit soft message by using the phase information and distances of the received symbols. The performance simulation revealed that these algorithms bring a little loss in BER performance, but have a lower computational complexity and can be realized easily.

Keywords High order modulation · LDPC · Decoding algorithm

8.1 Introduction

LDPC code is a sort of coding method that is close to the Shannon limit [1]. In recent theoretical studies, the encoding and decoding has become the focus of attention. With regard to encoding, Gallager and Mackay constructed regular codes by random construction approach; while for the encoding of irregular codes, PEG algorithm and Bit-Filling algorithm et al. [2, 3] can be employed to alleviate encoding complexity and time delay issues. On the other hand, decoding algorithms mainly includes belief propagation algorithm (Belief propagation, BP), minimum and decoding algorithm (Min-Sum), bit flipping decoding algorithm (Bit-Flipping, BF) and some other improved algorithms [4, 5]. Overall, the above

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algorithms are all sort of trade-offs between performance and complexity, that is, a good performance always compromises with a high complexity; while a low complexity always demonstrates a poor performance [6].

Among all these algorithms, the BP decoding algorithm reveals very excellent performance, however, the amount of computation and system complexity is quite high. In addition, the theoretical study of LDPC codes mainly adopts the binary modulation mode; however, high-order modulation is often applied in real communication systems.

8.2 Bit-LLR Algorithm in High order Modulation

Typical decoding algorithm of LDPC codes is belief propagation algorithm, i.e. BP decoding. According to the different message representations, BP decoding can be classified as probability domain BP algorithm and logarithm domain BP algorithm [7].

The probability domain BP algorithm expresses its messages in a probability form, which is a common representation for BP and it can be applied to non-binary LDPC codes and multiple-order modulation decoding. The shortcoming of the probability domain BP algorithm is the existence of a large number of multiplications, therefore complexity is quite high. If converting decoding to the logarithm domain algorithm, a large number of multiplications will transfer into addition operations, so as to reduce the computation time. The logarithm domain BP algorithm is adopted in simulation study here.

The decoding initial message is indispensable regardless of the probability domain decoding algorithm or the logarithmic domain decoding algorithm. In AWGN channels, the initial message for LLR BP (logarithmic likelihood ratio BP) decoding in the binary modulation is:

$$L(qij) = 2yi/\sigma 2 \tag{8.1}$$

The initial message calculation in high-order modulation is discussed below. A Bit logarithmic likelihood ratio algorithm based on maximum likelihood criterion is introduced.

Take the 8PSK modulation as an example, the Gray mapping constellation diagram is displayed as following.

Assuming that the code length after decoding is N, therefore after 8PSK mapping, we get a symbol sequence with N/3 length {Si}, i = 1,2,...,N/3, Si = f (bi1, bi2, bi3), bik ∈ {0,1}, k = 1,2,3. f is the mapping function. Let ri denotes the received symbols after adding noise, then the kth LLR in ri can be defined as

$$L(bik) = \text{In} \left[\Pr(bik = 0|rk) / \Pr(bik = 1|rk) \right] \tag{8.2}$$

Assuming a priori equiprobable, on the basis of Bayes principle:

$$L(b_{ik}) = \ln \frac{\Pr(b_{ik}=0|r_i)}{\Pr(b_{ik}=1|r_i)} = \ln \frac{\sum\limits_{s^-\in\{s:b_{ik}=0\}} p(r_i|s^-)}{\sum\limits_{s^+\in\{s:b_{ik}=1\}} p(r_i|s^+)} \tag{8.3}$$

where {s: bi = 0} represents the set of constellation points which satisfying with bi = 0, and {s: bi = 1} represents the set of constellation points which satisfying with bi = 1. P (ri|s) denotes the conditional probability density function with transmitted symbol s and received symbol ri. In AWGN channels,

$$p(r_i|s) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left(-\frac{\|r_i - s^-\|^2}{2\sigma^2}\right) \tag{8.4}$$

Therefore, the bit logarithmic likelihood ratio can be expressed as:

$$L(b_{ik}) = \ln \frac{\sum\limits_{s^-\in\{s:b_{ik}=0\}} \exp\left(-\frac{\|r_i-s^-\|^2}{2\sigma^2}\right)}{\sum\limits_{s^+\in\{s:b_{ik}=1\}} \exp\left(-\frac{\|r_i-s^+\|^2}{2\sigma^2}\right)} \tag{8.5}$$

Next, simplified above expression according to approximate Eq. (8.6)

$$\ln\left(\sum\nolimits_j \exp(-X_j)\right) \approx -\min_j(X_j) \tag{8.6}$$

We get:

$$L(b_{ik}) = \frac{1}{2\sigma^2}\left(\min_{s^+\in\{s:b_{ik}=1\}}(\|r_k - s^+\|)^2 - \min_{s^-\in\{s:b_{ik}=0\}}(\|r_k - s^-\|)^2\right) \tag{8.7}$$

The above equation is the basic calculation formula of the bit logarithmic likelihood ratio soft decision algorithm, that is, the channel initial message of input LDPC decoder. As seen, the premise of this algorithm is to categorize constellation points according to their corresponding per bit values; then calculate the distance between the received symbol and all other constellation points. On contrast with hard decision algorithm, this algorithm makes full use of the useful information in the received symbols, meanwhile overcoming the error caused by the symbol misjudge. However, it is seen from above formula, the calculation of L(bik) needs to obtain the probabilities of other bits in different constellation position equal to 1 or 0. The amount of computation is significant, and the decoding delay is high, and with the modulation order improved, the calculation amount will fold increase as a response.

8.3 Simplified Algorithm of Bit-LLR

The bit-LLR soft decision algorithm described above is subjected to heavy amount of computation problem. To address this issue, two simplified LLR algorithms are introduced in this paper. With the simplification of operation process, the deterioration of performance is also within an acceptable range.

8.3.1 Constellation Soft Decision Algorithm Based on Symbol Phases

A soft decision demodulation scheme specially aiming at APSK constellation encoding characteristics was presented. On the basis, this article calculates each bit soft message by using the phase information of the received symbols. The computation amount is much smaller than bit-LLR [8].

For the sake of convenience, the quadrant of each symbol points should be clarified. So the constellation diagram in Fig. 8.1 can be rotated $\pi/8$ in a counterclockwise manner, as shown in Fig. 8.2. Assuming the phase of the ith received symbol is θ_i, then its three corresponding bits are (bi1, bi2, bi3).

For simplicity, analyze the third bit soft output information at first. Concerning with the third bit bi3, after rotation, it is shown that points above X-axis are all zeros, and points below Y-axis are all equal to 1. Referring to the first and second quadrants: let the soft output values of phase $\pi/4$ and 3 $\pi/4$ equal to 1, then the soft output values closer to the longitudinal axis are more larger than 1, the higher

Fig. 8.1 Gray mapping constellation diagram of 8PSK
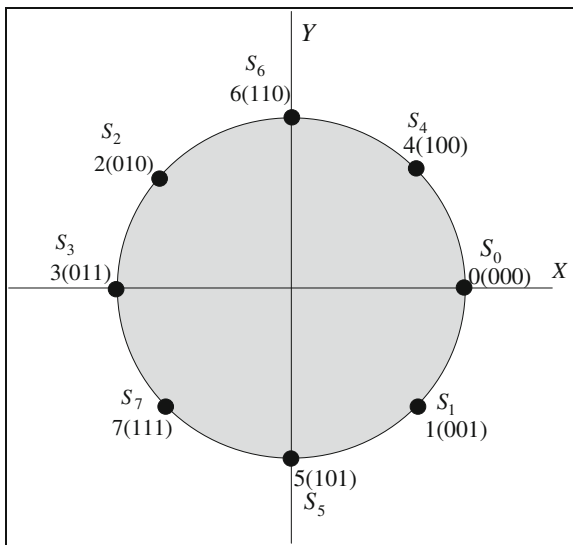
Fig. 8.2 The constellation diagram after $\pi/8$ counter-clockwise rotation
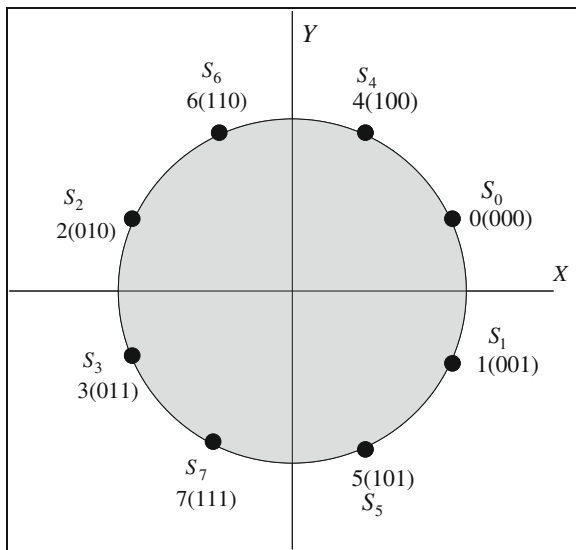
probability of this bit equals to 0. Therefore, bit in the first and second soft output can be expressed as:

$$L + (bi3) = \sin\theta_i / \sin\left(\frac{\pi}{4}\right) \tag{8.8}$$

Do the same analysis for the third and the fourth quadrants, let the soft output values of phase 5 $\pi/4$ and 7 $\pi/4$ all equal to -1, then the soft output values closer to the longitudinal axis are more less than 1, the higher probability of this bit equals to one. While much closer to horizontal axis, the soft output values are more approaching to zero, the lower probability of this bit equals to one. As a consequence, the bit in the third and fourth quadrants can be expressed as:

$$L - (bi3) = -\sin\theta_i / \sin\left(5\frac{\pi}{4}\right) = \sin\theta_i / \sin\left(\frac{\pi}{4}\right) \tag{8.9}$$

Combining with above mentioned discussion, the soft output values of the third bit can be obtained as:

$$L(bi3) = \sin\theta_i / \sin\left(\frac{\pi}{4}\right) \tag{8.10}$$

For the second bit constellation points, they are zero in the first and fourth quadrants, and one in the second and third quadrants. With reference to the above analysis, the soft output of the second bit can be expressed as:

$$L(bi2) = \cos\theta_i / \cos\left(\frac{\pi}{4}\right) \tag{8.11}$$

Take the $\pi/8$ rotation into consideration; the final bit-LLR formulas are represented as:

$$L\left(bi2\right) = \cos\left(\theta_i + {}^{\pi}\!/_8\right)/\cos\left({}^{\pi}\!/_8\right) \tag{8.12}$$

$$L(bi3) = \sin\left(\theta_i + {}^{\pi}\!/_8\right)/\sin\left({}^{\pi}\!/_8\right) \tag{8.13}$$

For the first bit, constellation points can be transferred to the first quadrant by the X-axis and Y-axis mirror. Therefore, the sine and cosine here are all absolute values. Assuming the constellation phase after rotation is

$$\Phi_i = \arg\left[\left|\cos\left(\theta_i + \frac{\pi}{8}\right)\right| + j\left|\sin\left(\theta_i + \frac{\pi}{8}\right)\right|\right] \tag{8.14}$$

After phase linear transformation, the soft output of first bit can be expressed as

$$L(bi2) = -\left({}^8\!/_\pi\right)\Phi_i + 2 \tag{8.15}$$

8.3.2 Constellation Soft Decision Algorithm Based on Symbol Phases

Both the basic bit-LLR algorithm and the constellation soft decision algorithm based on symbol phases need a estimation of system noise power. In the next discussion, a simplified constellation soft decision algorithm based on symbol distances will be presented. Known by the analysis of the constellation, the smaller the distance between symbols in the constellation diagram is, the similarity degree is higher, and consequently the posterior probability is greater. As a result, the posterior probability is a function of the reciprocal between received symbols and constellation distance, i.e. LLR can be expressed as:

$$L(b_{ik}) = \ln \frac{\sum\limits_{s^- \in \{s:b_{ik}=0\}} F\left(\|r_i - s^-\|^{-1}\right)}{\sum\limits_{s^+ \in \{s:b_{ik}=1\}} F\left(\|r_i - s^+\|^{-1}\right)} \tag{8.16}$$

It is observed from simulation that, when F(x) = x4, the decoding performance is the best, and calculated amount is not heavy as well.

8.4 Simulation Analysis

The performances of aforementioned soft decision decoding algorithms are essentially evaluated by error bit rates under different signal-to-noise ratios. In this
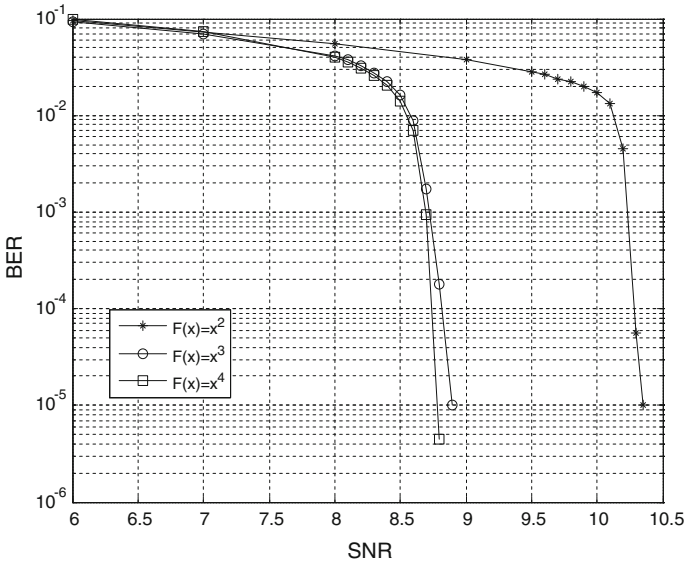
Fig. 8.3 The performance comparison for selecting different approximation functions F(x)

paper, DVB-S2 often frame is adopted, code length is 64,800 bits, code rate is 0.75 LDPC codes, 8PSK modulation method, Gray mapping manner. Conduct the simulation under AWGN channels condition.

Figure 8.3 displays the simulation performances for different F(x) on the basis of symbol distances. It is obvious to conclude that when F(x) = x4 or F(x) = x3, the performance index is better. When F(x) = x2, the performance value is roughly 1.5 dB poorer.

Figure 8.4 gives out the simulation performance for different decoding algorithms. As shown, the first algorithm is basic bit-LLR; the second algorithm represents the constellation soft decision algorithm based on symbol phases; and the third algorithm stands for the constellation soft decision algorithm based on symbol distances (here F(x) = x3).

The simulation results show that the bit error rate performance of LDPC codes by using bit-LLR algorithm in 8PSK modulation can achieve 10–5 when the signal-to-noise ratio is about 8 dB, and is the best. The performance of constellation soft decision algorithm based on symbol phases is slightly worse, while the performance of the constellation soft decision algorithm based on symbol distances is the worst. This phenomenon is due to the fact that the third algorithm estimated the posteriori probability by using the Euclidean distances between symbols. This computing process itself is an approximation, thus generating larger error compared with LLR soft decision algorithm based on maximum likelihood criterion. With respect to the amount of computation and complexity, the first algorithm needs to calculate the probabilities of three bits equal to zero or one in various constellation positions for each symbol, in addition, a large number of
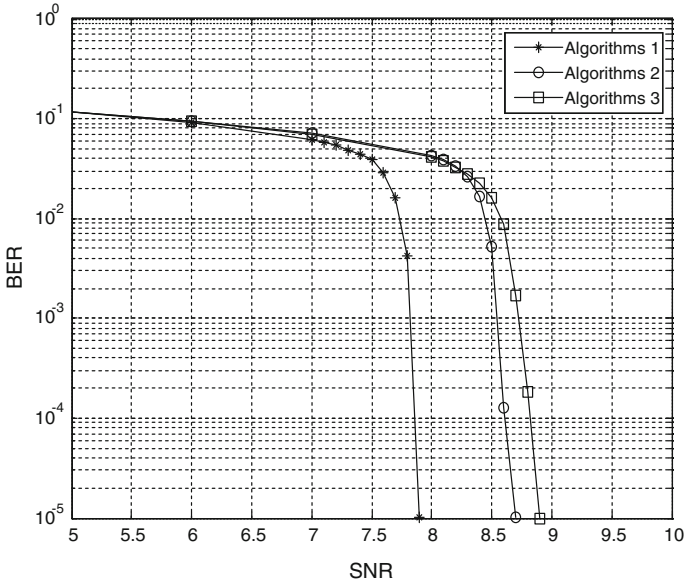
Fig. 8.4 The performance comparison among different decoding algorithms

exponentiation operations are involved, and thus the amount of computation is obviously the heaviest. By contrast, the amount of computation for the second algorithm and the third algorithm is much smaller, and moreover the third algorithm can leave out the estimation for noise power, so as to reduce the system complexity. Thereby the third algorithm possesses certain practical values in the cases when the signal-to-noise ratio condition is good or the requirement on bit error rate is not so strict.

8.5 Conclusion

In this paper, LDPC decoding algorithm in high-order modulation is studied. Two simplified algorithms based on symbol phases and symbol distances are employed, and compare them with basic bit-LLR algorithm. The simulation results reveal that the error rate performances of the two simplified algorithms have reduced at certain degree comparing with basic bit logarithm likelihood ration algorithm. But they can effectively cut down the amount of computation and system complexity, thus holding certain practical significances.

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Chapter 9
Study on Smart Home System Based on Internet of Things Technology

Yehui Liu

Abstract In this paper, by analyzing the shortcomings of existing technologies, we introduced a convenient and flexible smart home system based on Internet of Things. We have developed a demo version of this system and used a cell phone to query and control it locally and remotely. The experimental results show that this system can provide a real-time and reliable management for the smart home. It is believed that with the development of Internet of Things, smart home system will become more intelligent and multiplicity.

Keywords Smart home · Control system · Internet of things

9.1 Introduction

The new technology and integrated appear with perception and intelligence has changed for the future development of the information technology of the Internet from online things. And the development of the Internet things also created a new concept and wide development space for the intelligent household.

The smart home system based on Internet of Things has the following characteristics:

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9.1.1 Compatibility of Different Communication Technologies

It can converge many heterogeneous communication technologies by fixing various communication interfaces on the home gateway.

9.1.2 Ubiquitous Service

With the use of ubiquitous access network, no matter where the users are, the real-time smart home information can be obtained conveniently.

9.1.3 Comprehensive Perception

The comprehensive and real-time monitoring of home devices can be achieved by using a variety of physical and logical sensors.

9.1.4 Conveniently Control

The smart home system can be controlled by the mobile terminal, PC, and many other communication equipments, and the control results can be real-time displayed through all sorts of visual interfaces [1].

9.2 System Architecture

Referring to the multilayer thinking of IOT, a layer architecture model of smart home system based on Internet of Things is put forward as shown in Fig. 9.1. This architecture includes the following sections:

9.2.1 Perception Layer

Perception layer is the lowest level of the whole structure. By using a variety of physical and logical sensors, household devices can achieve the comprehensive and real-time monitoring of the house. The sensors include environmental monitoring sensors; household devices control sensors, camera, GPS and other sensing terminals.

Fig. 9.1 Layer architecture model of smart home control system
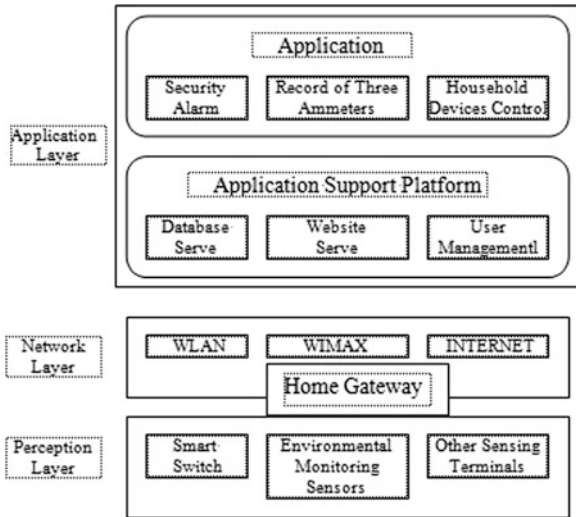
ZigBee as a low-complexity, low-power, low-cost and short-range wireless communication technology has broad application prospect in the field of smart home [2]. So we choose ZigBee wireless sensing technology as the perception layer information collecting and processing technology and use a mesh architecture to compose the Wireless Sensor Network (WSN).

9.2.2 Home Gateway

Home gateway connects the perception layer and the network layer. It gathers information from the perception layer and transmits it to the network layer. Home gateway plays a role as a protocol conversion unit and can compatible with a variety of communication technologies. We believe that the design of the gateway should be considered more scalability than compatibility, so this paper presents a low-cost, convenient, scalable gateway design method.

9.2.3 Network Layer

The network layer is consist of various kinds of wired and wireless communication networks such as Wireless Local Area Network (WLAN), mobile cellular network, Internet, etc. This layer is responsible for the transmission and processing of the getting information from perception layer. And through the heterogeneous network integration technology, resources can be shared by each network.

9.2.4 Application Layer

Application layer provides the interface between smart home system and users, which combined with industry needs to realize smart home applications based on Internet of Things. This layer is consists of application support platform and concrete applications. To support complex and intelligent applications, the interconnection environment needs devices of diverse functions to work in cooperation.

9.2.5 Application Support Platform

Smart home application support platform provides some common supports and abilities for the smart home applications, and it also provides open interfaces to enable applications access and use network resources and capabilities. By this means, it can shield upper layer application from the lower layer adverse factors and can simplify and reduce the upper layer application development and deployment complexity.

9.3 Hardware Design

Based on the functional requirement of the system, the hardware design is divided into two parts: the detecting terminal and the home gateway.

9.3.1 Design of Detecting Terminal

The hardware of detecting terminal mainly consists of the ZigBee module, smart sensors, household devices and other peripherals. The architecture of detecting terminal shows in Fig. 9.2.

Fig. 9.2 The architecture model of detecting terminal
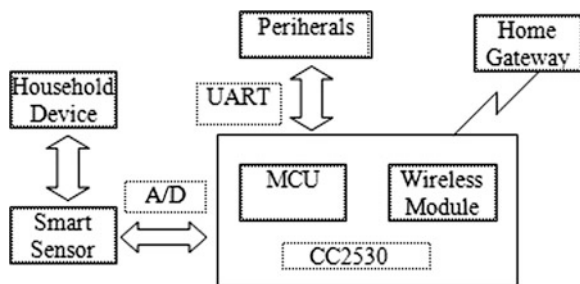
The CC2530 chip is the ZigBee module basis part of the system. CC2530 system-on-chip consists of a high-performance and low-power 8051 MCU, 2.4 GHz IEEE 802.15.4 compliant RF transceiver, two powerful UARTs with support for several serial protocols, 12 bit ADC with eight channels and configurable resolution and built-in ZigBee protocol stack (Z-Stack) [3].

According to the different needs of perceptive information, household devices carry difference sensors, some are for environmental monitoring, some are for devices control. The smart sensors connect to MCU through the A/D module which converts analog signals to digital signals.

9.3.2 Design of Home Gateway

In order to reduce the development cost and design difficulty, the home gateway only provides the most basic interfaces, and the rest of them are designed to be an extensible interface module.

The architecture of home gateway shows in Fig. 9.3. It mainly consists of ZigBee module, USB communication module and extensible interface module.

The ZigBee module plays a role as a coordinator which is responsible for establishing, maintaining and managing the network.

The wireless RF module is used for receiving the wireless signal, which is sent from detecting terminal. Then the CPU deals with the signal and transmits it to USB module through serial port (UART).

The extensible interface module is used for extending the capabilities of home gateway. For example users can add a PCI card and Rj45 interface on this module and connect to the Internet directly. By adding a wireless ir repeater module, the system can control household devices with infrared communication module. Using the reserved UART interface, LCD, keyboard and other peripherals can be added to the gateway.

Fig. 9.3 The architecture model of home gateway
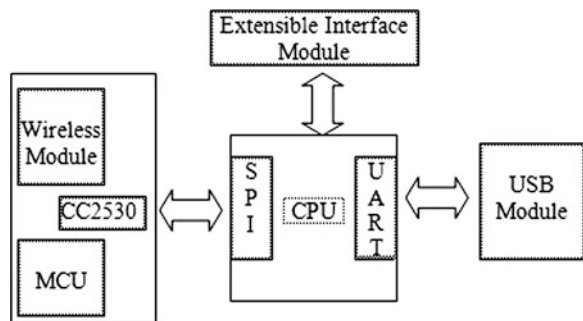
9.4 Software Design

Design of software in the system mainly includes the design of perception layer software and that of application support platform. The software of perception layer is responsible for the data collection, procession and wireless transmission of the WSN.

9.4.1 Software Design of Perception Layer

The software provides standard interfaces and device definitions for different devices. The workflow shows in Fig. 9.4.

9.4.1.1 Initialization of Household Devices

When a device joins a network, it needs to register in the gateway and be assigned a 16 bit address. The address is used for identifying devices and sending data

Fig. 9.4 Perception layer software workflow
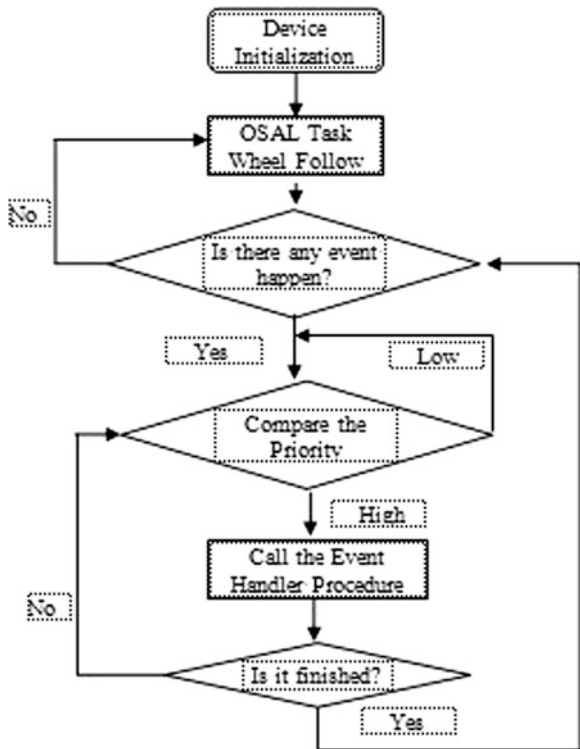
within the network. The ZigBee implementation uses a routing protocol that is based on the Ad hoc on demand Distance Vector (AODV) routing protocol for ad hoc networks. This protocol facilitates an environment capable of supporting mobile nodes, link failures and packet losses [4].

9.4.1.2 Task Management in OSAL System

When the above initialization is completed, the function osal_start_system () is called to run a OSAL system. This function is the main loop function of the task system. It will look through all task events and call the task event processor function for the task with the event. Function osal_Task_Add () is used to add a task to the OSAL system. A task consists of 2 functions—init and messages processing. Messages processing function takes in events, then processes one of them and returns the rest back to the main loop [5].

9.4.1.3 Event Handing

If there are events for particular task, the function will call the event process routine for that task to handle the events. Events are handled one at a time at the event process routine of the corresponding task. The events in the perception layer are consisting of timer events, operation events and response events. Timer events are used for updating the environmental monitoring information periodically by setting a timer. When the coordinator received a user's control commands, the function will call an operation event process routine to parser the commands and handle the events. A response event handle function is called by a task when it has finished processing a received message.

9.4.2 Software Design of Application Support Platform

Software design of application support platform mainly consists of web site creation and maintenance, the build and update of SQL database server and the command processing.

9.4.2.1 Web Access

Many web access methods can be selected such as socket programming, Client/ Server (C/S) mode and B/S mode. However, as C/S environment is faced with many challenges such as faster, easier, and flexible technologies, nowadays people are considering moving client/server environment to browse/server environment

for a better service [6]. So the B/S architecture is selected in order to make sure that the user can manage the control system anywhere and anytime.

9.4.2.2 SQL Database Server

The database server is used for managing the information of household devices, users and control strategies. We use the Microsoft SQL Sever as a database development tool to manage it and use ADO.NET data access technology to exchange data with database management system. Information classified as follows:

The information of household devices is consisting of device type, address, real-time status and history update records. This data sheet is updated periodically.

User information includes user identity information, private key, and permissions. A user needs to be certified and authenticated before accessing to the system.

Control strategies information contains the device control instruction set, the device group information, association information between devices and user-defined control strategies. Such a variety of control methods provide a more flexible and more convenient control for smart home system and are beneficial for the popularity and promotion of smart home system.

9.4.2.3 Command Transmission

The command transmission software mainly consists of four steps. Workflow shows in Fig. 9.5.

Step one: The user uses the browser from a mobile terminal or a PC to view the Web page of the smart home system and send commands through a visual interface.

Step two: The web server uses ADO.NET technology to visit the database. Then the server retrieves the database and queries the matching command list and judge the type of the command. If it's a control command then go to step three, else go to step four.

Step three: Using the control strategies in the database to package the command and sending it to the home gateway. Then the home gateway parses and executes the command. The work flow is finished.

9.5 Conclusion

As one of the core application domains in the Internet of Things, smart home attracts the most attention from the market. According to some reports, in the next several decades, the smart home industry will become one of China's main

Fig. 9.5 Command
transmission workflow
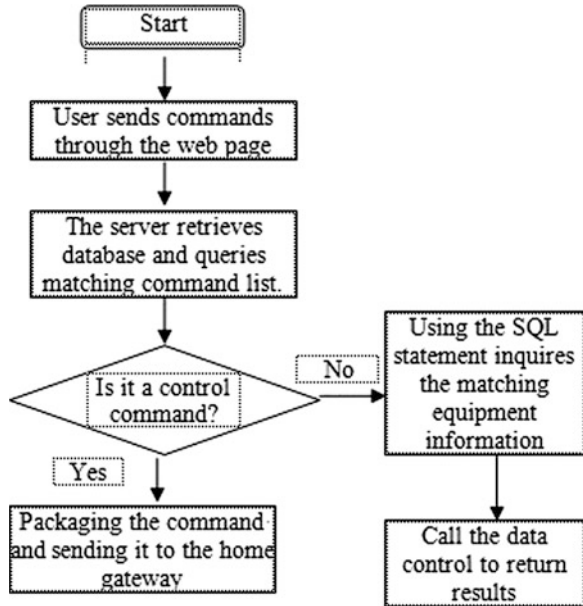
industry and the market prospects are very bright. Smart home system can improve the collection of traditional decoration with modern family living environment to meet the increasing demands of life [7]. This paper introduced a smart home control system based on B/S module which has good flexibility, easily expanded, high reliability and so on.

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Chapter 10
Brain Signal Processing Based on Wavelet Transform

Shao-hong Xu and Peng Yao

Abstract The paper introduces a new method to dispose brain signal with wavelet transform. The wavelet transform theory is widely used to deal with signals in time-frequency fields, especially to non-stationary signals which are hardly to be done by FFT. The brain signals mostly are non-stationary signals. The paper analyzes the brain signal trying to get when does the eyes' movement happens through signal processing. The paper uses wavelet transform theories combing with soft threshold method to remove the wavelet coefficient that have nothing to do with eyes' movement, then reconstruct the left coefficient. It will get exactly time when does the movements happen.

Keywords Wavelet transform · Brain signal · Signal processing's · Non-stationary random signal · Threshold disposal

10.1 Introduction

When a kind of biological electric current goes through the magnetic field, it takes some information which we called "brain wave". The human brain has many cells in the neural activity, and changes in electrical resistance. That is to say, there are electrical appliances of swing. This swing looks like a wave in scientific instruments. Brain electrical vibration is known as brain waves. Use a word to explain

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brain, perhaps can say it is by brain cells that generate biological energy, or brain cell activity rhythm [1, 2].

The brain wave contains all information of human, such as its health condition, its movement, and its thinking. This paper tries to find a way to analyze the brain wave signals, to know which part of brain wave contains the information of eyes movement.

In 1828, Fourier applied the method which has come to bear his name, of approximating arbitrary function segments by sums of sine waves. In 1870, Richard Caton described the electrical activity of the exposed brain of a dog, and mentioned that even in the absence of stimulation, the electrometer showed a rather unquiet baseline [3]. Recently wavelet transform theory is very popular for dealing with non-stationary signals. The recent confluence of these two branches of science, in the statistical analysis of brain waves, with the basis of much recent work, this paper is a contribution to that field.

In this paper, we use wavelet theory to deal with the signals to get the wavelet coefficients, then we use soft threshold to remove some coefficients that didn't reflect the change of the signals. At last we reconstruct the signals with left coefficients to see when the eyes' movement. In this way we get a new method to know the eyes' movement through brain wave signals.

10.2 Wavelet Transforms Theory

Wavelet transform theory and its application to multi-resolution signal decomposition has been thoroughly developed and well documented over the past decade. We will summarize the results of that work for the dyadic case here for use later in the paper [4, 5].

$$f(x) = \sum_{j=0}^{\infty} g_j(x) \tag{10.1}$$

The first level decomposition is done by projecting $f(x)$ onto two orthogonal subspaces, V_0 and W_0, where $V = V_0 \oplus W_0$, and "$\oplus$" is the direct sum operator. The projection produces $f_0(x) \in V_0$, a low resolution approximation of $f(x)$, and $g_0(x) \in W_0$, the detail lost in going from $f(x)$ to $f_0(x)$. The decomposition continues by projecting $f_0(x)$ onto V_1 and W_1 and goes on. The orthonormal bases of V_j and W_j are given by

$$\begin{aligned} \psi_{j,k} &= 2^{-j/2}\psi(2^{-j}x - k) \\ \phi_{j,k} &= 2^{-j/2}\phi(2^{-j}x - k) \end{aligned} \tag{10.2}$$

Where $\psi(x)$ is the mother wavelet and $\phi(x)$ is the scaling function,

$$\int \psi(x)dx = 0 \Leftrightarrow \Psi(0) = 0$$
$$\int \phi(x)dx = 0 \Leftrightarrow \Phi(0) = 1 \tag{10.3}$$

where $\Psi(x)$ and $\Phi(x)$ are the Fourier Transform of $\psi(x)$ and $\phi(x)$, respectively. The projection equations are

$$g_j(x) = \sum_{k=-\infty}^{\infty} d_k^j 2^{-(j/2)} \psi(2^{-j}x - k) \tag{10.4}$$
$$d_k^j = \langle f_{j-1}(x), \psi_{j,k} \rangle$$

$$f_j(x) = \sum_{k=-\infty}^{\infty} c_k^j 2^{-(j/2)} \phi(2^{-j}x - k) \tag{10.5}$$
$$c_k^j = \langle f_{j-1}(x), \phi_{j,k} \rangle$$

where d_k^j and c_k^j are the projection coefficients and $\langle .\ ,\ . \rangle$ is the L^2 inner product. The nested sequence of subspaces $\{V_j\}$ constitutes the multi-resolution analysis. For the MRA to be orthonormal $\psi_{j,k}$ and $\phi_{j,k}$ must be orthonormal bases of W_j and V_j, respectively, and $W_j \perp W_k$, for $j \neq k$, and $W_j \perp V$, which leads to the following conditions on ϕ and ψ

$$\langle \phi_{j,k}\ ,\ \phi_{j,m} \rangle = \delta_{k,m} \tag{10.6}$$

$$\langle \phi_{j,k}\ ,\ \psi_{j,m} \rangle = 0 \tag{10.7}$$

$$\langle \phi_{j,k}, \psi_{l,m} \rangle = \delta_{j,l} \cdot \delta_{k,m} \tag{10.8}$$

The Fourier transform of Eq. 10.6 gives the Poisson summation, which is for all

$$\sum_{m=-\infty}^{\infty} |\Phi(\omega + 2\pi m)|^2 = 1 \tag{10.9}$$

Since $\phi(x) \in V_0 \subset V$ and $\psi(x) \in W_0 \subset V$, they can be represented as linear combinations of the basis of V [6, 7].

$$\psi(x) = 2 \sum_{k=-\infty}^{\infty} g_k \phi(2x - k) \tag{10.10}$$

$$\phi(x) = 2 \sum_{k=-\infty}^{\infty} h_k \phi(2x - k). \tag{10.11}$$

In the frequency domain (10.10) and (10.11) become

$$\Phi(\omega) = H\left(\frac{\omega}{2}\right)\Phi\left(\frac{\omega}{2}\right)$$
$$\Psi(\omega) = G\left(\frac{\omega}{2}\right)\Phi\left(\frac{\omega}{2}\right)$$
(10.12)

For orthonormal MRAs, the sequences h_k and g_k in Eq. 10.10 and Eq. 10.11 represent the impulse responses of quadrature mirror filters (QMF).

PF theory is basing on the SIS. The essence of SIS is estimating the true value at time K by samples at time K−1. The main steps are as following:

10.3 Signals Processing and Simulation

For the brain signals contains lots of information and some of them have nothing to do with our research, so we need to remove them first. And we should also remove the noise mixed in the signals we collected. The brain signals are non-stationary time series which can't be done by traditional FFT theory. We can combine the wavelet transform theory and the threshold method to deal with the brain wave signals. Here are the computing steps:

We choose 32 points on the head to collect information. After we get 32 channel's information, we use space reconstruct method to choose which channel plays a more role for our research.

Choosing correct mother wave to do wavelet transform. We should also choose the levels. The more levels we choose, the more accurate results we will get, but it will also take more time for computer to deal with.

It sets right threshold. There are two main points in this step. We have already known that the frequency is between 8 and 13 Hz, so we should keep the coefficients which are contained in the frequency band. Second, we should set right threshold to remove the noise.

Doing reconstruct to left coefficients. We can get the time field wave figure and judge when the eyes movement happen.

After doing the above steps, we get the following results:

Figure 10.1 shows the signals of original brain wave and the signals of each hear wavelet level. S shows the original signals, a_5 shows the lowest frequency part, $a_5 \oplus d_5$ reflect W_4, and d_4 reflect V_4. So use 5 level hear mother wavelet we can divide the brain signals to 6 parts, and each part reflect different frequency band. Figure 10.2 shows wavelet coefficients in all levels. Figure 10.3 shows the left coefficients by threshold theory. The sample frequency is 64 Hz, so we kept the most coefficients in levels 4 and level 3, which means we kept most coefficients between the frequency 8 and 16 Hz. From the reconstruct signals we can see the summit of the signals is the time when the eyes' status changes.
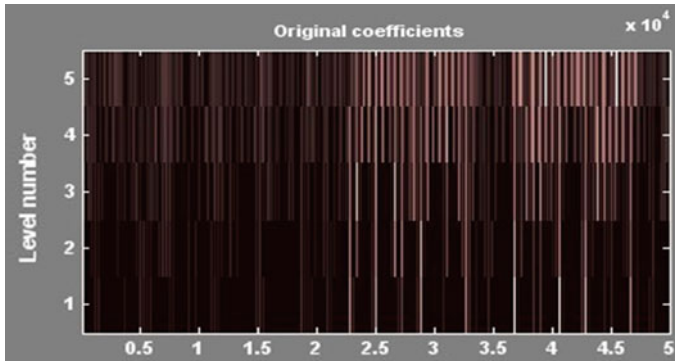
Fig. 10.1 The original wavelet coefficient
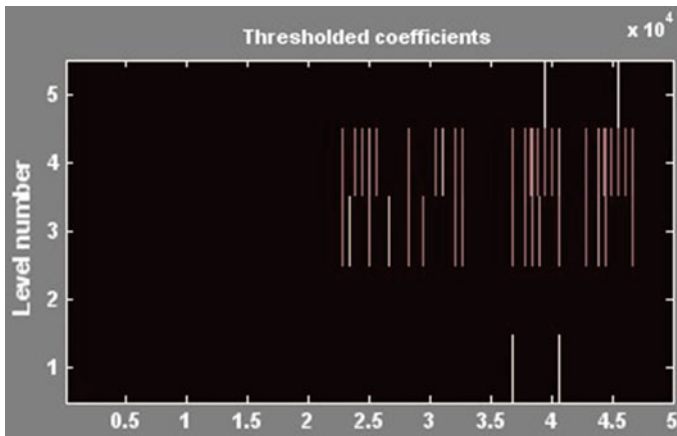
Fig. 10.2 The threshold wavelet coefficient

Fig. 10.3 The original and processed signals
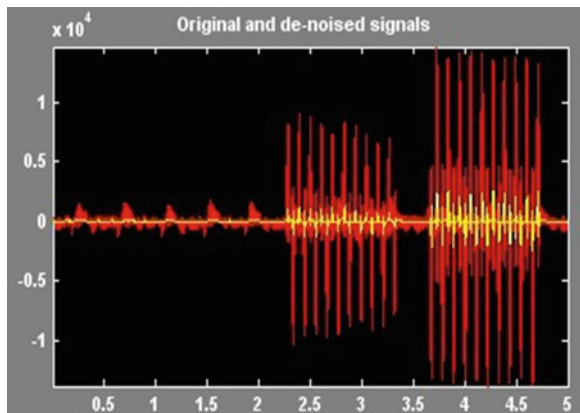
10.4 Conclusion

The article describes the method for brain wave analyzing by wavelet transform. Through wavelet transform, coefficient disposal and wavelet reconstruct, we get the signal that reflect when the eyes movement happening. This offer a good way for brain wave signals processing, but there is a premise that we should that the changing frequency first before signal processing, such as the eyes movement frequency is between 8 and 13 Hz. We can also do the same experiment for hand movement and even what people's thinking.

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Chapter 11
Study on GNSS Inter-System Interference

Chengyan He, Weidong He, Xiaochun Lu and Yongnan Rao

Abstract Nowadays, primarily been driven, among other motivations, by the desire to ameliorate the compatibility performance of GNSS, speculation has continued on the possibility of further optimization. Of special interests is the inter-system interference that one satellite navigation system will suffer due to another navigation system. To analyze inter-system interference, the method recommended by International Telecommunication Union (ITU) is provided in this paper. Traditional methods for code division performance analyzing are generally based on the correlation characteristics of PRN. However, actual inter-signal interference rests also with the correlation characteristics of signal waveforms, with contributions such as data bit reversal, code phase error, Doppler frequency shift and code waveform, etc. closely associated. As a result, coefficient accounting signal-to-noise ratio reduce at correlator output, due to inter-system interference, is proposed in detail in this paper. Then, calculation results of coefficients between several kinds of GNSS signals, and inter-system interference

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between GPS L5 and Compass B2a, are presented. In the end, conclusions are drawn as to which two signals have greater interference on each other, and how to design navigation signals to improve compatibility performance of GNSS. Based on the researches in this paper, it can be verified that, Compass B2a and GPS L5 can perfectly achieve compatibility.

Keywords Inter-system · Interference · Anti-jamming performance · GNSS · Compatibility · CDMA and FDMA

11.1 Introduction

The constant developments in the field of GNSS have opened the door for a new type of safety critical applications. These applications, mostly related to aviation, generate stringent requirements on the used satellite navigation systems. To meet these challenging requirements which include precision and integrity of the positioning solutions, as well as robustness of the service, new technologies have to be implemented in developing modernized navigation systems. Only the use of newly designed signals located on multiple frequencies, in combination with advanced receiver architectures and algorithms, will allow achieving these demands.

During these past two decades, the Global Positioning System has grown from a nascent military system to a most widely used, accurate, and reliable navigational tool for terrestrial, marine and aviation use in the world. The U.S. Air Force manages the GPS program, and currently supports 29 active GPS satellites, including the 50th GPS satellite, launched on 23 June 2004.

The European satellite navigation system Galileo, and Chinese satellite navigation system COMPASS, are going to contribute to the worldwide coverage provided by the GNSS. As to Galileo, the launch of the first test satellite GILVE-A has marked a very significant step towards this goal. China is going to launch 27 MEOs, 3 IGSOs and 5 GSOs, and several satellites of COMPASS have already been launched.

Global Navigation Satellite System (GNSS) including GPS, Galileo, GLONASS and COMPASS, has very exciting evolutions during the past several decades. With the modernization of GNSS, and the increase of satellite navigation systems, researches on compatibility and interoperability are becoming a worldwide "hot spot". This is primarily due to the fact that, each system is intended to design a system favorable for its own interests. The performance of compatibility can be evaluated through inter-system interference analysis, which can promote multi-lateral and bilateral coordination of researches on GNSS [1].

Precise interference analysis has already been done in the past, and people consider that, Galileo and GPS will not interfere with each other when BOC (2, 2) was the baseline for Galileo L1 OS. However, since important changes have

occurred in Galileo signal structure, and together with the developments of researches on compatibility and interoperability, it is our objective to assess GNSS inter-system interference [2].

11.2 Modulation Mode of GNSS Signals

11.2.1 BPSK-R Signals

In satellite navigation system, the widely used waveform of spreading signal is of binary amplitude, rectangular Non-Return-to-Zero waveform, with the duration of each chip $Tc = 1/f_c$. According to the conventional representation [1], Direct-sequence spread spectrum (DSSS) signals using this waveform is denoted as BPSK-R signal, where BPSK-R (n) indicates BPSK-R signal with $f_c = n \times 1.023$ MHz.

The ACF of DSSS base-band signal can be expressed as:

$$R(\tau) = \lim_{T \to \infty} \frac{1}{2T} \int_{-T}^{T} s^*(t)s(t+\tau)dt \tag{11.1}$$

where * denotes complex conjugate. Then the PSD can be expressed as:

$$S(f) = \int_{-\infty}^{+\infty} R(\tau) \exp(-j2\pi f\tau)d\tau \tag{11.2}$$

BPSK-R signal's autocorrelation is a triangle when we assume it has ideal auto-correlation and cross-correlation:

$$R_{BPSK-R}(\tau) = \begin{cases} 0, & other \\ 1 - \dfrac{|\tau|}{T_c}, & |\tau| \leq T_c \end{cases} \tag{11.3}$$

Its PSD can be derived from formula (11.2), as the following formula:

$$\begin{aligned} S_{BPSK-R}(f) &= T_c \sin c^2(\pi f T_c) \\ \sin c(x) &= \sin(x)/x \end{aligned} \tag{11.4}$$

11.2.2 BOC Signals

Binary offset carrier (BOC) modulation has been considered for the modernized GPS signal (M-code) in L1 and L2 bands, and also for the future European Navigation System Galileo [3]. The purpose of BOC is as follows:

It's to achieve better tracking performance than conventional PSK modulation, with respect to channel noise and multi-path. This improvement is due to the fact

Fig. 11.1 Autocorrelation function of BOC (6, 1), BOC (1, 1), BOC (2, 2) and BPSK-R (1)
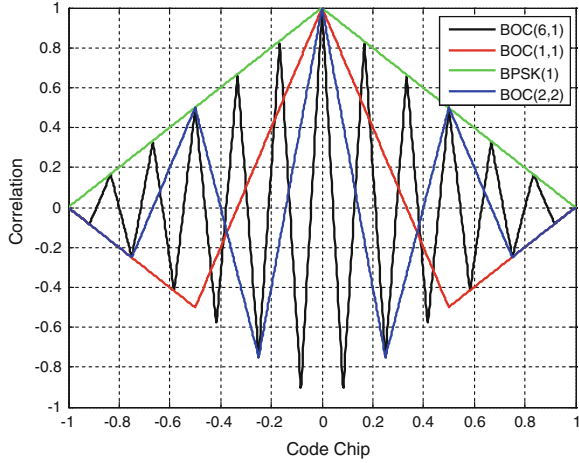
that, it has a larger concentration of energy on the edge of the allocated bandwidth, which leads to the increase of the Gabor bandwidth [4, 5].

To mitigate interference with pre-existing navigation signals in common bands, such as L1, by utilizing different spectral occupancies [6].

The BOC base-band signal can be expressed as

$$g_{BOC}(t) = g_{BPSK-R}(t)sign[\sin(2\pi f_s t + \psi)] \tag{11.5}$$

where *sign* is symbolic function; f_s is subcarrier rate; ψ is subcarrier phase.

Another representation method for BOC signal is BOC (m, n). It consists of multiplying the spreading code of rate fc = nfb, by a square wave of frequency fs = mfb, where m and n are two integers, and fb = 1.023 MHz. However, BOC waveforms have autocorrelation functions (ACF) that contains multiple peaks, which will lead to potential tracking ambiguities.

The PSD of BOC (fs, fc) can be expressed as [7]

$$S_{BOC}(f) = \begin{cases} T_c \dfrac{\sin^2(\pi f T_c)}{(\pi f T_c)^2} \tan^2(\dfrac{\pi f}{2f_s}), & M \text{ is even} \\[4mm] T_c \dfrac{\cos^2(\pi f T_c)}{(\pi f T_c)^2} \tan^2(\dfrac{\pi f}{2f_s}), & M \text{ is odd} \end{cases} \tag{11.6}$$

Normalized ACF can be expressed as [8]

$$R_{BOC}(\tau) = \begin{cases} (-1)^{v+1}[(-\frac{2v^2-2v}{M} + 2v - 1) - \frac{|\tau|}{T_c}(2M - 2v + 1)], & |\tau| \le T_c \\ 0, & other \end{cases} \tag{11.7}$$

where $v = \left\lceil M\frac{|\tau|}{T_c} \right\rceil$, $M = \frac{2m}{n}$

Figure 11.1 shows the autocorrelation function of BOC signals and B PSK-R (11.1).

11.3 Interference Analysis

11.3.1 ITU Recommended Method

Targeted at CDMA communication system for compatibility coordination of satellite navigation system, ITU-R M. 1831 proposal provided an interference analysis methodology based on equivalent carrier-to-noise-ratio, which can be expressed as follows for continuous noise interference [9]:

$$C/N_0^{'} = \frac{C}{vN_0 + I_{ref} + I_{alt} + I_{rem} + I_{ext}} \tag{11.8}$$

where v is equivalent thermal noise coefficient; I_{ref} is PSD of self-interference; I_{alt} is PSD of cross-interference from another satellite navigation system; I_{rem} is PSD of interference from other satellite navigation systems; I_{ext} is PSD of interference from other systems except for satellite navigation systems; N_0 is a constant refers to PSD of thermal noise in receiver.

When we consider only self-interference without cross- interference, then

$$\Delta(C/N_0')_{ref} = \frac{C/N_0}{C/(N_0 + I_{ref})} \tag{11.9}$$

When cross-interference is considered, then drop-out-value of equivalent carrier-to-noise-ratio, caused by another satellite navigation system, can be expressed as follows:

$$\Delta(C/N_0')_{alt} = \frac{C/(N_0 + I_{ref})}{C/(N_0 + I_{ref} + I_{alt})} \tag{11.10}$$

For interference such as I_{ref}, I_{alt}, I_{rem}, I_{ext}, we can define a parameter I_0 to denote the PSD of the total interference

$$I_0 = \sum_{m=1}^{M} \frac{G_m^{agg} \beta_m P_{\max,m}^R}{L_m} \tag{11.11}$$

Here m is serial number of interference signals; M is total number of interference signals; L_m is processing loss between useful signal and the math interference signal; G_m^{agg} is gain coefficient, maximum of total transmitting power for all satellites divided by the maximum of transmitting power for one satellite; β_m is SSC, spectrum separation coefficient, between useful signal and the math interference signal; $P_{\max,m}^R$ is maximum of interference power, for the mth interference signal received by reference receiver on ground.

11.3.2 Coefficient Calculation

Here, the most significant properties, concerning interference aspects, will be described. These address the space segment constellation, frequency bands where interference appears, modulation of the signals, together with the Pseudo-Random-Noise Codes on these band, etc. Here, we will introduce a parameter to account signal-to-noise ratio reduce at the correlator output due to inter-system interference. To denote interference between different signals, here we use k_{jam} to be the coefficient:

$$\tilde{k_{jam}} = \frac{1}{1 + \sum\limits_{i=1}^{M} 2(D_{I_{jam,i}} + D_{Q_{jam,i}})/(N_0 T)}. \tag{11.12}$$

where i is serial number of interference signals; M is total number of interference signals; $D_{I_{jam,i}}$ is interference component, in In-phase output of quadrature correlator; $D_{Q_{jam,i}}$ is interference component, in Quadrature output of quadrature correlator; T is integral time of correlator; N_0 is a constant, refers to PSD of thermal noise in receiver.

For actual calculation, we use this following formula:

$$\tilde{k_{jam}} = \sum\limits_{i=1}^{M} 2(D_{I_{jam,i}} + D_{Q_{jam,i}})/(N_0 T) \tag{11.13}$$

$\tilde{k_{jam}}$ Inter system interference estimation.

11.4 Interference Calculation

11.4.1 Signal Interference

We mainly calculate the cross-effect between BOC (1, 1) and BOC (6, 1) signal, that between BOC (1, 1) and BOC (1, 1) signal, that between BOC (6, 1) and BOC (6, 1) signal, and the cross-effect between BPSK-R and BPSK-R signal in this paper.

The ACF of BOC (6, 1) signal can be expressed as

$$R_{BOC(6,1)}(\tau) = \begin{cases} (-1)^{v+1}[\frac{1}{6}(-v^2 + 13v - 6) - \frac{|\tau|}{T_c}(24 - 2v + 1)], & |\tau \le T_c| \\ 0, & other \end{cases} \tag{11.14}$$

The ACF of BOC (1, 1) is

$$R_{BOC(1,1)}(\tau) = \begin{cases} (-1)^{\nu+1}[(-\nu^2 + 3\nu - 1) - \dfrac{|\tau|}{T_c}(4 - 2\nu + 1)], & |\tau| \le T_c \\ \\ 0, & other \end{cases}$$

(11.15)

Then, we can calculate the cross-effect between BOC (6, 1) and BOC (6, 1).

$$\int_{-T_c}^{T_c} R_{BOC(6,1)}(\tau)R_{BOC(6,1)}(\tau)d\tau = \frac{T_c}{4.4384}$$

(11.16)

Then the numeric inter-system interference estimation $\widetilde{k_{jam}}$ equals to $\frac{Q_{J/N_0}}{4.4384} T_c$, here Q_{J/N_0} is a jamming-to-noise ratio.

Cross-effect between BOC (1, 1) and BOC (1, 1) signal is given from the following integral

$$\int_{-T_c}^{T_c} R_{BOC(1,1)}(\tau)R_{BOC(1,1)}(\tau)d\tau = \frac{T_c}{3}$$

(11.17)

Then, the numeric inter-system interference estimation $\widetilde{k_{jam}}$ equals to $\frac{Q_{J/N_0}}{3} T_c$.

Cross-effect between BOC (1, 1) and BOC (6, 1) signal is given from the following integral

$$\int_{-T_c}^{T_c} R_{BOC(1,1)}(\tau)R_{BOC(6,1)}(\tau)d\tau = \frac{T_c}{215.9983}$$

(11.18)

Here, the numeric inter-system interference estimation $\widetilde{k_{jam}}$ equals to $\frac{Q_{J/N_0}}{215.9983} T_c$.

As to BPSK-R signals, using the same analysis method, we can obtain the cross-effect between BPSK-R and BPSK-R signal

$$\int_{-T_c}^{T_c} R_{BPSK-R}(\tau)R_{BPSK-R}(\tau)d\tau = \frac{T_c}{1.5}$$

(11.19)

As a result, the numeric inter-system interference estimation $\widetilde{k_{jam}}$ equals to $\frac{Q_{J/N_0}}{1.5} T_c$.

As expected, cross-effect between two different signals is much less than that between two same signals. Take BOC (1, 1) and BOC (6, 1) signals as an example, the cross-effect between BOC (1, 1) and BOC (1, 1) signal and that between BOC (6, 1) and BOC (6, 1) signal, are of the same magnitude order, but far outweighs that between BOC (1, 1) and BOC (6, 1) signals. Besides, you may have noticed that, the cross-effect between BPSK-R signals is slightly in excess of that between BOC (1, 1) signals or between BOC (6, 1) signals.

Table 11.1 Interference of GPS on compass B2a

	Useful signal		Self-interference		GPS interference
	Constellation	Signal	Constellation	Signal	Signal
1	MEO	B2a	MEO	B2a	L5
2	MEO	B2a	MEO + IGSO + GSO	B2a	L5
3	GSO	B2a	MEO + IGSO + GSO	B2a	L5
4	IGSO	B2a	MEO + IGSO + GSO	B2a	L5
	$\Delta(C/N_0')_{ref}$		$\Delta(C/N_0')_{alt}$		$\Delta(C/N_0')$
1	0.32		0.33		0.64
2	0.65		0.36		1.00
3	0.75		0.35		1.10
4	0.66		0.36		1.01

11.4.2 Inter-System Interference

We have described several significant properties concerning interference in the above chapters. Using interference analysis methods proposed in this paper, the inter-system interference between Compass and GPS is analyzed [9]. The results are shown in Tables 11.1 and 11.2.

From these two tables we can see that, the maximum drop-out-value of equivalent carrier to noise ratio for GPS L5 signal, caused by Compass, is 1.20 dB. While the maximum drop-out-value of equivalent carrier-to-noise-ratio for Compass B2a signal, caused by GPS, is 1.10 dB. According to the criteria, set by L5 electromagnetic compatibility workshop of USA, that if the maximum drop-out-value of equivalent carrier-to-noise-ratio for L5 receiver, caused by existing satellite navigation systems, is less than 5.8 dB in some geographical region, we can identify that L5 can achieve compatibility. As a result, Compass B2a and GPS L5 can perfectly achieve compatibility. So, if two bands can achieve interoperability, then the drop-out-value of equivalent carrier-to-noise-ratio for each band, caused by the other system, can be compensated by performance improvement, as a result of interoperability.

Table 11.2 Interference of compass on GPS L5

	Useful signal	Self-interference	Compass interference	
	Signal	Signal	Constellation	Signal
1	L5	L5	MEO + IGSO + GSO	B2a
2	L5	L5	MEO	B2a
	$\Delta(C/N_0')_{ref}$	$\Delta(C/N_0')_{alt}$	$\Delta(C/N_0')$	
1	0.47	0.73	1.20	
2	0.47	0.36	0.83	

11.5 Summary

In this paper, some analytical and real simulations, accounting for the inter-system interference, have been carried out. It is shown that, the cross-effect between two different signals is much less than that between two signals of the same kind. Meanwhile, self-interference of BPSK-R signals is slightly in excess of that of BOC signals. As described above, several properties concerning interference aspects, such as the modulation of the signals, together with the Pseudo-Random-Noise Codes, will be of great significance in designing navigation signal systems. In addition, using methods that are provided in this paper, we are able to verify that, Compass B2a and GPS L5 can perfectly achieve compatibility. However, due to the fact that, there are other signals on GPS L5, to evaluate compatibility more completely, the effect of total interference within this band should also be taken into consideration.

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Chapter 12
Efficient Routing Algorithm of Zigbee Network

Changqing Wang and Xinwei Yue

Abstract ZigBee technology is a wireless sensor network technology in the Internet of things; it has the characteristic of low-cost, low data rate and low power consumption. Routing protocol is the core technology of the ZigBee network. In view of the routing algorithm can't obtain the optimal path on the path selection, this paper focuses on the research into such an issue and analyses the tree and AODVjr routing algorithm. Based on the above analysis, an improve tree-based routing algorithm (ImcTR) is proposed which was used to optimize the path selection, reduces the network average hop count and energy consumption, shortening the average network transmission delay.

Keywords The internet of things · Zigbee · Neighbor table · Tree routing

12.1 Introduction

Wireless sensor networks (WSN) have been developed in the past few years for static and mobile networks [1]. This kind of network is envisioned for a wide range of application areas related to industry, health monitoring, control and the military [2]. ZigBee is low cost, low power consumption, low rate short-range wireless communication technology, which is mainly designed for low rate wireless communication

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network. With its unique features, it sparks in a number of wireless network technologies and also provides a powerful impetus to the development of the Internet of Things. ZigBee is the standard, which is based on the definition of IEEE 802.15.4 physical layer and media access layer [3]. The network layer specification is an important part of the ZigBee standard, and its main function is network maintenance, sending and receiving network layer data, route of choice as well as radio communication, but the routing algorithm is its core. This paper studies the ZigBee network routing algorithm, and proposes an improved tree routing algorithm (ImcTR) and simulates it by network simulator NS2.

12.2 ZigBee Network Key Technologies

ZigBee network layer is responsible for management of message routing, opening the network, device configuration, addressing, link establishment and dissolution, etc. and provide some necessary functions to ensure the normal work of the MAC layer. As well as zigbee network layer provide the appropriate service interface for application layer (which connects the interface between MAC layer and application layer). The network layer provides two necessary functional entities to interact with application layer. These functional entities are data service entity and management service entity. The data service entity provides generated network layer protocol data unit and the transmission route of the specified topology. The network layer management entity provides network management services, allowing the application in the stack interaction.

In the network configuration, zigbee network has three types of nodes: ZigBee coordinator, ZigBee router, ZigBee end device [4]. Zigbee coordinator (known as the IEEE 802.15.4 PAN coordinator) is the main controller of the entire network, which has more powerful function than other nodes. It is primarily responsible for initiating development of the network, setting the network parameters, management of the network nodes, etc. and also can perform router function, route discovery, message forwarding, enabling other nodes to relate this network through it. However, ZigBee end device only be associated with the network through ZigBee coordinator or ZigBee router, forbid other nodes to join in the network through itself.

12.3 Address Assignment Mechanism

In the ZigBee network, there are two kinds of address mode [5]: IEEE MAC address and 16 short address. IEEE MAC address is a 64 address, which is allocated by IEEE organization and chip makers unified compile a global unique identification of the chip, but 16 short addresses is used to identify the local network device. So these short addresses are how to distribute depend on the architecture of the entire

network. We suppose the following parameters: Cm: Maximum number of children per parent. Rm: Maximum number of router children a parent can have. Lm: Maximum depth of the network. d: the depth of the node. When the depth of the node is d, parent node allocates address for his child node using the following Eq. (12.1):

$$Cskip(d) = \begin{cases} 1 + Cm \times (Lm - d - 1), & Rm = 1 \\ (1 + Cm - Rm - Cm \times Rm^{Lm-d-1})(1 - Rm)^{-1}, & others \end{cases} \quad (12.1)$$

where d = 0, 1…Lm − 1.

If Cskip(d) equals to zero, this indicates that the node does not have the assignment ability and the new node can't join the network. If Cskip (d) is greater than zero, this indicates that the routing node can receive other nodes as its child and assign address for its child nodes.

When a new RFD child node $Addr_c$ join in the network through $Addr_p$, $Addr_p$ becomes its parent and assigns network address for $Addr_c$ using the following Eq. (12.2):

$$Addr_c = Addr_p + Cskip\ (d) \times Rm + n$$
$$1 \leq n \leq Cskip(d) - Rm \quad (12.2)$$

If the newly added node has a routing function, we will assign address for it using the following Eq. (12.3):

$$Addr_c = Addr_p + 1 + Cskip(d) \times (n - 1) \quad (12.3)$$

In summary, Lm, Cm, Rm, these three values are determined, the entire network device address will be determined. Therefore knowing the short address of a device, we can introduce to the device type and its parent address.

12.4 ZigBee Routing Algorithm

12.4.1 Tree Routing Algorithm

Node calculates the next hop of the packet according to the network address of the destination node in the Cluster-Tree routing algorithm. When the routing node whose network address is A and network depth is d receives the forwarded packet whose destination address is D, the router node first determine if the destination D is its child node and then deal with this packet in different ways according to the result [6]. If address D satisfies the following Eq. (12.4), we judge that D is a descendant node of the A.

$$A < D < A + Cskip(d - 1) \quad (12.4)$$

If the destination node is a descendant node of the routing node, the node will send this packet to its child node. Now if D satisfies the following Eq. (12.5):

$$D > A + Rm \times Cskip(d) \tag{12.5}$$

It shows that destination node is it's a terminal child node, the next hop address of node is D at this time. Otherwise, if the destination node is not a descendant of the receiving node, the packet will be sent to its parent node along the tree structure.

12.4.2 AODVjr Routing Algorithm

AODVjr is the improvement of on-demand distance vector routing protocol that is referred to as AODV [7]. Taking many factors into account such as energy conservation, application and so on, people have simplified some features of AODV, but AODVjr always remain the main function of the AODV. First, routing packets are composed of (route request message) RREQ and (route reply message) RREP. There are not serial numbers of the destination node in AODVjr routing algorithm. Only the destination node can send RREP to avoid circular problem and invalid RREP to appear and improve communication efficiency. Second, AODVjr has deleted (Route Error message) RERR and precursor list. At the same time in order to save the control overhead, AODVjr do not send Hello packet.

AODVjr algorithm looking for routing process: when the source node A send a message to the destination node K, A finds that there is not routing to reach the destination node K and begin to broadcast the RREQ. A requests their neighbour nodes to find whether there is the path to reach the destination node K. Each node which has received RREQ maintains routing information to the source node A, at the same time it helps source node A to broadcast to find the destination node. By this flood pattern, routing cost of the RREQ decide whether the routing table updates or not and reply the RREP for the source node A by path of the minimal routing cost. The source node A usually finds the destination node K by broadcast, however, the destination node K replys RREP to the source node A though unicast. After the source node A receives RREP of the destination node K, according to the minimum principles of Cost, A decides to select the best path to communicate with K.

12.4.3 Routing Algorithm Comparison

From the above analysis, we know that tree routing algorithm is applicable to this occasion that nodes are stationary or nodes almost change. This algorithm belongs to the static routing algorithm and its characteristic is that nodes do not have routing function can communicate with itself parent node to send data packets and control packet, but the efficiency is low.

Now Tree + AODVjr hybrid routing is used in the ZigBee network, this routing algorithm improves performance compared with Tree and AODVjr routing algorithm, but it still exits the problem of energy consumption. This algorithm finds the shortest path between the source node and the destination node through neighbours table so as to reduce the energy consumption and improve network throughput.

12.5 Improvement of the Tree routing Algorithm

Neighbour table. In a ZigBee network each node maintains a neighbour table. This table has all information for a one hop neighbour node (nodes within transmission range). It contains several items of information such as child node, the parent node, personal area network identifier, network address, MAC address, device type. ZigBee devices have the ability to limit the size of the neighbour table by selecting the maximum number of neighbour entries to store it in the table. The neighbour table is created when a node starts the procedure to join the existing network. When a node receives a response from router node which has already joined the network, this node starts storing neighbour information from the information contained in the packets. A ZigBee node receives and this helps to keep the neighbour tables up-to-date all the time. In the case if one node leaves this net-work, the neighbour tables will update by removing neighbours of node. Therefore we can use the neighbour table to improve the tree routing algorithm.

ImcTR algorithm. In our proposed algorithm, the following assumptions have been made: The use of a symmetrical relationship between nodes, in which if node A is a neighbour node of B, then node B is also a neighbour of node A [8]. Each node has an up-to-date neighbour table and has the same communication distance between nodes. The network structure does not change in the simulation. The maximum network parameters (Rm, Lm, Cm) are (5, 6, 5), and each node has a two-hop neighbour information.

Variables and definitions used in the ImcTR algorithm as follows:
D: destination node address; A: source node address.
$Addr_p$: parent node address; L_A: neighbour node address.
P_{LA}: the address of the neighbour node parent.
ImcTR: algorithm encompasses the following steps:
Step 1: If the source node checks the destination node is its parent node, packets will be forwarded to its parent node along the tree. Parent node address is calculated using the following Eq. (12.6):

$$Addr_p = A + Cskip(d)^{-1} \times [D - (A + 1)] \times Cskip(d) + 1 \qquad (12.6)$$

Step 2: Source node checks if the destination is one of its descendents by checking Eq. (12.7). If the condition is satisfied, packets will be forward to the appropriate child node along the tree. Each routing node has a block address which is responsible for assigning address to its child node in the ZigBee network.

$$A < D < A + Cskip(d-1) \tag{12.7}$$

Step 3: If the destination node is one of source node neighbours, the source node will transmit packets to the corresponding neighbour node directly and do not follow tree topology. The node in the ZigBee network saves neighbour node address (LA) in its neighbour table and judges the relationship between destination node and neighbour node by checking the neighbour table.

Step 4: The source node checks if the destination node is one of its neighbour's node descendents. If the condition is satisfied, the source node transmits the packets to its neighbour node and as a next step the neighbour node finds that the destination node is its descendents by algorithm, turning to step 2. As mentioned before, the source node has the address of all neighbour nodes. All routing nodes are aware of the address space of its descendant nodes. If the destination node is in address space of neighbour node by checking the following Eq. (12.8), the source node will transmit packets to the destination node though the shortest path. Therefore this reduces the number of hops.

$$L_A < D_A < L_A + Cskip(d(L_A) - 1) \tag{12.8}$$

Step 5: The source node checks if the destination node is parent of the neighbour node, If the condition is satisfied, the source node will transmit the packets to its neighbour node. The neighbour node checks the algorithm and find that the destination node its parent node, turning to the step 1. At this time neighbour node calculates its parent node using the following Eq. (12.9).

$$P_{LA} = L_A + Cskip(d)^{-1} \times [D_A - (L_A + 1)] \times Cskip(d) + 1 \tag{12.9}$$

Step 6: The source node checks if the destination node is ancestor node of the neighbour node, sibling node or sibling node of the neighbour. Each node has the information of two hops neighbour nodes in this algorithm and transmits Hello information to update one hop neighbour table. Especially before the node broadcasts information to neighbour node, it adds the mark of one hop neighbour address to updated packet. So every node knows its two-hop neighbour node by this mechanism. In this step source node checks two-hop neighbour list. If the destination node is in its list, packets will be transmitted to its two-hop neighbour node and then perform the routing algorithm, turning to the step 1.

12.6 The Simulation and Performance Analysis

In order to evaluate the performance of the improved algorithm ImcTR, we emulated this algorithm by NS2. Network range was 200×200 m in simulation environment and network nodes was 220. The neighbour table in each node was allowed to store up to 8 neighbours. The network coordinator is located in the center of the network region.
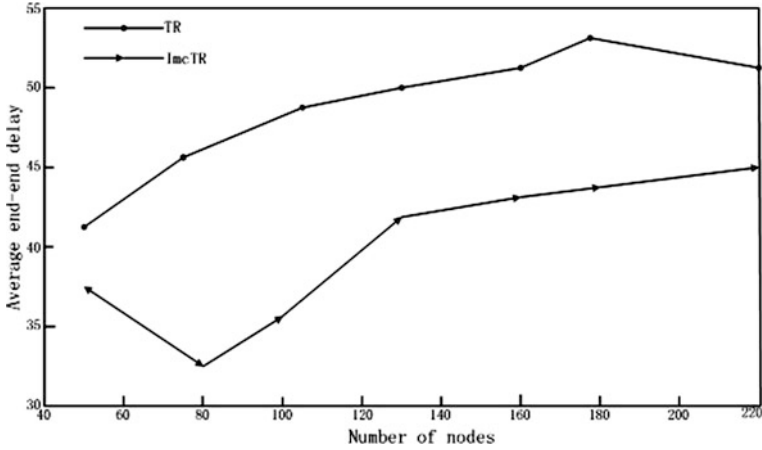
Fig. 12.1 Along with the increase of the depth of the network
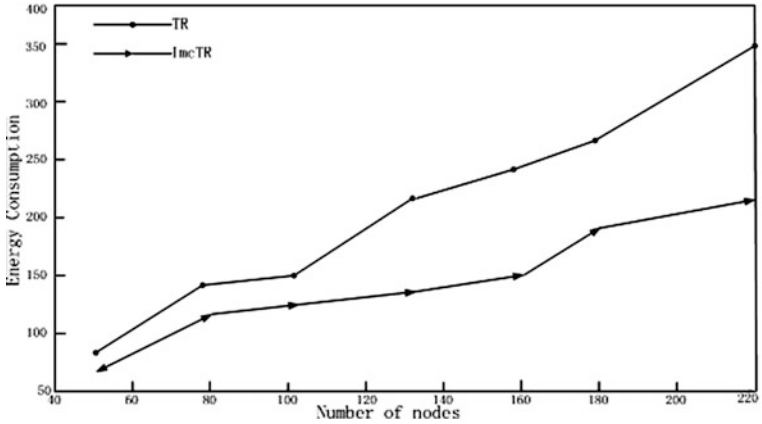
Fig. 12.2 Comparing TR and ImcTR algorithm

Considering the addition of node in the network, we analyse these performance indexes from average end-to-end delay, packet transmission rate, routing open efficiency. The results are as follows:

Figure 12.1 shows that along with the increase of the depth of the network. The source node transmits data packets to the destination node using more average end-to-end delay. But ImcTR algorithm can take advantage of the neighbour table to find the shortest path and reduce average delay. Our proposed ImpTR protocol reduces average end-to-end delay by 12 %.

As shown in Fig. 12.2, comparing TR and ImcTR algorithm, when the network has 80 or 100, because of the depth of network is not high, the number of packets are transmitted by intermediate node is lower. Therefore the corresponding energy
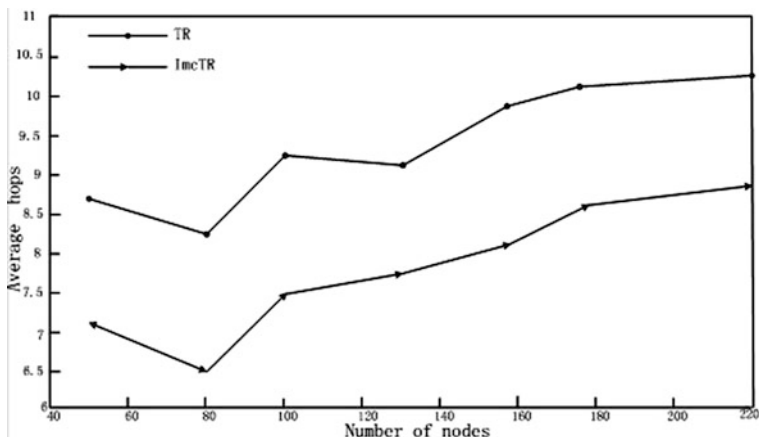
Fig. 12.3 The increase of network nodes

consumption is lower too. As nodes increase, the depth of the network is high. The node transmits packets through the coordinator in the tree routing algorithm, however the node transmits the packets without going through the network coordinator can find the shortest path. So it reduces the energy consumption.

As shown in Fig. 12.3, with the increase of network nodes, the depth of network becomes higher. The hops from the source to the destination node are increasing. Though the analysis and comparison, the ImcTR reduces the number of hops by approximately 15 % compared to the TR.

12.7 Conclusion

In this paper we proposed an improved ImcTR routing algorithm on the basis of tree routing algorithm. This algorithm reduces number of hops from the source node to the destination node by NS2 and its performance is good than AODVjr. ImcTR is suitable for the wireless sensor network whose resource is constrained and has no routing table information.

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Chapter 13
A Novel Modulation Recognition Algorithms for Wireless Analog Signal

GuoHua Wang and Yu Shen

Abstract In this paper, a novel modulation recognition algorithm for wireless analog signal is proposed. Firstly, Hilbert transform is applied to construct the analytic signal and time–frequency analysis, and then the modulation recognition method based decision theory is introduced and whose drawbacks are indicated, finally, we propose the description of modulation recognition algorithm based on wavelet transform and BP neural network. Simulation results show that the proposed method can automatically recognize the wireless analog signal. Furthermore, the recognition rate of wireless analog signal can reach to 85 % when the Signal–Noise ratio (SNR) reduce to 0 dB.

Keywords Modulation recognition · Decision theory · BP neural network · Morlet wavelet

13.1 Introduction

With the development of communication technology, communication signal modulation of automatic recognition technology is constantly development [1]. Communication recognition technology has been applied widely in the military, civilian areas [2, 3]. Therefore, automatic recognition technology of communication signals has very important significance and wide application prospect [4]. At present, there are three automatic modulation recognition algorithms, namely,

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statistical models, decision theory and artificial neural network, respectively. In the recognition of radio signal modulation, we have to extract the characteristics of the radio signal due to obtained signal type is unknown, and to determine the range that they are linked to the corresponding modulation types. Moreover, the measurement results of the signal characteristic parameters are used to determine the modulation classification [5]. If we take the modulation recognition and classification of the radio signal as a pattern recognition problem, pattern classification is a pattern recognition subsystem according to the theory of pattern recognition, Therefore, the radio signal modulation recognition is a general concept in the framework of mode recognition theory. But modulation classification is only a branch of modulation recognition. This paper only covers the simulation of the wireless communication signal analog modulation recognition.

13.2 Time–Frequency Analysis of the Analytic Signal

Suppose that the real signal of Hilbert transform is represented by $u(t)$ and $v(t)$, then the complex signal can be defined as follows:

$$z(t) = u(t) + jv(t) \tag{13.1}$$

$z(t)$ is called the analytic signal of the real signal $u(t)$, also known as pre-envelope. The modulus of $z(t)$ is defined as below:

$$|z(t)| = \sqrt{u(t)^2 + v(t)^2} \tag{13.2}$$

The instantaneous phase of the $z(t)$ is represented by $\phi(t)$

$$\phi(t) = \arctan\left[\frac{v(t)}{u(t)}\right] \tag{13.3}$$

we can get the instantaneous frequency $f(t)$ of $u(t)$ according to $\phi(t)$, $f(t)$ is shown in Eq. 13.4.

$$f(t) = \frac{1}{2\pi}\frac{d\phi(t)}{dt} \tag{13.4}$$

The solid line part of Fig. 13.1 is the AM signal, instantaneous envelope of the AM signal is obtained from Eq. 13.2 and is drawn in Fig. 13.1 using dotted lines. Figure 13.2 shows the instantaneous phase information is extracted from the phase modulation signal, we can clearly see from Fig. 13.2, the baseband signal to be restored is very close to the original baseband signal. Figure 13.3 shows the BFSK signal waveform of the code 010, the frequency of the code 0 is 50 Hz, the frequency of the code 1 is 200 Hz, by the instantaneous frequency information (refer with: Fig. 13.3) can visually distinguish the 0 and 1, and the estimated value of the frequency accurately matches with the original signal. We can see from the simulation results (refer with: Fig. 13.4), when the instantaneous phase of the

Fig. 13.1 Signa instantaneous information image: AM signal instantaneous envelope
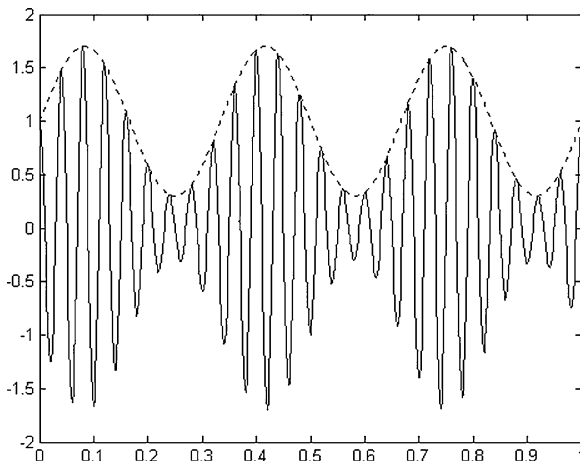
Fig. 13.2 Signa instantaneous information image: PM signal instantaneous phase
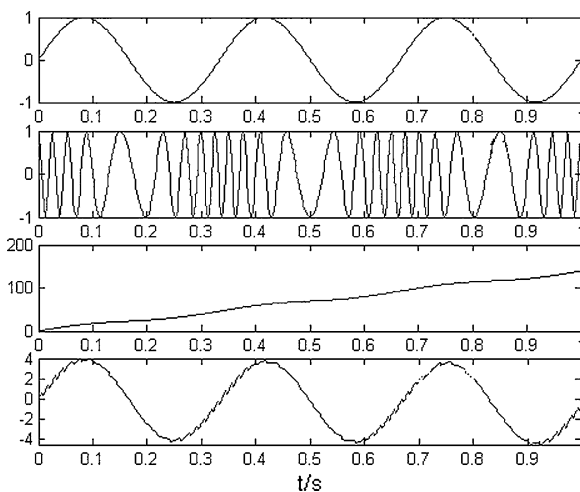
signal appears mutation point (break point), the instantaneous frequency of the corresponding location will be an instant high-frequency. Figure 13.4 shows an example of an estimated phase mutation, instantaneous high-frequency peak in Fig. 13.4 correspond to the 8 PSK waveform phase mutation.

13.3 Modulation Recognition Method for Analog Signal Based on Decision Theory

Set up the analysis of objects sequence of $s(n)$ is output by the receiver intermediate frequency (IF), the sampling frequency and carrier frequency of $s(n)$ are known, respectively denoted by F_s and F_c. The algorithm is divided into four steps:

Fig. 13.3 Signa
instantaneous information
image: BPSK instantaneous
information
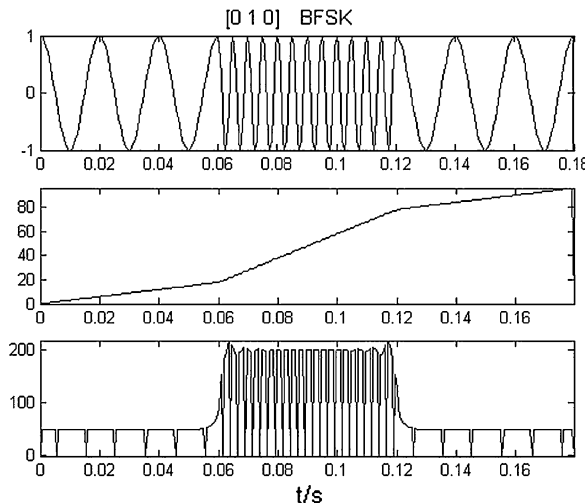
Fig. 13.4 Signa
instantaneous information
image: 8PSK instantaneous
information
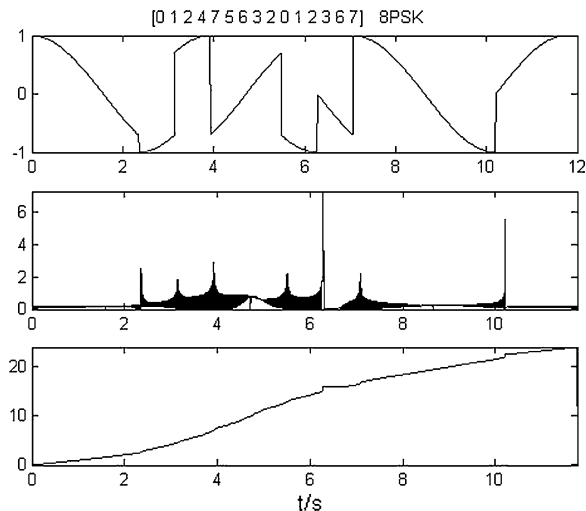
   First step: recognition of the AM, USB, LSB and FM. According to the signal
envelope characteristics distinguish AM, USB, LSB, and FM, because the enve-
lope of the AM, USB, LSB signal is a non-constant value, but the envelope of the
FM signal is a constant value in theory (in practice almost constant). Therefore, we
can extract a characteristic parameter R. The parameter R reflects the power
spectrum characteristics of the normalized envelope, the normalized envelope of
FM close to zero, because of the parameter R should be much less than the AM,
USB, LSB signals. The second step: is to recognize AM, USB and LSB. According
to the symmetry of the signal frequency spectrum distinguish AM and USB, LSB,
because of the carrier frequency of the unilateral frequency spectrum of AM is
approximately symmetrical, unilateral spectrum of USB and LSB for carrier

frequency is only the upper frequency and lower the frequency. For symmetry can be extracted from another characteristic parameter P. In theory, due to the symmetry of the AM, the frequency of the upper and lower side of AM characteristic parameter P is close to zero, LSB and USB characteristic parameters P is respectively close to 1 and -1.

The third step: recognition of the AM–FM and DSB. The definition of σ_{ap} is the standard deviation of the absolute value of the instantaneous phase nonlinear component. The instantaneous phase is part of the zero-center non-weak signal, you can use σ_{ap} to distinguish between DSB or AM–FM. The definition of σ_{ap} is shown in Eq. 13.5.

$$\sigma_{ap} = \sqrt{\frac{1}{c}\left[\sum_{a_n(i) > a_{tt}} \varphi_{NL}^2(i)\right] - \frac{1}{c}\left[\sum_{a_n(i) > a_{tt}} |\varphi_{NL}(i)|\right]^2} \tag{13.5}$$

In Eq. 13.5, a_{tt} is the threshold level to determine the amplitude of the weak signal segment, c is the number of the non-weak signal values in all sampling data N_s, $\varphi_{NL}(i)$ is a nonlinear component of the instantaneous phase after zero-center normalized, when the carrier wave is fully synchronized, we can get the result of Eq. 13.6.

$$\varphi_{NL}(i) = \phi(i) - \phi_0 \tag{13.6}$$

In Eq. 13.6, $\phi_0 = \frac{1}{N_s}\sum_{i=1}^{N_s} \phi(i)$, $\phi(i)$ is the instantaneous phase. Then you can use σ_{ap} to distinguish between DSB signals or AM–FM signal.

The fourth step, recognition of the AM, VSB and DSB, LSB, USB, AM–FM. The definition of σ_{dp} is the standard deviation of the absolute value of the instantaneous phase nonlinear component. The instantaneous phase is part of the zero-center non-weak signal, σ_{dp} can be defined as below.

$$\sigma_{dp} = \sqrt{\frac{1}{c}\left[\sum_{a_n(i) > a_{tt}} \varphi_{NL}^2(i)\right] - \frac{1}{c}\left[\sum_{a_n(i) > a_{tt}} \varphi_{NL}(i)\right]^2} \tag{13.7}$$

σ_{dp} is mainly used to distinguish the AM, VSB without direct phase information and the DSB, LSB, USB, AM–FM with direct phase information. The decision threshold is set to $t(\sigma_{dp})$.

13.4 An Improved Method of Decision Theory

The method based on decision theory greatly enhance the level of automatic identification of the modulation. However, this method also has the following defects: First, solving the instantaneous phase must be synchronized with the

carrier wave, these proposed high demands for carrier wave recovery and carrier wave synchronization; Second, the method for calculating the instantaneous frequency is not mentioned, and the instantaneous frequency defined in the project is not easy to grasp; Third, the calculation of the maximum of the power spectral density of the Zero-center normalized instantaneous amplitude is some large. For the problems just mentioned, the people propose the recognition method based on neural network (NN).

13.4.1 Analog Modulation Recognition Method of BP Neural Network as Classifier

This article use BP neural network with supervised training as a classifier, we combine the multi-layer perceptron network with the back propagation learning algorithm of the BP mode, we adjust the weight value according to the comparison of the actual network output with specify the desired output, until you come to the global (or local) difference minimum of the output, the neural network has a good effect to deal with many problems in the model details.

The BP neural network (refer with: Fig. 13.5) has three layers structure, namely an input layer, an output layer and a middle layer. The middle layer can be multi-layer, however, due to limitations of computational complexity, single or double layer structure of the middle layer is more common. The middle layer (refer with: Fig. 13.2) is made of single layer of 25 nodes. The input layer nodes depends on the number of the signal characteristics parameters, and output layer nodes depends on the number of signal categories, thus were 4 and 7.
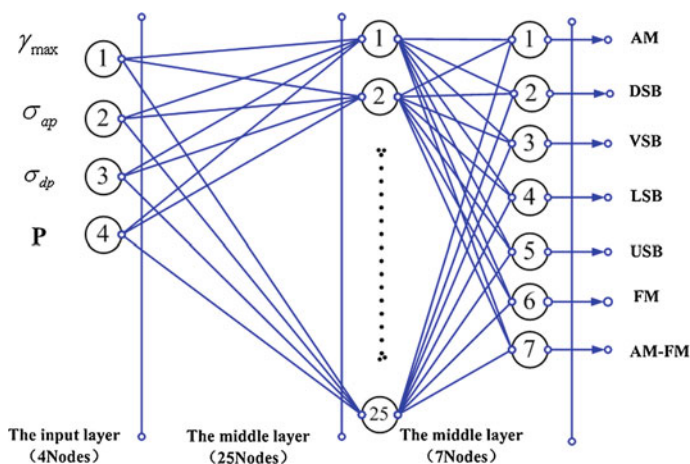
Fig. 13.5 Modulation recognition of the analog signal based on BP neural network

The neural network has distributed information storage, large-scale adaptive parallel processing and a high degree of fault-tolerant features, these features are applicable on the basis of the modulation recognition. Learning ability and fault-tolerant features of the neural network has a unique for modulation recognition of the uncertainty. Communication signals in the transmission process is likely polluted by channel noise, the received signal is time-varying, non-stable, the wavelet transform is especially suitable for the analysis of non-stable signal, wavelet transform as an information extraction tool has been more widely used, the wavelet transform has a time–frequency localized and zoom features, the neural network has self-learning, adaptive, robust, fault tolerance and generalization ability, the advantages of both wavelet transform and neural network combined with each other, you can get a good signal modulation recognition algorithm.

13.4.2 Modulation Recognition Method Based on Wavelet Feature Extraction

Wavelet is particularly suitable for the analysis of non-stable signal, it has been widely used as a feature extraction tool. Wavelet has an important feature that its ability to provide a signal localized frequency domain information. The wavelet transform can be composed mixed signal of the different frequencies into block signals of the different frequencies, it has a different interpretation on a different time and frequency, therefore, the modulated signals using wavelet decomposition will get details of the different levels, there have a difference for modulated signals of the different types.

In practical applications, the wavelet transform is defined usually with the following two ways.

$$WT_x(\alpha, \tau) = \frac{1}{\sqrt{\alpha}} \int_{-\infty}^{+\infty} \phi^* \left(\frac{t - \tau}{\alpha}\right) x(t) dt \tag{13.8}$$

$$WT_x(\alpha, \tau) = \frac{1}{\sqrt{\alpha}} \int_{-\infty}^{+\infty} \phi \left(\frac{t - \tau}{\alpha}\right) x(t) dt \tag{13.9}$$

In Eq. 13.8, the asterisk * denotes the conjugate, wavelet transform is the correlation integral of the input signal $x(t)$ and the wavelet function $\phi_{\alpha,\tau}(t)$; In Eq. 13.9, convolution instead of correlation integral. The two definitions are essentially the same, this article is used in Eq. 13.9.

The τ and t is discretized in Eq. 13.9, and even if $\tau = kT_s$, and $t = iT_s$, it will get the discrete form of the continuous wavelet transform, also known as the wavelet coefficients.

$$WT_x(\alpha, k) = \sum_{t=o}^{N-1} x(iT_s)\phi\left(\frac{(k-i)T_s}{\alpha}\right) \tag{13.10}$$

Morlet wavelet is a single-frequency complex sinusoidal modulation Gaussian wave, it is also the most commonly used complex wavelet, its time-domain form show in Eq. 13.11.

$$\phi(t) = e^{-\frac{t^2}{2}}e^{j\omega_0 t}, \omega_0 > 5 \tag{13.11}$$

Although there are many characteristic parameters of the signal, but the neural network during signal recognition is mainly based on the different of the spectral peaks position. Therefore, the extract signal features the main task is to find the inevitable link between the type of signal and the spectral peak position. The wavelet transform is equivalent to a mathematical microscope, the wavelet transform can learn more about the spectrum composition of the various types signals in different low frequency spectrum segment.

The method of the combining wavelet transform and BP neural network realize the classification and recognition of the signal. First, the wavelet algorithm extract discrete values as the characteristic parameters; Second, signal modulation classification and recognition is based on BP neural network as classifier, simulation results show that the method very effective complete the task for the signal modulation mode recognition, the correct rate of the recognition is significantly improved, at the same time it reduces the complexity of the classification and

Fig. 13.6 Signal frequency spectrum image: AM signal frequency spectrum
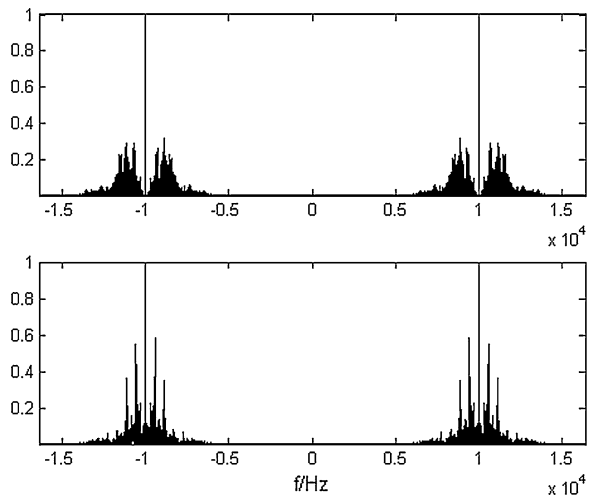
Fig. 13.7 Signal frequency spectrum image: FM signal frequency spectrum
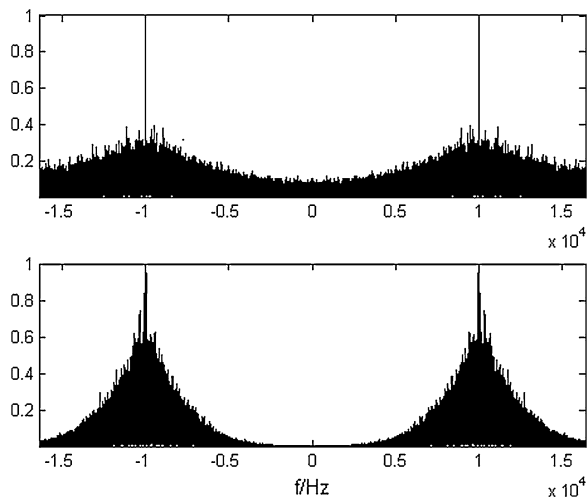
Fig. 13.8 Signal frequency spectrum image: LSB and USB signal frequency spectrum
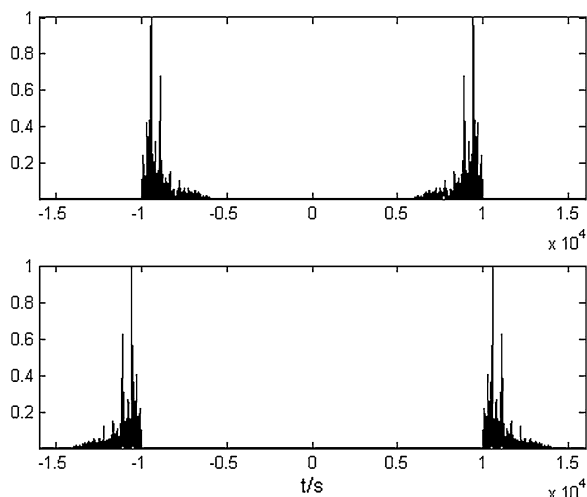
recognition, and it provides a theoretical basis for the signal modulation recognition on DSP.

13.5 Simulation Results

In the simulation experiment, first of all, we record a song and laughter using Cool Edit2.1, the sampling rate is 44 K; Then, sampling sound is generated 22 K sinusoidal carrier wave in the Matlab7.1 environment, modulation waveform is

generated according to the definition of AM, FM, the DSB modulation type; Finally, the improved algorithm is programmed in Matlab7.1 environment for simulation practice, the results shown in Figs. 13.6, 13.7 and 13.8 (all simulation results are achieved under the condition of SNR = 0 dB). The results show that the method of the combining wavelet transform and BP neural network can well identify the unknown signal, and the algorithm has a good discrimination. Comparing the frequency spectrum of the simulation results in Figs. 13.6 and 13.7, you can easily distinguish between AM and FM signals. In the simulation results of Fig. 13.8, the algorithm is a good distinction between LSB and USB signals.

13.6 Conclusions

The method of the combining wavelet transform and BP neural network simulate in the Matlab7.1 environment, The results (Figs. 13.6, 13.7 and 13.8) show that the algorithm have obvious advantages, it clearly recognize the modulation mode of AM, FM, LSB and USB based on the different of the spectral peak position, compared to algorithms based on decision theory, this algorithms improve on the effectiveness of the recognition, when the Signal–Noise Ratio (SNR) is 0 dB, the recognition rate can reach about 85 %.

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Chapter 14
Partner Selection and Optimization Based on Manufacturing Resource Sharing Platform for Virtual Enterprise

Feng Qi and Zuobing Chen

Abstract In the environment of economic globalization, this paper proposed partner selection and optimization based on manufacturing resource sharing platform for virtual enterprise. Firstly, a comprehensive evaluation system for virtual enterprise partner selection was established. Secondly, the weight of evaluation was defined based on the market conditions and nature of the project by analytic hierarchy process (AHP). Thirdly, a multi-objective optimization model for virtual enterprise partner selection was established. Fourthly, an optimal combination scheme was solved by self-adaptive genetic algorithm. Finally, effectiveness of partner selection and optimization for virtual enterprise was proved by an example.

Keywords Virtual enterprise · Partner selection · Analytic hierarchy process · Genetic algorithm

14.1 Introduction

With formation of global network economy, the competition of manufacturing is not on individual enterprise but on complementary advantage and resource optimization and supply chain and industry chain. Virtual Enterprise has become an

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important trend in commercial activities. It can integrate the advantage of resource among different enterprises. So it cans response to market opportunity rapidly [1].

Manufacturing resource sharing platform is an integration solution based on the industry supply chain. It can make inter-enterprise information interoperability and data sharing and business interaction facilitate. It allows knowledge and ideas greater exchange and information and resource wider use. Thus the efficiency of business activities can be improved greatly. Meanwhile, the chief of virtual enterprise can find the best business partners on manufacturing resource sharing platform [2].

Partner selection and optimization is the key for virtual enterprise. Therefore it has important theoretical and practical significance. Many scholars at home and abroad have been done about this problem. However, they basically focused on the qualitative or quantitative. This paper proposed a new method of partner selection for virtual enterprise between qualitative and quantitative analysis. AHP was adopted to determine the evaluation index weight based on the virtual enterprise comprehensive evaluation system and market conditions. Then a multi-target partner selection optimization model for virtual enterprise was established. Then candidate companies were searched on manufacturing resource sharing platform. Finally, the optimal combination was obtained through self-adaptive genetic algorithm.

14.2 Comprehensive Evaluation Index and Weight for Virtual Enterprise

14.2.1 Comprehensive Evaluation Index System for Virtual Enterprise

A scientific and complete comprehensive evaluation index system must be established for Virtual Enterprise partner selection. There are many factors that can affect the virtual enterprise partner selection. According to the different opportunity, the emphasis is different. Predecessors have done a lot of research on the evaluation index system, but there have different evaluation index system for different industry. This paper summarizes and analyzes a comprehensive evaluation system for machinery manufacturing industry.

Generally, Time (T) and Quality (Q) and Cost (C) are used to evaluate the competitiveness of an enterprise [3]. This paper suggests increasing Innovation (I) and Advancement (AD) and Credit (CR) and Management & Culture (MC) and Environment (E) for machinery manufacturing comprehensive evaluation system. The comprehensive evaluation system was divided into three levels. The first layer was the overall goal to find the best partners. The second level has eight criteria: T, Q, C, I, AD, CR, and MC, E. The third layer is more detailed guidelines. Specific was shown in Fig. 14.1.
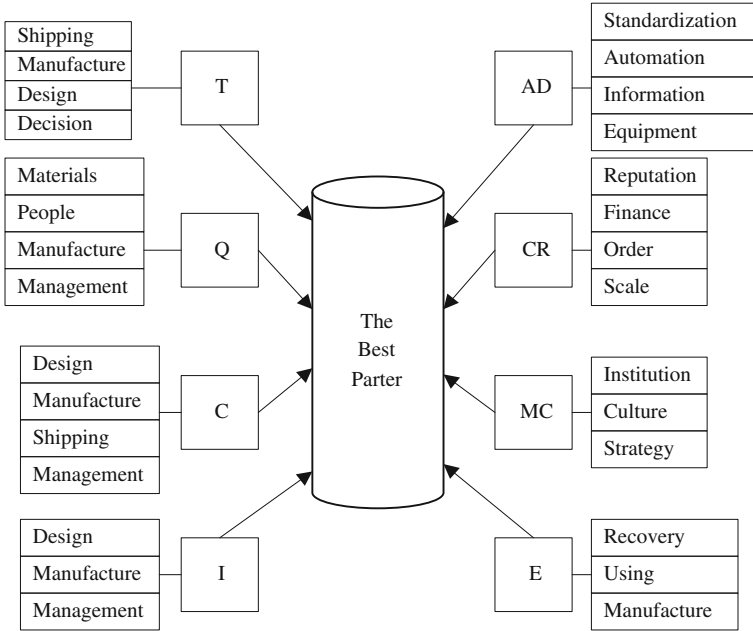
Fig. 14.1 Comprehensive evaluation index system for virtual enterprise

14.2.2 Determination for the Weight of Virtual Enterprise Comprehensive Evaluation Index

There are many factors that can affect the virtual enterprise partner selection, and these factors are often contradictory. In order to get optimal result, this paper use multi-objective planning approach and AHP to determine weight of evaluation index rationally. Specific steps are as follows:

According to specific market objective and specific circumstance of the project, the index of partner selection evaluation was determined. The determination can refer to the virtual enterprise comprehensive evaluation system.

Nine-bit table was used to select the importance of the evaluation. The ratio of the relative importance was shown on Table 14.1.

According to the specific situation, the expert of the project compares the index of evaluation by pairwise. Then a reciprocal matrix was got. The equation is as follow [4]:

Table 14.1 The ratio of the relative importance

Definition	Equally important	Somewhat important	Obviously important	Strongly important	Extremely important	Among
Value	1	3	5	7	9	2, 4, 6, 8

$$R_m = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nn} \end{bmatrix}$$

where, m is the number of experts. n is the number of index. r_{ij} is the ratio of two index. r_{ij} satisfy: $r_{ij} \times r_{ji} = 1$.

In AHP evaluation, the geometric average score is a good approach to summarize the expert opinion. The equation is as follow.

$$\bar{r}_{ij} = \left(\prod_{i=1}^{m} r_{ij}^{(l)} \right)^{\frac{1}{m}}$$

where, m is the number of experts, $r_{ij}^{(l)}$ is the evaluation value by the lth experts, $l = 1, 2, \ldots, m$. The new matrix is

$$\bar{R} = \begin{bmatrix} \overline{r_{11}} & \overline{r_{12}} & \cdots & \overline{r_{1n}} \\ \overline{r_{21}} & \overline{r_{22}} & \cdots & \overline{r_{2n}} \\ \vdots & \vdots & \ddots & \vdots \\ \overline{r_{n1}} & \overline{r_{n2}} & \cdots & \overline{r_{nn}} \end{bmatrix}$$

Solution for the maximum eigenvalue of matrix $\bar{R}$.

Eigenvectors are standardized to make the sum of Eigenvectors is 1. After Standardization, the Eigenvectors is the weight of index.

Based on the above steps, the eight index of virtual enterprise comprehensive evaluation system is $R = \{T, Q, C, I, AD, CR, MC, E\}$. The corresponding weight vector is $R = \{T, Q, C, I, AD, CR, MC, E\}$

14.3 The Multi-Objective Partner Selection Model for Virtual Enterprise

14.3.1 Description for Model

The project will be broken down into N independent sub-tasks by the chief of virtual enterprise and denoted as: $T = \{T_0, T_1, T_2, \ldots, T_n, T_{n+1}\}$, where T_0 and T_{n+1} is the virtual task. The corresponding workload is recorded as: $Q = \{Q_0, Q_1, Q_2, \ldots, Q_n, Q_{n+1}\}$, where the workload of Q_0 and Q_{n+1} is 0 h.

The timing relationships between sub-tasks is shown by T_Seq = { $(T_i, T_j | i, j \in [0, n+1]), i \neq j, T_i, T_j \in T\}$, where T_j is the direct follow-up T_i [8, 9]. All enterprises is denoted as: $E = \{E_{ij} | i \in [1, n], j \in [1, m]\}$, where n is the total number of sub-tasks, m is the number of candidate enterprises for the task Ti. $E_{ij} \neq 0$

indicates that the candidate enterprises effective, Ti can select one or more candidate companies [5]. The information of each candidate enterprise is recorded as $E\_Info = \{(start\_fee_{ij}, per\_fee_{ij}, per\_qua_{ij}, Q_{ij}, I_{ij}, AD_{ij}, CR_{ij}, MC_{ij}, E_{ij}), i \in [1, Num], j \in [1, Param]\}$, where $Num = \sum_{i=1}^{n} m_i$ is the total number of company for the project, Param is the number of evaluation index.

14.3.1.1 Establishment of the Multi-Objective Optimization Model

In order to evaluate effect of the virtual enterprise partner selection, the multi-objective optimization model must be established. Firstly, define the following function [6].

$$S_{ij} = \begin{cases} 1 & 38; T_i \text{ select jth candidate enterprise} \\ 0 & 38; T_i \text{ not select jth candidate enterprise} \end{cases}$$

The various of single-objective function can be expressed as follows:

$$Min(T) = t_{n+1} \tag{14.1}$$

Equation (14.1) t_{n+1} is the completion time of Tn +1, that is also the project finish time. Transform the Eq. (14.1) into a maximization problem:

$$Max(T') = C - t_{n+1} \tag{14.2}$$

where, C is a large enough positive number to ensure $C - t_{n+1} \geq 0$.

$$Min(C) = \sum_{i=1}^{n} \sum_{j=1}^{m} (start\_fee_{ij} + q_{ij} \times per\_fee_{ij}) \times S_{ij} \tag{14.3}$$

Equation (14.3) q_{ij} is the workload that the chief of virtual enterprise assigned to E_{ij}, $\sum_{j=1}^{m} q_{ij} = Q_i$. Transform the Eq. (14.3) into a maximization problem:

$$Max(C') = C - \sum_{i=1}^{n} \sum_{j=1}^{m} (start\_fee_{ij} + q_{ij} \times per\_fee_{ij}) \times S_{ij} \tag{14.4}$$

where, C is a large enough positive number to ensure $C - \sum_{i=1}^{n} \sum_{j=1}^{m} (start\_fee_{ij} + q_{ij} \times per\_fee_{ij}) \times S_{ij} \geq 0$.

$$Max(Q) = \sum_{i=1}^{n} \sum_{j=1}^{m} Q_{ij} \times S_{ij} \tag{14.5}$$

$$\text{Max}(I) = \sum_{i=1}^{n} \sum_{j=1}^{m} I_{ij} \times S_{ij} \qquad (14.6)$$

$$\text{Max}(AD) = \sum_{i=1}^{n} \sum_{j=1}^{m} AD_{ij} \times S_{ij} \qquad (14.7)$$

$$\text{Max}(CR) = \sum_{i=1}^{n} \sum_{j=1}^{m} CR_{ij} \times S_{ij} \qquad (14.8)$$

$$\text{Max}(MC) = \sum_{i=1}^{n} \sum_{j=1}^{m} MC_{ij} \times S_{ij} \qquad (14.9)$$

$$\text{Max}(E) = \sum_{i=1}^{n} \sum_{j=1}^{m} E_{ij} \times S_{ij} \qquad (14.10)$$

Eventually, the multi-objective problem was transformed into a single objective problem. The index weights models (14.11) can be got by AHP and combining the equations of (14.2, 14.4–14.10).

$$\begin{aligned}
\text{Max}(Total) = \omega_t \times \text{Max}(T^{'}) + \omega_q \times \text{Max}(Q) + \\
\omega_c \times \text{Max}(C^{'}) + \omega_i \times \text{Max}(I) + \omega_{ad} \times \text{Max}(AD) + \\
\omega_{cr} \times \text{Max}(CR) + \omega_{mc} \times \text{Max}(MC) + \omega_e \times \text{Max}(E)
\end{aligned} \qquad (14.11)$$

$$\text{s.t. } q_{ij} \geq 0 \qquad (14.12)$$

$$\sum_{j=1}^{m} q_{ij} = Q_i, \quad i = 1, 2, \ldots, n \qquad (14.13)$$

$$S_{ij} = \begin{cases} 0 & q_{ij} = 0 \\ 1 & q_{ij} > 0 \end{cases} \qquad (14.14)$$

14.4 Model Solution Based on Genetic Algorithm

14.4.1 Arithmetic Coding

According to the model, the encoding of virtual enterprise is [3]:

$$\begin{pmatrix} s \\ q \end{pmatrix} = \begin{pmatrix} s_{11} & \cdots & s_{1m} & \cdots & s_{n1} & \cdots & s_{nm} \\ q_{11} & \cdots & q_{1m} & \cdots & q_{n1} & \cdots & q_{nm} \end{pmatrix} \tag{14.15}$$

where, s is the selected vector of all candidates enterprises, encoding using integer $0-1$, $s_{ij} = 0$ or 1, indicating whether the candidate enterprise is selected; q is the task vector of all candidate enterprise assigned, using real-coded, q_{ij} is the workload assigned to E_{ij}.

14.4.2 Design Objective Function

Supposed the scale of group is Popsize, according to equations of (14.2, 14.4–14.10), a single-target value of individual is calculated on the same generation. Each single-target value is order from small to large. According to the index weight, the overall fitness of individual is got. P_k is defined as follows:

$$P_k = q_{\max} - (k-1) \times (q_{\max} - q_{\min})/(Popsize - 1) \tag{14.16}$$

where, $q_{\max}$ and $q_{\min}$ represent the selection probability of best and worst chromosomes. After determining the probability of each individual, the selection follow the roulette algorithm.

14.4.3 Self-Adaptive Across and Variation

The self-adaptive across and variation is used in this paper.

$$P_c = \begin{cases} \frac{P_{c\_\max} - (P_{c\_\max} - P_{c\_\min})(k - midst)}{Popsize - midst} \times \delta(g) & k \geq midst \\ P_{c\_\max} \times \delta(g) & k < midst \end{cases} \tag{14.17}$$

$$P_m = \begin{cases} \frac{P_{m\_\max} - (P_{m\_\max} - P_{m\_\min})(Popsize - k')}{Popsize - midst} \times \delta(g) & k' \geq midst \\ P_{m\_\max} \times \delta(g) & k' < midst \end{cases} \tag{14.18}$$

where, $\delta(g) = 1 - g/(\gamma \times Gen)$; $midst = \lfloor Popsize/2 \rfloor$.

g is the No. of present generation; Gen is the largest generation; γ is factor; $P_{c\_\max}$ and $P_{c\_\min}$ is the across probability of maximum and minimum; $P_{m\_\max}$ and $P_{m\_\min}$ is the variation probability of maximum and minimum; k is the ranking of individual cross, k' is the ranking of individual variation [3].

14.5 Conclusion

The virtual enterprise partner selection problem was studied based on manufacturing resource sharing platform in this paper. A comprehensive evaluation index system for virtual enterprise has been established. The weight of each evaluation index has been determined by AHP. The multi-objective optimization model for virtual enterprise partner selection has been established. The solution process of self-adaptive genetic algorithm has been designed.

In Matlab 6.5 platform, the optimization algorithm was achieved. The effectiveness of new methods was proposed in this paper was proved through an example. The result using self-adaptive genetic algorithm is close to the actual situation. It is indicated that the new virtual enterprise partner selection method is effective for practical problems.

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Chapter 15
Wireless Speech Assistant System for the Elderly People in the Indoor Environment

Chih-Feng Huang and Chien-Yuan Liu

Abstract The elderly people cause a lot of inconvenient in the daily life because of memory impairments and chronic diseases. The elderly people movement track can be built by examining with the direction of the electronic compass and the human's positioning system carried out by the technique of ZigBee wireless sensor network. In this paper, a wireless speech assistant system for elderly people in the indoor environment can be used to help for providing the elderly people the information of the whole environments. It makes elderly people a convenience of the life to inform the elderly drugs location and the medication time, the location of the physical instruments and the measurement time, the location of fitness equipments and fitness time and sends out the warning as the danger is taken place. This system is tested in the indoor environment to act the normal. The elderly people tries out, and modify at any time the speech sentence makes it be able to let elderly people all can understand.

Keywords Elderly care · ZigBee wireless network · Electronic compass

15.1 Introduction

Most elderly people have chronic diseases and need to be assisted by the long-term care system for maintaining the health in the daily life because of physical degradation. The elderly people also need a wireless speech assistant system for

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reminding the daily schedules [1]. This system must examine the elderly people movement track to inform the elderly drugs location and the medication time, the location of the physical instruments and the measurement time, the location of fitness equipments and fitness time [2]. The indoor positioning system can be used to guide the elderly people in the indoor location information. For example, the system is using ultrasound indoor positioning systems, accelerometer or gyroscope technology to calculate the indoor location information [3]. These positioning technologies to prompt the environment information for the elderly people are not ideal [4].

Along of the technological advance, the technique that uses ZigBee wireless sensor network to carry out the human's positioning system and the electronics compass module to carry out the human's direction is gradually mature. The text-to-speech (TTS) technology is widely used in electronic dictionary pronunciation. The ZigBee wireless sensor network technology and the electronic compass module are combined with the text-to-speech technology for the development of a portable wireless positioning system with voice machine to assist the elderly people [5]. The computer must be inputted the information such as the location of pharmaceuticals, the time for taking the medicine, the time for measuring the physiological signal etc. The computer receives the position and the direction of the elder to set the time with the speaker in a voice to remind the elderly pharmaceutical drug name and location, time to eat medication, and use physiological instruments to measure physiological signals. The wireless data transmission technology, the physical data transfer to computer storage and analysis, providing for the elderly physical health information. A wireless speech assistant system for the elderly people in the indoor environment can use in everyday for making more convenient and more secure life.

The rest of this paper is organized as follows. Section 15.2 presents the method of the system. Section 15.3 depicts the system implementation. In Sect. 15.4, the results of the system are tested in the laboratory. Finally, Sect. 15.5 describes the discussions and some further works.

15.2 Method

ZigBee wireless positioning system using Texas Instruments' (TI) CC2430 and CC2431 system-on-chip wireless ZigBee combination agreement on line with ZigBee-2006 specification of the Z-Stack protocol stack can be used to conduct ZigBee-2006 instant network positioning system development. The location of fixed reference nodes of ZigBee wireless positioning system should normally be powered at any time. The receiver is always open in the idle to respond the request message of the blind nodes. The coordinates of the location reference node is specified by the user and entered into the computer. The reference nodes are recommended using CC2430 to reduce costs. The blind node is mobile node. It can be battery powered and can enter the sleep mode. It will check the location of the

reference nodes within radio range and response from each node to obtain the response message and received signal strength of radio. The blind node is constituted by the CC2431. The CC2431 with the internal hardware positioning engine is used to calculate the position of the blind node. ZigBee wireless sensor network positioning system has 4 to 8 reference nodes. The reference nodes are designed by the CC2430 that includes receiving information of the elderly people and implements the host PC connection. The elderly people can carry ZigBee wireless network transceiver movable blind node that is designed by the CC2431. The blind node is based on the reception of radio nodes to calculate the distance between the blind node and the reference node by using the radio strength to know the coordinates of the elderly people.

A wireless speech assistant system for the elderly people in the indoor environment can be set the location of reference nodes by the service people. The location of reference nodes can be set as the first reference node unit, the second reference node unit and the third reference node. The position coordinates of the reference node and object position coordinate of indoor objects (such as furnitures, electrical appliances, appliances, etc.) input and store to the computer. The wireless electronic device using ZigBee wireless network module and the electronic compass module obtains the direction and position coordinates of the elderly people. The device can calculate the distance between the elderly people and the location of reference node (e.g. living rooms, sleeping rooms, bathrooms, furniture, doors, windows or corners) and transmit the position coordinates of the elderly people to the computer. The direction and the distance between the position coordinates of the elderly people and object position coordinate of indoor objects can be calculated by the PC. The electronics compass module carries out the direction of the elderly people. Then the voice playback module for indoor voice message play information corresponding to the position and the direction of the elderly people associated with the indoor environment. The elderly people can be reminded around the dangerous situation by the voice message that provides the elderly people more diversified and more comprehensive environmental safety information.

15.3 System Implementation

Figure 15.1 is the block diagram of the wireless speech assistant system for the elderly people in the indoor environment. The system including the portable position and direction device with the wireless speech assistant, the position system using the ZigBee wireless sensor networks and the wireless module with an embedded ZigBee wireless microprocessor can be connected to the host computer. Figure 15.2 is the portable position and direction device with the wireless speech assistant using the embedded ZigBee wireless sensor network microprocessor, the electronic compass module, TTS module, headphones or speakers, charging circuit and battery box. The battery charging circuit must provide the power of the portable instruments. The embedded microprocessor can be designed to control the
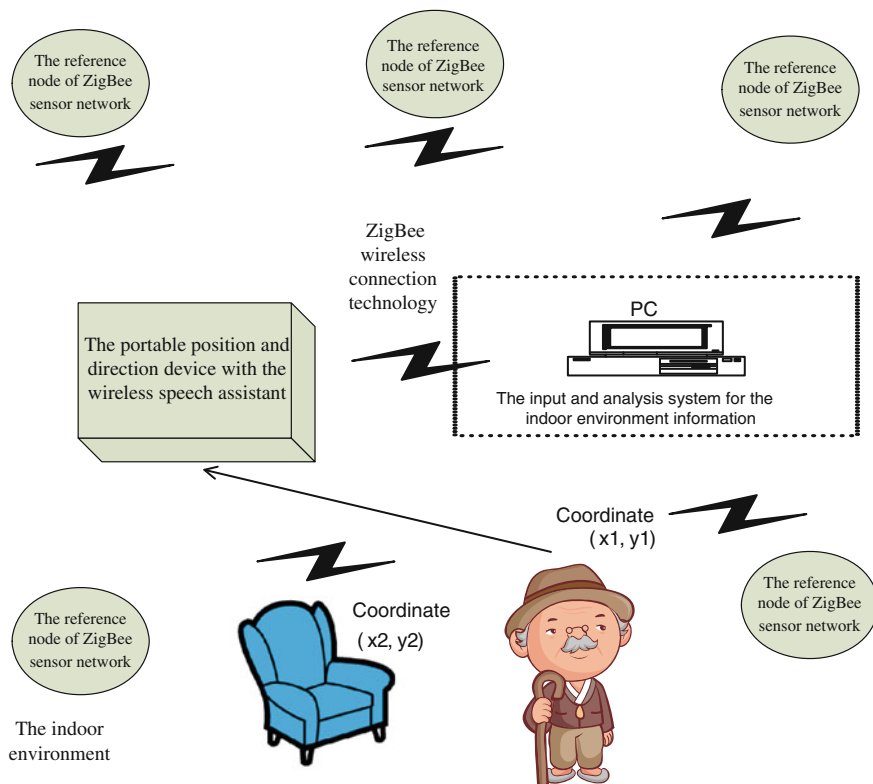
Fig. 15.1 Wireless speech assistant system for the elderly people in the indoor environment

power so that power consumption is minimized. The major development on the body of the ZigBee wireless network technology to the elderly people is gotten the current location. Then the current location is transmitted to the computer for calculating the distance and direction between the elderly people and all the furniture such as doors, windows, bathrooms, bedrooms, supplies. The current direction of the elderly people is obtained by the electronic compass module via the RS232 interface. The speech output generated by the computer to the headphones or speakers inform the elderly people on the surrounding environment information.

15.4 Results

The thesis of the wireless speech assistant system for the elderly people in the indoor environment is used the ZigBee wireless network positioning system for detecting the location of the elderly people. The social service personnel enter the
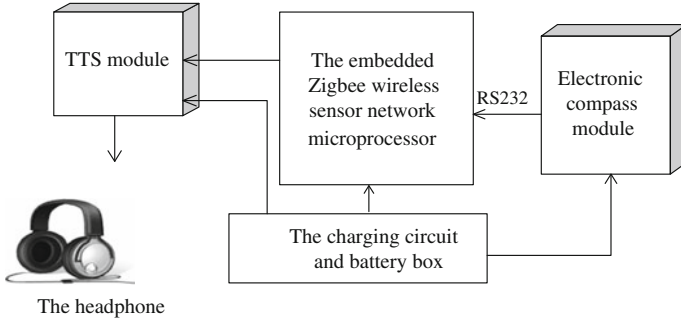
Fig. 15.2 Portable position and direction device with the wireless speech assistant
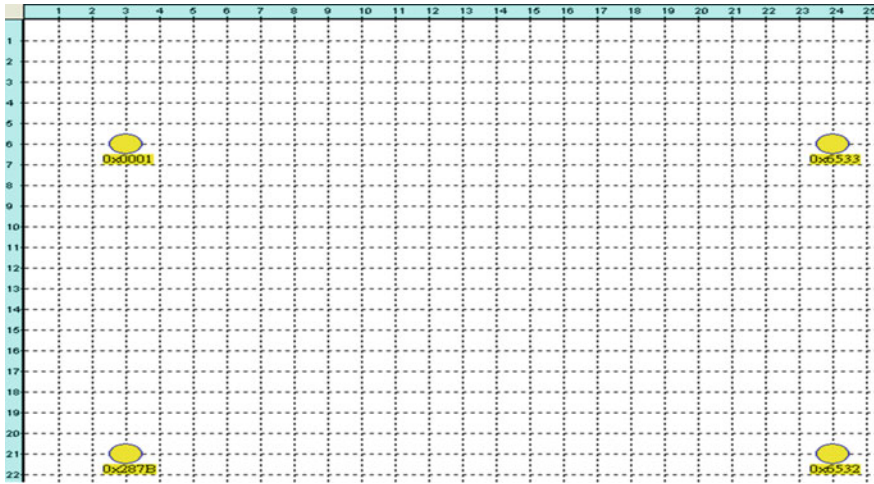
Fig. 15.3 The setting windows for the coordinates of the reference nodes (*yellow*)

coordinates of the reference nodes consisted of furniture, doors, windows, bathrooms and bedrooms. Figure 15.3 is the setting windows for the coordinates of the reference nodes. Then the blind ZigBee wireless sensor node can be used to carry by the elderly people for providing the location of the elderly people as show in the Fig. 15.4. The computer calculates the direction and distance of the home furniture, doors, windows, bathroom, bedroom and play the appropriate statement entered by the social service personnel to guide the elderly people come to the right place.

The application software of the computer is written by the LabVIEW as show in the Fig. 15.5 for obtaining the current direction of the elderly people from the electronic compass module. The direction of the elderly people is wirelessly monitored by the computer.
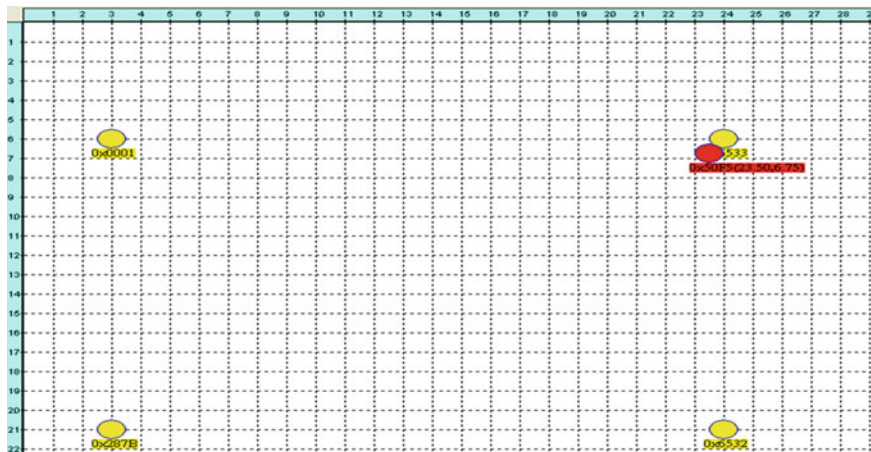
Fig. 15.4 The blind node (*red*) for providing the coordinates of the elderly people
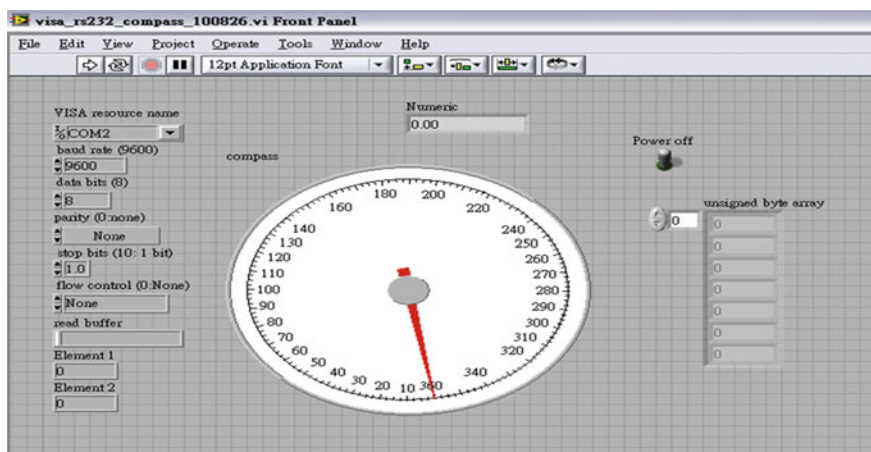
Fig. 15.5 The current direction of the elderly people obtained by the electronic compass module

15.5 Discussions

The wireless speech assistant system for the elderly people in the indoor environment calculates the range by using the radio strength. The environment contains other interference with the same radio frequency will enable the error of the wireless location coordinates. The solution is that the other 2.4 GHz radio interference signal ensure is not exist in the environment of the ZigBee wireless network positioning system. The system for indoor positioning system is easy installation and high accuracy near the reference node. It can be accurately guide the elderly

people to a reference node position. The more important location can be guided by placed the reference node. The elderly people will be able to make more convenient and more secure life as using the system.

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Chapter 16
Formal Model of Time for Analyzing Denial-of-Service Attacks

Shin-ya Nishizaki and Ritsuya Ikeda

Abstract A denial-of-service attack (DoS attack) is an attempt to make a system resource unavailable to its intended users. Several types of DoS attacks are known. A SYN flood attack is a typical DoS attack, exploiting the vulnerability of TCP's three-way handshake with respect to imbalances between the computational costs of clients and server. In addition to cost imbalance, the amount of cost over a given short term is also an indispensable factor in DoS attacks, including SYN flood attacks. In this paper, we propose a process calculus for formalizing computational costs and cost amounts over the short term. This procedure is called the "timed spice-calculus", and was developed by improving the prototypic theory of preliminary studies, known as the spice-calculus. Time is modeled as a hierarchical ordered structure with respect to types of processing.

Keywords Denial-of-service attack · Pi-calculus · Process calculus · Time model

16.1 Introduction

A denial-of-service (DoS) attack is an attempt to make a system resource unavailable to its intended users. Several types of DoS attacks are known, and those that are caused by the vulnerability of a network protocol are known to be serious. A SYN flood attack is a typical example of this, exploiting the vulnerability of TCP's three-way handshake with respect to inappropriate imbalances between the computational costs of clients and server.

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Meadow's work is a pioneering study of a formal framework for describing and analyzing protocols with respect to DoS attack resistance [1]. The framework is a kind of protocol description in the Alice-and-Bob style, in which a computational cost is annotated with each communication step of the protocol. Although the Alice-and-Bob-style specification is easy to understand, it lacks accuracy in some cases.

To address these inaccuracies, we propose a formal system for analyzing DoS attack resistance. The system is called the spice-calculus and is based on Milner's pi-calculus and Abadi and Gordon's spi-calculus [2, 3]. Because a process calculus is more accretive and more precise than the Alice and- Bob style for describing communication processes in protocols, the spice-calculus enables grasping the dynamism of a protocol. Consequently, it clarifies the cost imbalances between clients and servers [4].

Another advantage of the spice-calculus, in comparison with pi- and spi-calculi, is its explicit memory management. Because memory management features, such as memory allocation and deallocation, are implicit in the pi- and spi-calculi, memory usage is not readily traced. Making memory management explicit is indispensable for estimating memory costs.

In addition to our approach, there is another technique for correcting this type of inaccuracy, using multi-set rewriting (MSR), developed by Cervesato [5].

Purpose of this paper: Imbalances in computational costs result in vulnerability to DoS attacks. In particular, an excessive amount of computational cost over a given short term can lead to denial of service in a server. In our previous work, we formalized the imbalances between servers and clients, but were unable to determine how each computational cost occurred in the timeline of communication between a server and a client. In this research, we incorporate the notion of time into the calculus by annotating each computational cost with a time stamp, so that we can determine the distribution of computational costs in a timeline.

16.2 The Spice-Calculus and the Time Model

16.2.1 The Syntax of the Spice-Calculus

First, we define the syntax of the spice-calculus. We begin with terms and values. We formalize data as terms, and the results of a computation as values in the spice-calculus. Values are defined inductively by the grammar.

$$V, U, W ::= n|i|x|f_v \quad (v_1, \ldots, v_n) \tag{16.1}$$

where V, U, W represent values and n, I, x denote a name, an integer, and a variable, respectively. In the above grammar, f_v is a function symbol for a variable (that is, a data constructor for the results of a computation). In fact, we use only two such symbols in this paper: a pair-value constructor $(V_1, \ldots, V_n)$ and a hash-value constructor $hash_v$.

Terms are defined inductively by the grammar

$$M, N ::= V | f(M_1, \ldots, M_n) \tag{16.2}$$

where M, N represent terms and f is a function symbol. In this paper, we use only three function symbols: addition $(M + N)$, pairing $[M_1, \ldots, M_n]$ and hashing hash (M). The difference between $[M_1, \ldots, M_n]$ and $(V_1, \ldots, V_n)$ is that the former expression is used before a computation is carried out, while the latter contains the results of the computation. For example, the result of the term $[1 + 2, 3 + 4, 5 + 6]$ is the value (3, 7, 11).

We next define a process inductively by the grammar.

$$
\begin{aligned}
P, Q, R ::= &\ outM\langle N\rangle; P | inp \quad M(X); P \\
&| (P|Q) | new(n); P | repeat \quad P \\
&| stop | store \quad x = M; P | free \quad x; P
\end{aligned}
\tag{16.3}
$$

$$
\begin{aligned}
&| split[x_1, \ldots, x_n] \ is \quad M \quad err\{R\}; P \\
&match \quad M \quad is\ N \quad err\{P\}; Q
\end{aligned}
\tag{16.4}
$$

Out M <N>; P is a process that sends a message N through a port M, following which a process P is executed. The expression imp M(x); P is a process that receives a message and binds a variable x to the message, following which a process P is executed. (P|Q) is the parallel execution of processes P and Q. The expression new (n); P denotes the restriction of the scope of a name n within a process P. The expression stop is the terminated process.

The following grammar is used to define agents, which represent an intermediate type of process for communicating between processes. We introduce the notion of an agent for technical reasons.

16.2.2 The Time Model of the Spice-Calculus

As we explained in the previous section, by adding a time model to the spice-calculus, we can determine the distribution of computational costs in the timeline of a process.

To analyze DoS attack resistance, it is preferable to know the amount of computational cost for a number of time granularities (e.g., a short time unit, a medium time unit, and a long time unit). We thus adopt a layered timeline structure. The timeline is usually modeled as a directed line indexed with the positive integers, like the x-axis in Cartesian coordinates. The unit of time is defined as a very short time span (e.g., 1 ms) (Fig. 16.1).

In contrast to this, we introduce a number of time units, depending on the type of processing (Fig. 16.2).

Fig. 16.1 Short time span

Fig. 16.2 Introduced time units
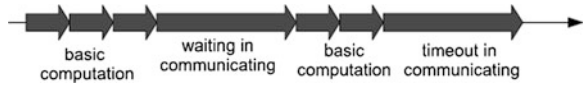
In this paper, we use the following three layers of time units:

Short time unit: the time required for within-process computations, such as arithmetic operations and computing hash values.

Medium time unit: the time required for inter-process communications, and

Long time unit: the time required for timeout in inter- process communication.

A time is represented as a triple of nonnegative integers:

$$(t_1, t_2, t_3) \tag{16.5}$$

Where the three components correspond to the three time units defined above. The triples are ordered by lexicographic ordering. For example, we have

$$(3, 2, 4) > (2, 5, 10) > (2, 5, 9) \tag{16.6}$$

We introduce algebraic operations between triples by regarding them as three-dimensional numerical vectors. For example,

$$(3, 2, 4) + (2, 5, 10) = (5, 7, 14) \tag{16.7}$$

16.2.3 Typing in the Spice-Calculus

In the spice-calculus, a type does not refer to a data type, but rather to a location in which a process is executed. In programming languages and typed lambda-calculi, we categorize expressions with respect to data type, whereas in the spice-calculus, we categorize processes with respect to the processors in which they are supposed to be executed. When we want to distinguish these types from the usual ones, we call them processor types. The processor types are defined inductively by the following grammar:

$$A, B ::= \alpha :: \{x_1, \ldots, x_n\} | (A|B) \tag{16.8}$$

Type $\alpha :: \{x_1, \ldots, x_n\}$ denotes a processor whose name is a, in which n memory cells $x_1, \ldots, x_n$ are allocated. Type $(A|B)$ denotes a combination of two processors, A and B. For example, $\alpha :: \{x, y\}|b :: \{z, w\}$ means that there are two processors, **a** and **b**, memory cells x, y are allocated in **a**, and memory cells z, w are allocated in **b**.

Typing in a programming language is used for checking and guaranteeing consistency between functions (e.g., operators, procedures) and parameters. On the other hand, typing in spice-calculus plays two roles:

Management of information on processors that bear computational costs, the ensuring consistency with respect is memory allocation. We next present the typing rules of spice-calculus.

$$\frac{a :: (\{x\} \cup V)\Delta P \quad V \notin x \quad V \supseteq fv(M)}{a :: V\Delta inp \quad M(x); P} \tag{16.9}$$

where V is a set of variables and $fv(M)$ is the set of free variables occurring in M. This rule indicates that if P is executed on processor **a**, then inp $M(x); P$ should be executed on the same processor a, and that a fresh variable x will be newly allocated for evaluating P.

$$\frac{a :: V\Delta P \quad V \supseteq fv(M) \quad V \supseteq fv(N)}{a :: V\Delta out \quad M(N); P} \tag{16.10}$$

$$\frac{A\Delta P \quad B\Delta Q}{(A|B)\Delta(P|Q)} \tag{16.11}$$

If process P is executed on processor A, and Q is executed on B, it may be said that $(P|Q)$ is executed on the combined processor $A|B$.

$$\frac{A\Delta P}{A\Delta new(n); P} \tag{16.12}$$

This rule means that the restriction operation has no connection with processor configuration.

$$\frac{a :: \theta\Delta P}{a :: \theta\Delta repeat \quad P} \tag{16.13}$$

This typing rule imposes the restriction that in spice-calculus, the replication operation is allowed only on a processor without memory allocation.

$$\overline{a :: \theta\Delta stop} \tag{16.14}$$

This typing rule enforces the restriction that every process should be terminated in a state in which no variable is allocated.

$$\frac{a :: (\{x\} \cup V)\Delta P \quad V \notin x \quad V \supseteq fv(M)}{a :: V\Delta store \; x = M; P} \tag{16.15}$$

This rule means that a variable x should be allocated after the store operation.

$$\frac{a :: V\Delta P \quad x \notin V}{a :: (\{X\} \cup V)\Delta free \quad x; P} \tag{16.16}$$

Conversely, this rule means that the variable x should be deallocated after the free operation.

$$\frac{a :: V\Delta P \quad a :: V\Delta Q \quad V \supseteq fv(M) \quad V \supseteq fv(N)}{a :: V\Delta match\ M \quad is\ N \quad err\{P\}; Q} \tag{16.17}$$

These two typing rules mean that the match operation has no connection with processor configuration, as is the case with rest.

$$\frac{a :: (\{x_1, \ldots, x_n\} \cup V)\Delta Pa :: V\Delta R \quad \{x_1, \ldots, x_n\} \cap V = 0 \quad V \supseteq fv(M)}{a :: V\Delta split(x_1, \ldots, x_n)\ is\ M \quad err\{R\}; P} \tag{16.18}$$

This typing rule means that n variables $x_1, \ldots, x_n$ are allocated, and P is then executed with this configuration.

$$\frac{A\Delta P \quad A\Delta P \quad fv(M) = 0}{A\Delta(x)P\, A\Delta(vn_1 \cdots n_j)\langle M\rangle P} \tag{16.19}$$

16.2.4 Timed Operational Semantics for the Spice-Calculus

We extend the operational semantics for pi- and spi-calculi to spice-calculus, in which each computational step is formalized as an instance of the transition relation. We incorporate the notions of time and a timeline into the transition relation as a label attached to the transition.

Pi-and spi-calculi *inp* $\quad n(x); P \xrightarrow{n} (x)P$

Spice-calculus $a :: V \vdash inp\ n(x); P \xrightarrow{n} (x)P : \quad \{a \cdot store_x\}$

For the spice-calculus, "$\{a \cdot store_x\}$" means that the cost store is entailed on the processor a this transition.

The *cost bases* $u1, \ldots, u_j$ denote the primitive types of cost. Linear combinations of these having integer coefficients,

$$n_1 u_1 + \cdots + n_j u_j \tag{16.20}$$

are called *cost values*. A finite set of pairs of cost values and processor names is called a *cost assignment*. For example, the cost assignment

$$\{a \cdot (2store + hash), b \cdot (store + 3match)\} \tag{16.21}$$

Means that the cost $(2store + hash)$ is entailed on the processor and $(store + 3match)$ is entailed on **b**. Moreover, in the timed spice-calculus, we incorporate time information into the costs. More precisely,

$$\{a \cdot (2store^{(0,0,2)} + hash^{(0,1,1)}), b \cdot (store^{(0,1,0)} + 3match^{(0,0,2)})\} \tag{16.22}$$

We annotate each cost base with time information.

$$(t_1, t_2, t_3), a :: V \vdash inp\, n(x); P \xrightarrow{n} (x)P : \quad \{a \cdot store^{(t_1, t_2, t_3)}\} \tag{16.23}$$

In the operational semantics, we increment the time with a time unit corresponding to a processed operation. The transition for evaluation of terms is described by Eq. (16.23) and is defined by the following rules Eq. (16.24)

$$(t_1, t_2, t_3) \vdash P > Q : c, (t'_1, t'_2, t'_3) \tag{16.24}$$

We abbreviate (t_1, t_2, t_3) to $\vec{t}$ and (t'_1, t'_2, t'_3) to $\vec{t'}$

$$\vec{t} \vdash V > V : 0, \vec{t'} \tag{16.25}$$

$$\frac{\vec{t} \vdash M_1 \downarrow i_1 : c_1, \vec{t'} \quad \vec{t'} \vdash M_2 \downarrow i_2 : c_2, \vec{t''} \quad j = i_1 + i_2}{\vec{t} \vdash (M_1 + M_2) \downarrow j : c_1 + c_2, \vec{t''}} \tag{16.26}$$

$$\frac{\vec{t} \vdash M_1 \downarrow V : c, \vec{t'}}{\vec{t} \vdash hash(M) \downarrow hashv : c + hash^{(t'_1, t'_2, t'_3 + 1)}} \tag{16.27}$$

The transition relation formalizing an inter-process computation is defined by the following rules.

$$\vec{t} \vdash P > Q : C, \vec{t'} \tag{16.28}$$

$$\begin{array}{c} \vec{t} \vdash repeat \quad P > P | (repeat \quad P) : repeat^{(t_1, t_2, t_3 + 1)} (t_1, t_2, t_3 + 1) \\ \vec{t} \vdash inp \quad n(x); P\, err\{Q\} > Q : \{\}, \quad (t_1 + 1, t_2, t_3) \end{array} \tag{16.29}$$

The latter represents timeout processing for message receiving, and time (t_1, t_2, t_3) is advanced to $(t_1 + 1, t_2, t_3)$.

$$\frac{\vec{t} \vdash M \downarrow V : c, \vec{t'} \quad fv(V) = \theta}{\begin{array}{c} \vec{t} \vdash store \quad x = M; P > P[V/x] : c + store_x^{(t'_1, t'_2, t'_3 + 1)}, \ (t'_1, t'_2, t'_3 + 1) \\ \vec{t} \vdash free\, x; P > P : \quad -store_x^{(t_1, t_2, t_3 + 1)}, \ (t_1, t_2, t_3 + 1) \end{array}} \tag{16.30}$$

$$\frac{\vec{t} \vdash M \downarrow V : c, \vec{t'} \quad \vec{t'} \vdash N \quad \downarrow V : d, \vec{t''}}{\vec{t} \vdash match \quad M \quad is\, err\{P\}; Q > Q : c + d + match^{(t''_1, t''_2, t''_3 + 1)} \quad (t''_1, t''_2, t''_3 + 1)}$$

$$\frac{\vec{t} \vdash M \downarrow V : c, \vec{t'} \quad \vec{t'} \vdash N \quad \downarrow W : d, \vec{t''} \quad V \neq W}{\vec{t} \vdash match \quad M \quad is\, N\, err\{P\}; Q > P : c + d + match^{(t''_1, t''_2, t''_3 + 1)} \quad (t''_1, t''_2, t''_3 + 1)} \tag{16.31}$$

$$\frac{\vec{t} \vdash M \downarrow (v_1 \ldots \ldots v_n) : c, \vec{t'} \quad fv(V_t) = \theta(i = 0 \ldots \ldots n)}{\vec{t} \vdash split \quad [x_1 \ldots \ldots x_n] \quad is\, M\, err\{R\}; P > P[V_1/x_1 \ldots \ldots V_n/x_n] : c+}$$

$$\frac{\vec{t} \vdash M \downarrow (v_1 \ldots \ldots v_n) : c, \vec{t'} \quad fv(V_t) = \theta(i = 0 \ldots \ldots n)}{n \times store_x^{(t'_1, t'_2, t'_3 + 1)}, (t'_1, t'_2, t'_3 + 1)}$$

$$(16.32)$$

$$\frac{\vec{t} \vdash M \downarrow V : c, t' \quad V \quad is \quad not \quad a \quad pair}{\vec{t} \vdash split \quad [x_1 \ldots \ldots x_n] \quad is \quad M \quad err\{R\}; P > R : c, \vec{t'}} \quad (16.33)$$

The relation represents a multi-step extension of the previous transition, defined by the following rules.

$$(t_1, t_2, t_3), A \vdash P > Q : \sigma, (t'_1, t'_2, t'_3) \quad (16.34)$$

$$(t_1, t_2, t_3), A \vdash P > Q : \{\}, (t'_1, t'_2, t'_3) \quad (16.35)$$

$$\frac{(t_1, t_2, t_3) \vdash P > P' : c, (t'_1, t'_2, t'_3)}{(t_1, t_2, t_3), a :: V \vdash P > P' : \{a \cdot c^{(t'_1, t'_2, t'_3)}\}, (t'_1, t'_2, t'_3)} \quad (16.36)$$

$$\frac{(t_1, t_2, t_3) \vdash P > P' : \sigma_1, (t'_1, t'_2, t'_3), A \cong B, (t'_1, t'_2, t'_3), B \vdash P' > P'' : \sigma_2, (t''_1, t''_2, t''_3)}{(t_1, t_2, t_3), A \vdash P > P'' : \sigma_1 + \sigma_2, (t''_1, t''_2, t''_3 + 1)}$$

$$(16.37)$$

$$\frac{(t_1, t_2, t_3), A \vdash P > P' : \sigma_1, (t'_1, t'_2, t'_3)(t_1, t_2, t_3), B \vdash Q > Q' : \sigma_2, (t''_1, t''_2, t''_3)}{(t_1, t_2, t_3), (A|B) \vdash (P|Q) > (P'|Q') : \sigma_1 + \sigma_2, (t'_1, t'_2, t'_3 + 1) \cup (t''_1, t''_2, t''_3 + 1)}$$

$$(16.38)$$

$$\frac{(t_1, t_2, t_3), A \vdash P > P' : \sigma_1, (t'_1, t'_2, t'_3)}{(t_1, t_2, t_3), A \vdash new(n); P > new(n); P' : \sigma, (t'_1, t'_2, t'_3)} \quad (16.39)$$

An inter-process communication is formalized as a transition relation, called a commitment relation, is defined by the following rules

$$\vec{t}, A \vdash P \xrightarrow{a} A : \sigma, \vec{t'} \quad (16.40)$$

$$\vec{t}, a :: V \vdash inp\, n(x); P \xrightarrow{n} (x)P : \{a \cdot store_x^{(t_1, t_2 + 1, t_3)}\}, (t_1, t_2 + 1, t_3) \quad (16.41)$$

$$\frac{\vec{t} \vdash N \downarrow V : c, \vec{t'} \quad fv(V) = \theta}{\vec{t}, a :: V \vdash out \quad n\langle N \rangle; P \xrightarrow{\overline{n}} (v)\langle V \rangle; P : \{a \cdot c^{\vec{t'}}\}, \vec{t'}} \quad (16.42)$$

$$\frac{\vec{t}\ \mathcal{A} \vdash P \xrightarrow{n} F : \sigma_1, \vec{t'} \qquad \vec{t}, B \vdash Q \xrightarrow{\bar{n}} C : \sigma_2, \vec{t''}}{\vec{t}, (A|B) \vdash (P|Q) \xrightarrow{t} F@C : \quad \max(\sigma_1 + \sigma_2, \vec{t'}, (t_1'', t_2'' + 1, t_3''))} \tag{16.43}$$

The rule should be read as follows: Suppose that process P is executed on processor B and transited to F with cost $\sigma 1$ and signal n at time $\vec{t'}$ and that Q is executed on processor B and transited to C with cost $\sigma 2$ and signal n at time $\vec{t'}$. Then, the combined process P | Q is executed on A | B and transited to F @ C with cost $\sigma 1 + \sigma 2$ and signal τ. The time at which F @ C is attained should be the maximum of t' and $(t_1'', t_2'' + 1, t_3'')$. The interaction operation F @ C lis defined later. The following rule is a symmetrical case of the above rule.

$$\frac{\vec{t}, \mathcal{B} \vdash Q \xrightarrow{\bar{n}} C : \sigma_2, \vec{t'} \qquad \vec{t}, A \vdash \mathcal{P} \xrightarrow{n} F : \sigma_1, \vec{t''}}{t}$$
$$\vec{t}, (B|A) \vdash (P|Q) \rightarrow C @ F : \sigma_2 + \sigma_1, (t_1', t_2' + 1, t_3') \cup \sigma, \vec{t'} \tag{16.44}$$

$$\frac{\vec{t}\ \mathcal{A} \vdash P \xrightarrow{a} A : \sigma, \vec{t'}}{\vec{t}, (A|B) \vdash (P|Q) \xrightarrow{a} (A|Q) : \sigma, \vec{t'}} \tag{16.45}$$

This rule should be read as follows: If process P is executed at time $\vec{t}$ on processor A and transited to A with cost σ at time t' then process $P|Q$ is transited to $(A|Q)$ with the same cost.

$$\frac{(t_1, t_2, t_3), A \vdash P \xrightarrow{a} A : \sigma_1, (t_1', t_2', t_3') \quad a \notin \{m, \overline{m}\}}{(t_1, t_2, t_3), A \vdash new(m); P \xrightarrow{a} new(m); A : \sigma, (t_1', t_2', t_3')} \tag{16.46}$$

This rule implies that the costs of new (m); P and P have the same value, σ.

Agents F and C are assumed to be $(x) P$ and $(vn1, \ldots, nk) \langle M \rangle Q$, respectively. Then, $F @ C$ is a process defined as follows.

$$(x)P@(vn_1, ..., n_k)\langle M \rangle Q \equiv new(n_1) \cdots new(n_k)(P[M/x]|Q)$$
$$((vn_1, ..., n_k)\langle M \rangle Q)@(x)P \equiv new(n_1) \cdots new(n_k)(Q|P[M/x]) \tag{16.47}$$

The symmetric case, C @ F, is defined similarly.

We impose the condition that if the starting time for a process is delayed, the termination of the process is also delayed by the same amount of time.

16.3 Time Shift Property

For any time $t1$, $t2$, $t3$, and t', t', t' any time span $\Delta t1$, $\Delta t2$, $\Delta t3$,

$$(t_1, t_2, t_3) \vdash M \downarrow V : c, (t'_1, t'_2, t'_3)$$
$$\Leftrightarrow (t_1 + \Delta t_1, t_2 + \Delta t_2, t_3 + \Delta t_3) \vdash \ominus M \downarrow V : c, (t'_1 + \Delta t_1, t'_2 + \Delta t_2, t'_3 + \Delta t_3)$$
$$(t_1, t_2, t_3) \vdash P > Q : c, (t'_1, t'_2, t'_3)$$
$$\Leftrightarrow (t_1 + \Delta t_1, t_2 + \Delta t_2, t_3 + \Delta t_3) \vdash \ominus P > Q : c, (t'_1 + \Delta t_1, t'_2 + \Delta t_2, t'_3 + \Delta t_3)$$
$$(t_1, t_2, t_3), A \vdash P \xrightarrow{a} A : \sigma, (t'_1, t'_2, t'_3)$$
$$\Leftrightarrow (t_1 + \Delta t_1, t_2 + \Delta t_2, t_3 + \Delta t_3), A \vdash \ominus P \xrightarrow{a} : \sigma, (t'_1 + \Delta t_1, t'_2 + \Delta t_2, t'_3 + \Delta t_3)$$

$$(16.48)$$

This is proved inductively from the structure of the transition relation.

16.4 Conclusion

In this paper, we propose a process calculus for formalizing computational costs and cost amounts over the short term. This procedure is called timed spice-calculus, and was developed by improving the prototypic theory in preliminary studies, known as spice calculus.

The timed spice-calculus is merely a framework for formulating denial-of-service attacks. We should develop a methodology for finding vulnerabilities based on this calculus.

In the previous study, we began work on an automatic approach to verification and analysis, using model- checking for non-timed spice-calculus. We intend to extend this work to timed spice-calculus [6, 7].

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Chapter 17
Service-Oriented and Data Mining Based Context-Aware Systems Construction

Zhujuan Li

Abstract With the rapid development of the Internet, service-oriented architecture has been increasingly used to develop large software systems, and web services based system development not only improve the efficiency of large systems construction, but also makes operations personnel, system architects focus on the layout and construction of the entire process to face the ever-changing business. With the increase of web services, how to find an appropriate service in so many services becomes a problem to consumers. This paper, starts from data mining, and SOA-based context-aware system, and through integrating those two technologies, builds a service-oriented context-aware system based on data mining. By discovering Web service proactively based on the environmental context, and returning the most appropriate service to the consumer, context-aware systems overcome the shortcomings of the traditional passive SOA.

Keywords Data mining · SOA initiative · Intelligence · Context-aware

17.1 Introduction

People are always in a specific scenario and each scenario includes a number of context elements. Such as physical scenarios, including temperature, humidity; user scenarios, including user profile, user location, computing scenarios, networks, and sensing equipment. Based on the user's information, we can dig out the potential needs of the user, such as user location is the airport, the user's

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information shows the user is VIP customer of ICBC, user has 2 h before check-in. According to the user scenarios above, Airport service system can push services initiatively for the user, such as telling the user the location of the waiting lounge for the VIP of ICBC in the airport, and the services the user can get in it. The smart push services are usually able to solve the user's current problems, so that the user has a good experience. However, the user scene information is complex and volatile. Such as geographic location may change, the user's recent activity records, including the user entity activities and customers of online virtual activities, are constantly updated. How to find useful information in these changing scenarios information and push services based on the useful the scene information is the core issue of context-aware system, and this paper introduces context-aware based service-oriented architecture, and analyzes the use of data mining techniques in it. Through the integration of context-aware, service-oriented architecture, data mining, we can achieve a context-aware based service-oriented architecture, which can push services more precisely.

17.2 Overview

17.2.1 An Overview of the Context-Aware

Context-aware processing object is context information of the user's environment. In 1994, Schilit used the concept of context-ware and divided context information into three categories [1]: (1) technology context, such as network type, network availability, network bandwidth, the equipment around. (2) User context, such as the configuration of the user, user location, people around the user, posture, behavior, the user's social relationships. (3) Physical context, such as weather, temperature, light, noise, traffic conditions. This definition ignores the historical context, which means the context changes in the timeline Dey, in his paper, gives the following definition for context information: the context information is any information used to describe the entity situation. The so-called entity is a person, location, or other objects related with the user or system. Including the object and the application itself [2]. Context-aware system is used to collect context information and use it in an appropriate manner.

17.2.2 Overview of Data Mining Technology

There are many different ways to definite data mining, but essentially are same, the more accepted definition is: data mining [3] is the process of extract people do not know in advance, but potentially useful information and knowledge implicit in a large number of incomplete, noisy, fuzzy and random data. Manifestations: the

rules, concepts, and patterns. In this concept, the object of data mining should be a lot of incomplete, noisy, fuzzy, random data, and the target is to get useful information to the user which implicit in large amounts of data. Users can use this information as a basis for building other systems or the basis for another data mining.

17.3 The Principles and Framework of Data Mining Based Context-Aware System

17.3.1 Analysis of Context-Aware Based Personalized Web Services Principles and Framework

Usually we use Web services technology to achieve service-oriented architecture. The traditional Web services, including three parts: service providers, service consumers, and service registration and search Center (UDDI). Service providers submit their own services to the UDDI, and are responsible for providing services to the service consumers; service consumers' inquiry services from UDDI and consumer services. UDDI is responsible for receiving the service registration information of service provider and provide the inquiry services function to the service consumer [2].

Communication mediums between the three roles of the Web service are WSDL and SOAP. WSDL, as a description of the service, provides the description of the services and the method of how to access. SOAP, as a communication medium, is the medium of communication service provider and service consumer.

In the structure described above, the service consumer can only take the initiative in the service registry query the service they need, communicate with service provider via SOAP to get the appropriate service. In the context-aware based SOA, we need perceived user demand for services before the user issue a service request, and push the appropriate services. And therefore, we need to add a new role—intelligent agent—to achieve this function. Through data mining, analysis, and the corresponding pattern matching the context information, the intelligent agent can get the appropriate query, and use the query to get the appropriate service in the service registry query, and then push the service to the user. The architecture is shown in Fig. 17.1.

In context-aware SOA model, service users can directly query the service center and also can inquiry services through intelligent agents. At the same time, through collecting, mining and matching, intelligent agents find the appropriate service, and push it to the service to service users.

In service-oriented and data mining based context-aware systems construction; we need to resolve the following problem:

How can web service consumers and web service providers interact with each other?
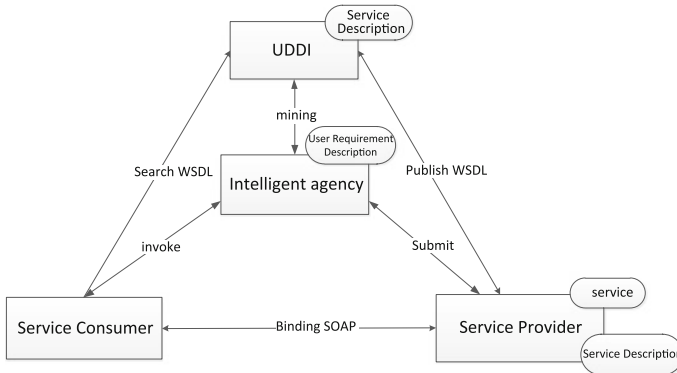
Fig. 17.1 Context-aware SOA architecture model

How can web service providers publish web services to service registry.

How can the web service consumer query appropriate services in the service registry?

Management and security of the whole architecture.

How can intelligent agents map web service to the service registry?

How can intelligent agents get context information from service consumers?

How can intelligent agent's process and store context information.

How can intelligent agents find service through reasoning based on the rules of the context and context information?

Among them, the first three problems should be considered in common SOA, and are not the key points discussed in this paper. According to management and security of the whole architecture, because the intelligent agent module is added to the architecture, and the architecture also have increased context information processing, services push and other functions, we should consider the management and security of the architecture. For example, before taking the initiative to push service, we need to obtain the context information from the service consumer; and match to the appropriate service, take the initiative to push the service to the service consumer without reality request and calls the service. These are related to user privacy and should bet take into account in service-oriented and data mining based context-aware systems construction. However, this paper is focus on how to integrate data mining technology and the existing context-aware systems; we do not pay too much attention to the management and security. How can intelligent agents map web service to the service registry is the difference of a context-aware service-oriented system and the general service-oriented systems. Taking into account the paper focuses on data mining techniques and context-aware systems integration and application, we do not conduct too much analysis on service mapping. How can intelligent agents get context information from service consumers? How can intelligent agent's process and store context information. How can intelligent agents find service through reasoning based on the rules of the context and context information? These three areas have be including access to

context information, the mining of context information with noise, the storage and use of de-noised context information. These aspects are the main consideration in data mining technology, and in Sect. 17.2.2, we analyze them in detail.

17.3.2 The Integration of Data Mining and Context-Aware Web Services

In context-aware Web services architecture, the process to push services is as follows:

Context information acquisition
Context information modeling
Context information processing
Service query based on context information
Push the queried service.

The core content of this process is information gathering; modelling, processing and reasoning, and this process could take advantage of the concept of data mining and use appropriate data mining algorithms to solve the problem.

Context information collection: there are three kinds of context information collection interfaces: sensor data acquisition (such as GPS), information collection for other services (such as the weather service data, stock data services, transport services, data), and historical data acquisition (such as user recently used what kind of service). The collection objects also include all service consumer sensor, service providers, the services provided by relevant providers, and historical data and context information saved by the intelligent agents.

Context information modelling: context information should be transferred from context information collection objects to the intelligent agent, and intelligent agent take the job of analysis, excavation, removal of noise, and get useful context information. Different context of expression vary. In order to facilitate the transfer and understanding, we usually model for the collected context information, and get unified context information. This unification is divided into two levels, one is unified on the syntax (format unified), and the other is a unified semantic. In order to make the collected context information can be data mined and reasoned, we must ensure that the intelligence of the semantics of the context information. In order to achieve semantic unity, the ontology modelling is now a popular way. There is no uniform definition of ontology. 1993, Grub gives the body of one of the most popular definition, that "ontology is a conceptual model of explicit formal specification" [4]. Representation of the ontology can be varied, for example, the first order predicate logic, semantic networks, frame-based system, but currently the most widely used is OWL language which recommended by the W3C [5].

Context information processing: the processing of context information is the process to remove the information we do not care and retain the information that

we care about. And through specific algorithm, mine the relationship between the context information with specific profiles.

In this process, data mining technology has played a central role, so, in the following, we introduce data mining technology:

The association rules are used in the context-aware applications. The association rule is mining interesting link among a given data set [6]. Apriori algorithm is a classic algorithm for mining user interest rules. Apriori uses breadth-first search and a Hash tree structure to count candidate item sets efficiently. It generates candidate item sets of length from item sets of length. Then it prunes the candidates which have an infrequent sub pattern. According to the downward closure lemma, the candidate set contains all frequent-length item sets. After that, it scans the transaction database to determine frequent item sets among the candidates. This algorithm conducts the excavation of the relevant rules based on the traversal [7].

The above algorithm can be used on analysis the relations between the context and service consumers, and provide a theoretical basis for the intelligent agent customize specific services in particular context.

17.4 Summary

With the network more and more widely used, a large number of network information and service make the choice of service becomes more difficult. Many systems can provide users with many services, but users tend to feel overwhelmed in the face of a variety of services. So how to provide users with personalized services to meet users' needs is what many systems need to focus on. Now, many websites provide personalized access. Such as shopping sites, based on the user's browsing information, recommend personalized merchandise. However, the system of service-oriented architecture, this technology is not very mature. How data mining technology will be integrated into our service-oriented architecture, allowing the user's profile environment, proactive notification service, is the problem this paper focuses on. In the paper, we introduce principle and process of service-oriented context-aware systems construction, and describes the concept of data mining, data mining technology used in context-aware service-oriented architecture, so as to guide the actual commercial context-aware systems construction.

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Chapter 18
Quantity Requirement Analysis of Stratospheric Airship-Carried GPS Jammer

Ma Li, Fei Liu and Jian-jun Yang

Abstract In order to react to the development of "Air-Sea Battle" and Global Positioning System (GPS) precision-guided weapons and enhance anti-intervened combat capabilities, a combat mode that obstructs the GPS receivers which utilizes stratospheric airships as the jammer carrier is put forward. A mathematical model about the relationship with the jammer height, transmitted power and the effective interference distance is derived, and the capacity of the jammer is simulated and analyzed. According to the quantitative measurement of the lethality of cruise missiles, the requirement of the effective interference distance is also put forward. And it calculates the required number of jammer that protect point target by using the irregular region Hexagonal grid filling algorithm.

Keywords Suppressible jamming · Disposition · Boundary-fill algorithm · Stratospheric airship · Global positioning system (GPS) · Point target protection

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18.1 Introduction

At present, china's "anti-access" combat forces are greatly developed. And efforts are made to improve the security status of the Western Pacific Ocean, and measures are taken to prevent some unfriendly countries' power from closing to china. In order to offset china's rapidly increasing "anti-access" capability and protect its armed forces deployment, the United States hastens to explore the "Air-Sea Battle" combat conception. Therefore, the United States refits the fourth-generation Ohio submarines which are presently the largest number in service and the most advanced craft. And then this submarine can carry 154 "Tomahawk" cruise missiles. The Ohio submarine firstly surfaces in the Philippines Subic Bay on June 28, 2011. At the same time, another fellow "Michigan" submarine arrives in Pusan, South Korea, and the third fellow "Florida" submarine surfaces in the United States-Britain joint "Diego Garcia" naval base of the Indian Ocean. These three submarines made China have to face with more than 462 Tomahawk cruise missiles in the sea which is adjacent to the mainland.

In response to the United States "Air-Sea Battle" and the development of GPS precision guided weapons, and to enhance the "anti-access" capability, this paper mainly researches on the GPS/Inertial Navigation (GPS/INS) system-guided tomahawk cruise missiles and views stratospheric airships as the jammer carriers. Based on the existing suppression interference impact on GPS receivers, it carried on the analysis on the interference range when jammers were placed on adjacent space platform, and then a reasonable jammer deployment height was also proposed on this basis. By analyzing the effective interference range demand, it discusses about the minimum required number of jammers and presents the result.

18.2 The Interference Range Calculation of a Single Platform

For GPS receivers without assistance, the weakest link is the carrier tracking loop. Therefore, the carrier tracking loop threshold 28 dB/Hz can be used as equivalent carrier noise power spectral density ratio $[C/N_0]_{eq}$. According to the literature [1]; the improved tracking threshold can be achieved 18.5 dB/Hz. The relationship among the tracking threshold, undisturbed Carrier to Noise ratio C/N_0 and jamming power J is the following [2, 3].

$$
\begin{cases}
[C/N_0]_{eq} = -10\lg\left[10^{-(C/N_0)/10} + \dfrac{10^{(J/S)/10}}{Qf_c}\right] \\[2ex]
J = EIRP + G_{rj}(\theta) - L_2 + 20\log\left|\dfrac{c}{4\pi fR}\right| \\[2ex]
\theta = \arcsin\left((H-h)/\sqrt{D^2 + (H-h)^2}\right) \\[2ex]
EIRP = J_T + G_T
\end{cases}
\tag{18.1}
$$

In the equation:

f_c	GPS PRN code rate
Q	Spreading frequency processing factor (dimensionless)
S	Signal power (same as the carrier power)
J	Jamming power received by GPS receivers
f	GPS L_1 frequency (1575.42 MHz) or L_2 frequency (1227.6 MHz)
c	Light velocity (2.99792458×108 m/s)
$EIRP$	Interference source equivalent isotropy radiance power
R	Distance between jammers and receivers
L_2	Implementation loss
$G_{rj}(\theta)$	GPS receiver antenna gain in the interference direction
H	Jammer height; h: Receiver height
D	Horizontal distance between jammers and receivers
J_T	Jammer's transmitted power (dBW)
G_T	Jammer antenna gain in the receiver direction (dB)

Figure 18.1 is a typical GPS antenna pattern [4].

Suppose that undisturbed Carrier to Noise ratio C/N_0 is: L_1 band C/A code: 45.4 dB/Hz, P(Y) code: 42.4 dB/Hz; L_2 band P(Y) code: 39.8 dB/Hz.

Fig. 18.1 Gain of GPS receiver antenna
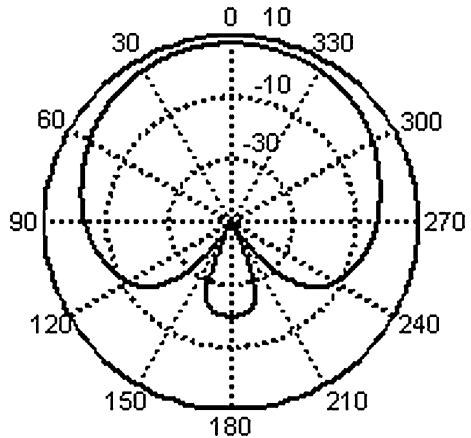
Relationship
among the *jamming distance*,
jammer height and
transmitted power
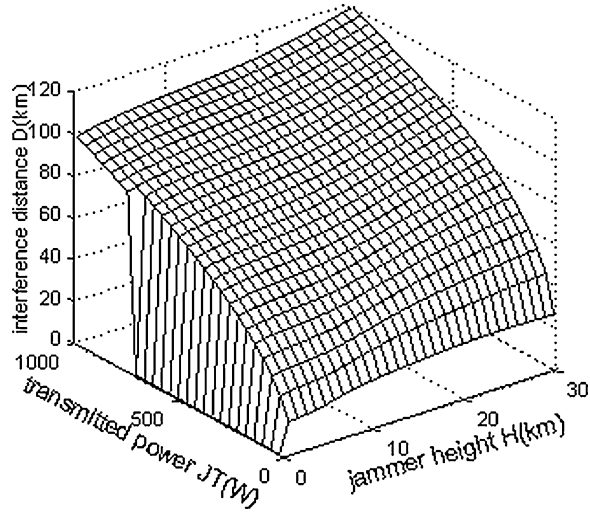
Take L_1 band P(Y) code as an example, a relationship diagram among jamming
distance, jammer height and jamming power can be obtained, just as Fig. 18.2
shows. When jammer height is lower than receiver height and jammer's transmitted
power is less than 740 W, there is no significant interference effect. For example, at
100 km interference distance: when jammer height is 20 km, the transmitted power
requires 800 W; when jammer height is 25 km, the transmitted power needs
700 W; when jammer height is 30 km, the transmitted power demands 610 W.

18.3 Distance Demand of Jamming

For a kind of weapon (such as cruise missiles), the quantitative measurement of its
lethality is the destruction probability; to a given target, the cruise missiles'
destruction probability P_k is [5]:

$$\begin{cases} P_k = 1 - 0.5 \left(\dfrac{R_L}{CEP} \right)_2 \\ CEP = (R^2/v)\Omega \end{cases} \qquad (18.2)$$

In that equation, R_L is warhead killing range; *CEP* is cruise missiles circular
error probability [6]; Ω is cruise missiles angular error drift rate; R is the distance
between missiles and targets when GPS is losing lock, that is interference distance;
v is tactical tomahawk flight speed.

Fig. 18.3 Relationship between *warhead killing range* and *jamming distance*
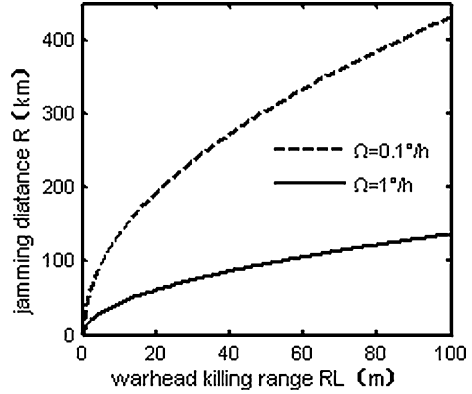
Suppose that cruise missiles can not be a threat to the target, the destruction probability P_k is 0.05. When v is 885 km/h and Ω is $1°/h$ or $0.1°/h$, Fig. 18.3 shows the relationship between warhead destruction range and the interference distance. For INS Ω is $1°/h$, in order to make 100 m destruction-range cruise missiles lose power, only 120 km interference distance is needed, however the warhead's destruction range is only $30-60$ m. For INS Ω is $0.1°/h$, it needs at least 300 km interference distance so as to make 50 m destruction-range cruise missiles lose power.

18.4 Stratospheric Airship Jammer's Deployment and Quantity Determination Method

18.4.1 The Best Deployment Height for Stratospheric Airship Jammers

Take L1 band P(Y) code as an example, Fig. 18.4 shows the maximum interference distance's curve along with jammer height changes. 100 km interference distance can be achieved when the output power is 800 W and the jammer height is 20 km. The jammer height should be at least 25 km while the output power is 700 W.

In addition, among the $20-25$ km range, the atmospheric temperature alters little, when the height changes and the advection movement mainly happens in the atmosphere without convection; and wind speed is minimum and the force is relatively stable, then fixed point hover can be realized. At the same time, air is thinner, water vapor and dust content is minimal, and visibility is excellent and it is convenient to accomplish information countermeasure [7–10]. Therefore, it is optimal to deploy stratospheric airships at 20–25 km height.
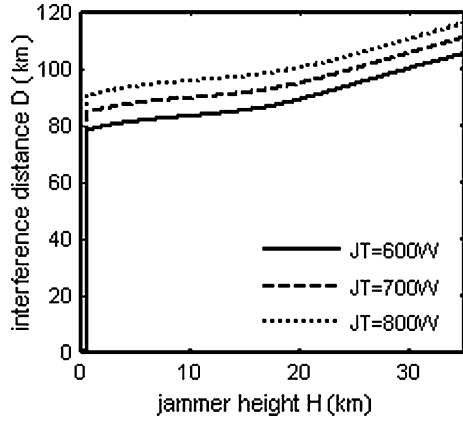
18.4.2 The Deployment Scheme for Stratospheric Airship Jammers

The stratospheric airship jammer deployment can be transformed into irregular region's filling problem. According to literature [11], the best distribution in the plane is the hexagonal grid form. In order to get greater coverage efficiency, it can be filled in the hexagonal grid system. The adjacent elements only have one connection in the hexagonal grid system. Figure 18.5 shows the Six Adjacent Types connection.

The effective interference distance of jammers is taken as the radius. The interference covering circle is approximately used as a regular hexagon, and then its central point is the jammer's position. Suppose that the cruise missiles attack direction is $\theta_{1\circ}-\theta_{2\circ}$, the attack target A is the circle center and the interference distance R is the radius, and a sector with the $\theta_{1\circ}-\theta_{2\circ}$ angle is used as a target area

Fig. 18.5 Six adjacency type
on hexagonal grid
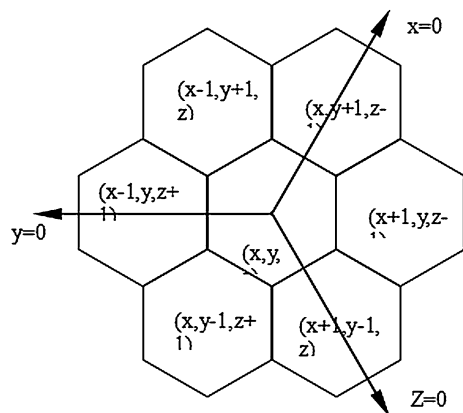
Fig. 18.6 Jammer
disposition scheme
on irregular region
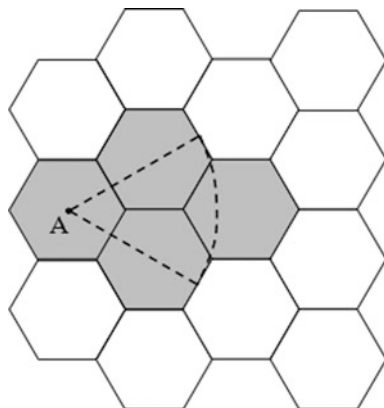
to be covered. In order to accomplish the target area coverage, boundary-fill
algorithm and stack are adopted. The basic principle is as follows:

(1) A starting point within the target area is pushed into the stack;
(2) If the stack is null, go to (5), or else turn to (3);
(3) A point is popped out the stack, and this point will be transformed into filling
    color. Then six adjacent points closing to that point are judged whether they
    are the boundary color or the polygon filling color, if not, then that point will
    be pushed into the stack.
(4) Go to (2);
(5) End.

Figure 18.6 shows the deployment instance of the stratospheric airship jammers
in the sector region. Suppose that the cruise missiles attack target A is the circle
center, and the interference distance R = 300 km is the radius and a sector with
the 0−60° angle is used as a target area to be covered, and a single jammers
interference distance is 100 km. A starting point is selected in the target region,
and then six adjacent points will be filled and tested until all points within the
region are completely tested.

Figure 18.6 shows that, for important areas (such as Beijing), four stratospheric
airship jammers with 100 km effective interference distance are needed among the
0° : 60° sector angle and 300 km range effective interference.

18.5 Conclusions

The stratospheric airship is used as the jammer carrier in this article. The existing
suppression interference has an effect on GPS receivers. On the basis of this
research, a mathematical model about the relationship among jammer height,
transmitted power and effective interference distance is derived when the jammer

lifts up to the near space platform. Under the precondition of a given carrier tracking loop threshold, effective interference range is simulated and analyzed, and then on this foundation, a reasonable jammer deployment height is proposed. The quantitative measurement of cruise missiles lethality is taken into consideration and the interference distance demand is analyzed by means of simulation. In the hexagonal grid system, boundary-fill algorithm is made full use of the strato-spheric airship jammers deployment. Accordingly, the demanding jammer quantity is computed while the point target is needed to protect.

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Chapter 19
Fast Training for Multi-Class Classification: K-SVCR

Zhibin Zhu and Anwa Zhou

Abstract In this paper, we apply a regularized no smooth Newton method to solve the multi-class classification *K-SVCR* machine which is reformulated as an box constrained variation inequality problem (BVIP) with a positive semi-definite matrix. This algorithm fully exploits the typical feature of sparsity solution for the *K-SVCR* method, which shows that our algorithm for *K-SVCR* can be implemented efficiently. Preliminary numerical results on benchmark data sets indicate that the method is remarkably faster than the standard Mat lab routine for training the original *K-SVCR*.

Keywords Fast training · *K-SVCR* regularized no smooth Newton method · BVIP

19.1 Introduction

Assume that

$$\mathrm{T} = \{(x_p, \theta_p)\}_{p=1}^{l} \subset X \times Y \tag{19.1}$$

is an independently and identically distributed training data set, where $X \subset R^n$ is an input space, $Y = \{\Theta_1, \ldots, \Theta_K\}$ is an unordered set of classes, and $K > 2$ is the number of classes to be considered. Then the SVM for multi-class classification is

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to construct an approximation of an unknown function defined from X onto Y by fully exploiting the data set T. The existing approaches [1–4] based on decomposition reconstruction architecture has been proposed for multi-class classification. Recently, *K-SVCR* method [5] and *v-K-SVCR* method [6] use the mixed classification and regression SV (or *v*-SV) machine formulations [7]. Incorporated a regularized no smooth Newton method (RNN) for training the *v-K-SVCR*. Similarly, we apply the RNN to train *K-SVCR* machine in this paper.

19.2 The K-SVCR Machine and Reformulation

Let the training set T be given by (19.1). For an arbitrary pair $\Theta_i, \Theta_j \in Y$ of classes, the *K-SVCR* method constructs a decision function $f(x) = w \cdot \phi(x) + b$ that is supposed to satisfy

$$f(x_i) = y_i = \begin{cases} +1, & i = 1, \ldots, l_1, \\ -1, & i = l_1 + 1, \ldots, l_1 + l_2, \\ 0, & i = l_1 + l_2 + 1, \ldots, l, \end{cases} \tag{19.2}$$

where patterns x_i, $i = 1, \ldots, l_1$, and x_i, $i = l_1 + 1, \ldots, l_{12}$, $l_{12} = l_1 + l_2$, belong to the two classes Θ_i and Θ_j, which will be labeled $+1$ and -1, respectively, and the remaining $l_3 = l - l_{12}$ patterns belong to the other classes, which will be labeled 0. For $\zeta \in [0, 1)$, $C, D > 0$ chosen a priori, the *K - SVCR* method [5] is to solve the dual problem

$$\begin{aligned} \min_r \ & \tfrac{1}{2} \gamma^T Q \gamma + c^T \gamma \\ s.t. \ & h^T \gamma = 0, \\ & a \leq \gamma \leq d, \end{aligned} \tag{19.3}$$

where $c = (-1/y_1, \ldots, -1/y_{l_{12}}, \zeta, \ldots, \zeta, \zeta, \ldots, \zeta)^T$, $a = (0, \ldots, 0, -C, \ldots, -C,$ $0, \ldots 0, 0, \ldots, 0)^T$, $d = (C, \ldots, C, 0, \ldots, 0, D, \ldots, D, D, \ldots, D)^T$, $h = (1, \ldots, 1,$ $1, \ldots, 1, -1, \ldots, -1, 1, \ldots, 1)^T$ in $R^{l_1+l_2+l_3+l_3}$, and Q is the relevant kernel matrix which is composed of the kernel function $k(x_i, x_j) = (\phi(x_i) \cdot \phi(x_j))$. The typical kernel functions include Gaussian kernels $k(x_i, x_j) = \exp(-\|x_i - x_j\|^2 / \kappa^2), \kappa \neq 0$, polynomial kernels $k(x_i, x_j) = (x_i \cdot x_j)^q$ and so on. Obviously, Q is symmetric positive semi-definite. Define $\tilde{l} = l + l_3 = l_1 + l_2 + l_3 + l_3$, $L(\gamma, \mu, v, \omega) = Q\gamma + c + \mu h - v + \omega : R^{\tilde{l}+1+\tilde{l}+\tilde{l}} \to R^{\tilde{l}}$. then, the KKT conditions of the QP (19.3) are

$$\begin{cases} L(\gamma, \mu, v, \omega) = 0, h^T \gamma = 0, \\ v \geq 0, \gamma - a \geq 0, v^T(\gamma - a) = 0, \\ \omega \geq 0, -\gamma + d \geq 0, \omega^T(-\gamma + d) = 0. \end{cases} \tag{19.4}$$

Denote $[a,d] = \left\{ \gamma \in R^{\tilde{l}} \middle| a_i \le \gamma_i \le d_i, i = 1, \ldots, \tilde{l} \right\}$, $\quad \tilde{L}(\gamma, \mu) = Q\gamma + c + \mu h$: $R^{\tilde{l}+1} \to R^{\tilde{l}}$ and $r(\gamma, \mu) = \begin{pmatrix} \gamma - \prod_{[a,d]} [\gamma - \tilde{L}(\gamma, \mu)] \\ h^T \gamma \end{pmatrix} : R^{\tilde{l}+1} \to R^{\tilde{l}+1}$, where $\prod_X x$ is the Euclidean projection of x onto X. Let $z = (\gamma^T, \mu)^T$, $X = [a,d] \times R$, and $F(z) = \begin{pmatrix} \tilde{L}(z) \\ h^T \gamma \end{pmatrix} = \begin{pmatrix} Q & h \\ h^T & 0 \end{pmatrix} z + \begin{pmatrix} c \\ 0 \end{pmatrix} \triangleq \hat{Q}z + q$. Obviously, $\hat{Q}$ is positive semi-definite. Then, $r(\gamma, \mu) = 0$ can be written as

$$r(z) = z - \prod_X (z - F(z)) = 0. \tag{19.5}$$

Consider the following linearly BVIP: Find $z^* \in X$ such that

$$(\hat{Q}z^* + q)^T (z - z^*) \ge 0, \forall z \in X \tag{19.6}$$

We denote the problem (19.6) as BVI (F, X). And it is easy to know that finding a solution of (19.4) is equivalent to solving (19.5) or (19.6). Then we have transformed the dual QP (19.3) into BVI (F, X) (19.6).

19.3 Regularized No Smooth Newton Method for K-SVCR

In this section, we utilize the RNN proposed in [7] to solve our problem (19.6). Denote $F_\varepsilon(z) = (\hat{Q} + \varepsilon E)z + q$. For a given $\varepsilon > 0$, solving $BVI(F_\varepsilon, X)$ is to solving

$$r_\varepsilon(z) = z - \prod_X (z - F_\varepsilon(z)) = 0. \tag{19.7}$$

Now, we specify an element of the B-sub differential $\partial_B r_\varepsilon(z)$ of $r_\varepsilon(z)$ at an any point z and denote $X = [a,d] \times R = \prod_{i=1}^{\tilde{l}+1} [\underline{X}_i, \bar{X}_i]$ where $\underline{X}_i = a_i$, $\bar{X}_i = d_i$, $i = 1, \ldots, \tilde{l}$, $\underline{X}_{\tilde{l}+1} = -\infty$, $\bar{X}_{\tilde{l}+1} = +\infty$. For any given point z, the index set $\{1, \ldots, \tilde{l} + 1\}$ can be partitioned as the union of three index sets $\rho_1 = \rho_1(z) = \{i | z_i - F_{\varepsilon,i}(z) \in (\underline{X}_i, \bar{X}_i).\}$, $\rho_2 = \rho_2(z) = \{i | z_i - F_{\varepsilon,i}(z) \in \{\underline{X}_i, \bar{X}_i\}\}$, and $\rho_3 = \rho_3(z) = \{i | z_i - F_{\varepsilon,i}(z) \notin \{\underline{X}_i, \bar{X}_i\}.\}$, where $F_{\varepsilon,i}(z)$ is the i-th component of the vector-valued function $F_\varepsilon(z)$. Then,

$$H = \begin{pmatrix} [F_\varepsilon'(z)]_{\rho_1 \cup \delta, \rho_1 \cup \delta} & [F_\varepsilon'(z)]_{\rho_1 \cup \delta, \bar{\delta} \cup \rho_3} \\ 0_{\bar{\delta} \cup \rho_3, \rho_1 \cup \delta} & E_{\bar{\delta} \cup \rho_3, \bar{\delta} \cup \rho_3} \end{pmatrix} \in \partial_B r_\varepsilon(z), \tag{19.8}$$

where δ is some index set with $\delta \subset \rho_2$ and $\delta \subset \rho_2$ denotes the complement of δ in ρ_2 [8]. Obviously, the matrix H defined by (19.8) is no singularity for any δ with $\delta \subset \rho_2$, $\varepsilon > 0$ now we describe the frame of the RNN [7] for the K-SVCR, which includes an inner loop and an outer loop as follows.

Algorithm 1 (Inner loop: The NN for $BVI(F_\varepsilon, X)$).

Step 0 Select $z^0 \in R^{\bar{l}+1}, 0 < \alpha < 1 < \beta, \varsigma > 0, \tau \in (0, 1), \sigma \in (0, 1/2), p > 1, \eta \in (0, 1), \theta \geq 0$, and set k = 0.

Step 1 if $\left\| \nabla g_{\alpha\beta\varepsilon}(z^k) \right\| \leq \theta$, stop.

Step 2 Choose an arbitrary matrix $H_k \in \partial_B r_\varepsilon(z^k)$ according to (19.8).

(a) Solve Newton equation $H_k d = -r_\varepsilon(z^k)$, and obtain $d^k \in R^{\bar{l}+1}$, that is to solve
     the following reduced equation

$$[F'_\varepsilon(z)]_{\rho_1 \cup \delta, \rho_1 \cup \delta} d_{\rho_1 \cup \delta} = -[r_\varepsilon(z^k)]_{\rho_1 \cup \delta} + [F'_\varepsilon(z)]_{\rho_1 \cup \delta, \bar{\delta} \cup \rho_3} [r_\varepsilon(z^k)]_{\bar{\delta} \cup \rho_3},$$
$$d_{\bar{\delta} \cup \rho_3} = -[r_\varepsilon(z^k)]_{\bar{\delta} \cup \rho_3}, \tag{19.9}$$

where $\rho_i = \rho_i(z^k), i = 1, 2, 3$. If d^k is not available, then set $d^k = -\nabla g_{\alpha\beta\varepsilon}(z^k)$, and
go to Step 3.

(b) If $g_{\alpha\beta\varepsilon}(z^k + d^k) \leq \eta g_{\alpha\beta\varepsilon}(z^k)$, then set $t_k = 1$ and go to Step 4.
(c) If d^k does not satisfy the descent condition $\nabla g_{\alpha\beta\varepsilon}(z^k)^T d^k \leq -\varsigma \left\| d^k \right\|^p$, then set
     $d^k = -\nabla g_{\alpha\beta\varepsilon}(z^k)$.

Step 3 Let m_k be the smallest nonnegative integer m such that $g_{\alpha\beta\varepsilon}(z^k + \tau^m d^k) \leq g_{\alpha\beta\varepsilon}(z^k) + \sigma \tau^m \nabla g_{\alpha\beta\varepsilon}(z^k)^T d^k$ and let $t_k = \tau^{m_k}$.

Step 4 Set $z^{k+1} = z^k + t_k d^k, k = k + 1$, and go to Step 1.

Here, $g_{\alpha\beta\varepsilon}(z^k) = g_{\alpha\varepsilon}(z^k) - g_{\beta\varepsilon}(z^k)$, $y_{\alpha\varepsilon}(z^k) = \prod_X (z^k - \alpha^{-1} F_\varepsilon(z^k))$, $g_{\alpha\varepsilon}(z^k) = F_\varepsilon(z^k)^T(z^k - y_{\alpha\varepsilon}(z^k)) - \alpha \left\| z^k - y_{\alpha\varepsilon}(z^k) \right\|^2 / 2$, and likewise $g_{\beta\varepsilon}(z^k)$. And the Newton equation in Step 2(a) will be reduced effectively by the nature of K-SCVR.

Algorithm 2 (Outer loop: The RNN for $BVI(F, X)$).

Step 0 Initialization Select $\varepsilon_0 > 0, \lambda \in (0, 1), \bar{\theta} \geq 0$, and set k = 0.

Step 1 Obtain an approximate solution $z(\varepsilon_k)$ of $BVI(F_{\varepsilon_k}, X)$ by Algorithm 1.

Step 2 if $g_{\alpha\beta}(z(\varepsilon_k)) \leq \bar{\theta}$, stop.

Step 3 let $z(\varepsilon_k)$ be the starting point for Algorithm 1, set $\varepsilon_{k+1} = \lambda \varepsilon_k, k = k + 1$,
and go to Step 1.

19.4 Numerical Results

In this section, we present some numerical experiments with the RNN and com-
pare the results with that of the standard Mat lab routine. Three typical data sets
from the UCI repository [9]-Iris, Wine, Glass—have been employed, which is
given in Table 19.1.

Table 19.1 Three benchmark data sets from UCI

	#pts	#ats	#cls
Iris	150	4	3
Wine	178	13	3
Glass	214	9	6

Note #pts, the number of training data; #ats, the number of attributes of patterns; and #cls, the number of classes

Table 19.2 Results of RNN and the standard Matlab routine

	RNN			Mat lab routine
	Time (s)	$g_{\alpha\beta}(z(\varepsilon_k))$	IN	Time (s)
Iris	0.151123	2.8445e-009	4	2.270050
Wine	0.289978	3.8091e-010	4	3.782467
Glass	0.446362	5.9225e-009	4	8.421738

Throughout the computational experiments, the 10-fold cross validation is used. The parameters in algorithms 1 and 2 are set as: $z^0 = 0, \alpha = 0.99, \beta = 1.001,$ $\varsigma = 10^{-8}, \tau = 0.5, \sigma = 10^{-4}, p = 2.1, \eta = 0.9, \theta = 10^{-6}, \varepsilon_0 = 0.1, \lambda = 0.1, \bar{\theta} = 10^{-8}$. And in Algorithm 1, we replaced the termination criteria in Step 1 by $\|r_\varepsilon(z^k)\| \leq \max\{\theta, \varepsilon_k\}$.

In Table 19.2, IN denotes the number of iterations for the outer loop; $g_{\alpha\beta}(z(\varepsilon_k))$ denotes the final value of the D-gap function when the RNN terminates; for the wine data set, we adopt polynomial kernel, where q = 2 and the other data sets with Gaussian kernel, where $\kappa = 1e - 1$. It can be observed from Table 19.2 that the RNN performs much more efficiently than the standard routine.

19.5 Conclusion

In this paper, we reformulate the multi-class classification *K-SVCR* machine as an affine BVIP, and use the RNN method proposed in [7–9] to solve the resulting BVIP. This algorithm fully exploits the typical feature of sparsity solution for the *K-SVCR* method, which shows that it can be implemented efficiently.

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Chapter 20
Study of Short-Term Wind Power Prediction Based on Advanced BP Neural Network Model

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Abstract Wind power prediction is important to wind power system operation with a large amount of wind power integration. Effective prediction for wind power can reduce the difficulty of grid dispatching. In this paper an advanced neural network model was proposed to predict the short-term output power of a single wind turbine in a wind farm. According to the relevant wind speed, wind direction, temperature, output power and other data obtained from the wind farm, the model was established to predict the output wind power ahead of 10 min and 1 h. The simulation results showed that the proposed advanced BP neural network model had a higher prediction accuracy comparing to the existing BP neural network model.

Keywords Wind power · Wind farm · BP neural network · Short-term prediction

20.1 Introduction

With the development of wind power technology, wind turbine unit capacity and the number and size of grid-connected wind farms is expanding, and the proportion of wind power in the power grid is also increasing. The impact of wind power on the grid is more and more obvious, especially when several planned wind farms of million kilowatts level connected to grid, which will have a significant impact

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on the stability, power quality, flow distribution and dispatch mode of the grid [1]. To meet the power demand, guarantee the stability of grid operation and reliability of power supply, effective planning and scheduling is essential to power system. However, the inherent volatility, intermittent, and anti-shaving characteristics of wind power, increases the difficulty of power system planning and scheduling. If wind power can be accurately predicted, it's beneficial to make scheduling plan, reduce its adverse effects on the entire grid, and reduce the power system operating costs and spinning reserve. It can also increase the wind power penetration limit, and is conducive to develop power exchange plan accurately under the open electricity market.

Artificial neural network has parallel processing, distributed storage and fault tolerance characteristics, along with self-learning, self-organizing and self-adaptive capacity, so it's very effective for solving complex problems. Because of these advantages, neural network technology gets the widest application in wind power prediction [2, 3]. However, there are some problems in using the neural network models for wind power prediction. The models select data of a long continuous time before forecast point when choosing training data set [4, 5]. By training the neural network to achieve the non-linear input–output mapping relation under all weather conditions, and then make predictions based on the mapping relation. This way needs a huge number of training data, resulting in a long training time and a slow convergence speed [6, 7], easily falling to over-fitting. Besides, the gained mapping relation is an average approximation under all weather conditions, which would limit further improving the prediction accuracy. The existing neural network models that use weather data to make wind power prediction all have this problem [8].

For the above shortcomings of the existing neural network prediction models, this paper designed an advanced BP neural network model choosing training data set based on weather data similarity.

20.2 Advanced BP Neural Network Model Based on Weather Data Similarity

This advanced BP neural network prediction model selected the appropriate training data set based on weather data of every forecast period, and then made specific training to get the mapping relation under weather condition of the period for wind power prediction.

20.2.1 Choose Input and Output Data

The data used in this paper is from a single wind turbine in a wind farm, which is all kinds of system and environmental data from 01/02/2008 to 24/02/2008,

recording every 10 min. From various types of historical data, selecting the average wind speed, wind direction and the average environmental temperature that affect the output active power mainly, and take the vector {average wind speed, wind direction sine, wind direction cosine, environmental temperature} as input data of the model. This paper adopted direct prediction method, therefore selected active power as the BP neural network model output data. This paper called input data and the corresponding output data as the source data.

20.2.2 Remove Bad Data Set

Wind power prediction modeling requires a large number of historical data as training samples. However, the historical data would be affected not only by measurement error of measuring device itself, but also by data transmission errors and scheduling plan as well as other factors. So, the historical data may contain data missing, unusual fluctuations and non-real data. This paper took prediction based on weather data, so when limiting the wind farm output power because of scheduling plan, weather data and wind farm output power would not accurately reflect the right mapping relation. Take the weather data and wind farm output power in this case as bad data.

   The training sample set containing bad data; it will probably get the wrong mapping relation, leading to serious distortions in predictions. So that, identifying and removing bad data is a necessary safeguard for training neural network.

20.2.3 Data Normalization and Anti-Normalization

In order to prevent weight adjustment entering the flat area of the error surface because the absolute input value is too large, usually the input and output data needs proper process to improve the generalization ability and prediction accuracy. Data processing commonly uses normalization method, the network input and output data will be limited to [0, 1] or [−1, 1]. In this paper, the normalized formula is as follows, the input and output data is limited to [−1, 1].

$$Y_i = \frac{X_i - X_{min}}{X_{max} - X_{min}} \qquad (20.1)$$

where, X_{max} and X_{min} are the defined maximum and minimum values of input and output data, X_i and Y_i are the input and output data values before and after normalization.

After getting prediction value, it needs to be anti-normalized to restore to the original data range. Anti-normalization formula is as follows:

$$X_j = Y_j \cdot (X_{max} - X_{min}) + X_{min} \tag{20.2}$$

where, X_{max} and X_{min} are respectively the maximum and minimum values of output data, Y_j and X_j are prediction values before and after anti-normalization.

20.2.4 Weather Data Similarity

The proposed BP neural network model used the input vector $X = \{$average wind speed, wind direction sine, wind direction cosine, environmental temperature$\}$. Using the weighted Euclidean distance to determine the weather data similarity, the formula is:

$$S_{i,j} = 1 - \sqrt{\sum_{k=1}^{4} w_k \cdot (X_{i,k} - X_{j,k})^2} \tag{20.3}$$

where, $S_{i,j}$ is the similarity between input vector Xi and Xj, w is the weight vector. The wind speed is the greatest impact factor which plays a decisive role. Constrained by the wind farm topography, different wind direction has different impact to wind farms, so wind direction is also an important factor. Environmental temperature affects air density, so it can affect the wind turbine active output power, too. This paper determines the weight vector w = $\{0.7, 0.1, 0.1, 0.1\}$.

20.2.5 Determine the Network Structure

The designed BP neural network model is of three-layer structure, including input layer, hidden layer and output layer. Input layer node number equals to the number of input variables, therefore, take the input layer node number as 4. As well, take the output layer node number as 1.

There is no perfect theoretical basis for selecting hidden layer node number at the present time, only some empirical formulas. For example, through research on three-layer BP network, Kolmogrov found that the number of hidden layer node should be $2N + 1$, where N is the number of input layer node. Based on his geometric interpretation of multi-network functions, Lippman figured that the number of second hidden layer node should be $2M$, where M is the number of output layer node. Refer to empirical formulas, this paper conducted manifold experiments on three typical wind speed sections namely low-speed (<5 m/s), medium-speed (5–9 m/s), high-speed (>9 m/s) in many areas. According to the result, determine a single hidden layer structure, and the number of nodes is 13.

20.3 The Modeling and Forecasting Process of the Advanced BP Neural Network

The flow chart of modeling and forecasting process is as follows.

1. Build up BP neural network model, determine the net structure.
2. Remove bad data set from source data.
3. Normalize source data.
4. Forecast period t = 1.
5. Normalize weather data of the current prediction period according to the source data normalization format.
6. Work out weather data similarity between the source data and weather data of the current prediction period, and choose train data set according to the similarity.
7. Train the BP neural network with the gained training set.
8. Do prediction simulation, and then anti-normalize the prediction results.
9. t = t + 1, if t > T, end; else, go to step 5.

20.4 Prediction Results Analysis

To evaluate the performance of the proposed advanced BP neural network prediction model scientifically and objectively, this paper made prediction results analysis taking existing BP neural network models as a basis for comparison. Percentage error PE1 is prediction error relative to the actual value and the percentage error PE2 is prediction error relative to the installed capacity of wind turbines. The maximum absolute percentage error MRPE1 and mean absolute percentage error MAPE1 are taken as sensitivity indicator, MRPE2 and MAPE2 are taken as accuracy indicator. The formulas are as follows:

$$PE1(i) = \frac{f_i - r_i}{r_i} * 100\,\% \tag{20.4}$$

$$PE2(i) = \frac{f_i - r_i}{P} * 100\,\% \tag{20.5}$$

$$MRPE1 = \max_{i=1}^{N}\{|PE1(i)|\} \tag{20.6}$$

$$MRPE2 = \max_{i=1}^{N}\{|PE2(i)|\} \tag{20.7}$$

$$MAPE1 = \frac{1}{N}\left[\sum_{i=1}^{N}|PE1(i)|\right] \qquad (20.8)$$

$$MAPE2 = \frac{1}{N}\left[\sum_{i=1}^{N}|PE2(i)|\right] \qquad (20.9)$$

where, f is the predictive value of wind turbine active power output, r is the actual value of wind turbine active power output, N is the number of prediction samples, P is the installed capacity of wind turbine.

Set the number of hidden layer node as 13, the maximum number of epochs to train as 400, the performance goal as 0.0005, the minimum gradient as 10–10. The transfer function uses "tansig". When equally using hourly data of the previous 23 days as source data to predict hourly power output of the 24th day, the prediction results comparisons are as in Figs. 20.1, 20.2 and 20.3.

Keep BP neural network parameter settings unchanged, use every 10 min data of the previous 23 days as source data, to predict the previous 4 h' 10 min power output of the 24th day, the prediction results comparisons are as in Figs. 20.4, 20.5 and 20.6.

By comparing the three curves of the prediction results, it can be figured that, the advanced BP prediction model has higher prediction precision than the existing BP prediction models. The error range of the advanced BP prediction model is smaller, and plus and minus error are well-distributed, and this trend is even more apparent with the source data increase, which is helpful for the development of scheduling plan. In addition, short-term changes of wind power is very significant, the hourly average power range of the first 4 h is about 500–700 kW, while the every 10 min power average reaches even 300–900 kW.

Table 20.1 is the sensitivity indicator and accuracy indicator contrast. It can be figured that, the advanced BP prediction model is superior to the existing BP prediction models, and along with the source data increases, the advantage of the advanced BP prediction model is more obvious. For example, for hourly
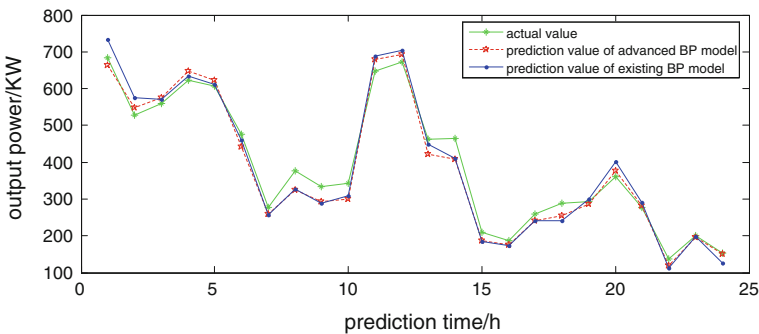
Fig. 20.1 Contrast of hourly prediction results
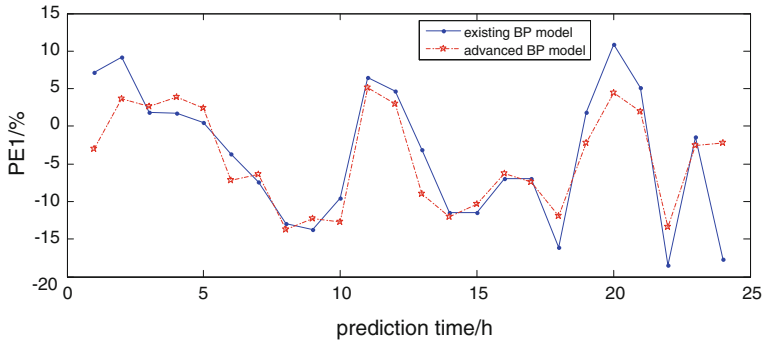
Fig. 20.2 Contrast of hourly prediction results *PE*1 curve
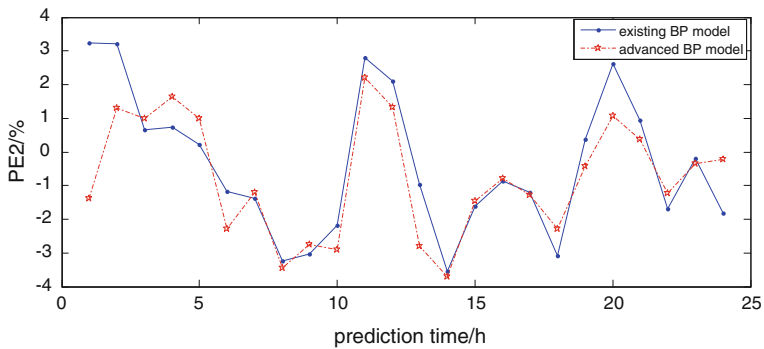
Fig. 20.3 Contrast of hourly prediction results *PE*2 curve
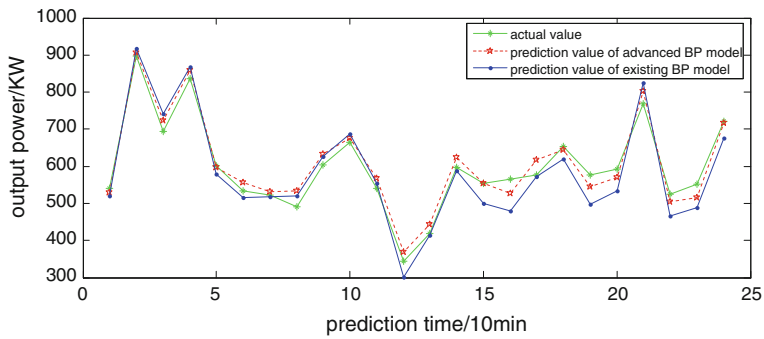
Fig. 20.4 Contrast of every 10 min prediction results

prediction, the MRPE1 and the MAPE1 of the existing BP prediction model are respectively 18.5063 and 7.9397 %, while the MRPE1 and the MAPE1 of the advanced BP prediction model are respectively 13.7214 and 6.6606 %; and for every 10 min prediction, the MRPE1 and the MAPE1 of the existing BP prediction
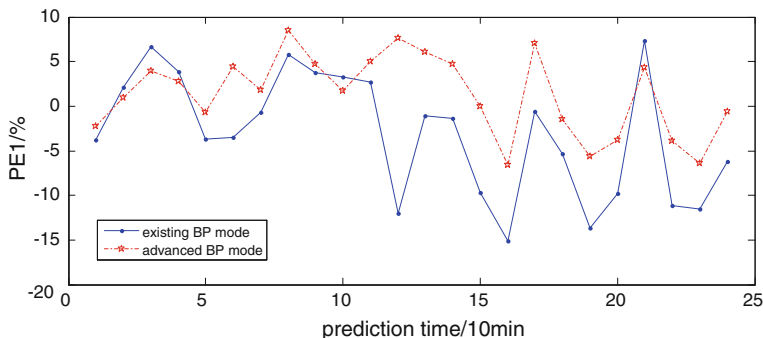
Fig. 20.5 Contrast of every 10 min prediction results *PE*1 curve
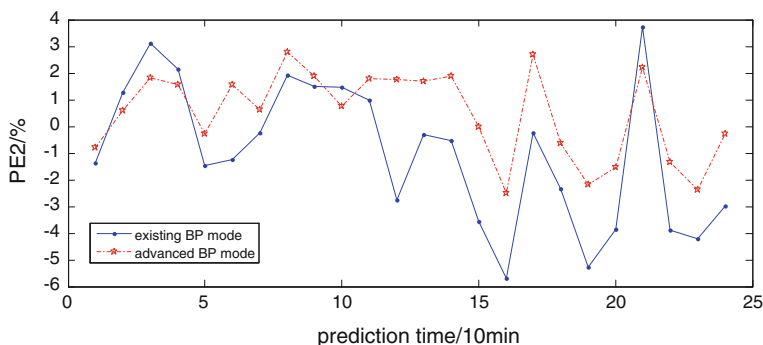
Fig. 20.6 Contrast of every 10 min prediction results *PE*2 curve

Table 20.1 Contrast of prediction results sensitivity indicator and accuracy indicator

Model	Hourly prediction		Every 10 min prediction	
	Advanced BP model (%)	Existing BP model (%)	Advanced BP model (%)	Existing BP model (%)
*MRPE*1	13.7214	18.5063	8.5072	15.1236
*MAPE*1	6.6606	7.9397	3.9605	6.0253
*MRPE*2	3.7067	3.5527	2.7858	5.6985
*MAPE*2	1.5955	1.7875	1.4816	2.3358

model are respectively 15.1236 and 6.0253 %, while the MRPE1 and the MAPE1 of the advanced BP prediction model are respectively 8.5072 and 3.9605 %. It shows that, the advanced BP prediction model chooses the appropriate training data set based on the weather data character of every prediction period, and then made specific training to get the mapping relation under weather condition of the period for wind power prediction. So that, the model is more sensitive and accurate, and with source data under all kinds of weather conditions increase the prediction accuracy can be further improved.

20.5 Conclusions

This paper briefly described the problems of the existing neural network models for wind power prediction at first. Then, for the shortcomings of the existing neural network model in selecting the training data sets, the advanced BP neural network model based on weather data similarity was proposed, and the improved modeling approach and prediction process was detailed. Finally, by prediction results analysis showed that the improved BP neural network model is advantage than the others of BP neural network model.

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Chapter 21
Research on Regional Differences and Convergence of the Efficiency of the Telecommunications Industry

Yaming Zhang, Chaosheng Tang and Ruijia Sun

Abstract The telecommunications industry is the most dynamic growth engines to promote the economic development of China. This paper analyzes the efficiency of China's telecommunications industry from 2003 to 2009 by DEA. Then we discusses the α and β convergence of the efficiency of China's telecommunications industry by coefficient of variation and wilcoxon signed rank test and Kendall'w test. The discussion concludes that the efficiency of China's telecommunications industry was influenced by the user scale; regional differences existed in the telecommunications industry market and the factors affecting the efficiency changes in different regions. This paper analyzes the efficiency of China's telecommunications industry from 2003 to 2009 by DEA. Then we discusses the α and β convergence of the efficiency of China's telecommunications industry by coefficient of variation and wilcoxon signed rank test and Kendall'w test. The results indicated that although the regional differences of the telecommunications industry of China is shrinking, the market is not mature enough and still needs to adopt strict asymmetric regulation policy to promote effective competition and coordinated development of the telecommunication market in China.

Keywords Efficiency of the telecommunications industry · Convergence · Non-parametric test

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21.1 Introduction

In recent years, under the dual drive of technological progress and customer requirements, the convergence of telecommunications and IT industry, software industry and service business is inevitable. It is in this situation that the value networks of global telecommunications formed. The telecommunications industry has become an important engine that promotes the development of national economy, which draws the attention worldwide to increase the input intensity. An issue followed is that whether the value of telecom investment profits can be quantified and proved. Therefore, the efficiency problem of telecommunications industry has become a hotspot to scholars both home and abroad. For example, the study of Uri [1], Kang [2] indicated that the efficiency of telecommunications can be improved by government regulations in the aspects of innovation and competitive system environment. Goto [3] put forward with the approaches for operators in different regions to increase the productivity. By comparing the changes of the telecommunication efficiency in European Union, China and other regions, Giokas and Pentzaropoulos [4] Li Zaiyang [5] analyzed its deep reasons and pointed out that improving the management level and changing the investment strategy is of great significance to enhance the telecommunications industry efficiency. In addition, Resende [6] and Van Meensel [7] studied the measurement precision of the telecommunications industry efficiency. These achievements provide theoretical basis for this paper, however it should be noted that these researches are still far away from perfect especially in the measurement efficiency. As the present research of measurement adopts classical model DEA, leading to the calculation deviation as a result of crowd or loose vested elements. Furthermore, during the comparison of regional differences, the former research failed to notice the convergence of efficiency and the "efficiency catch up" or "leap phenomenon" in the development process of China telecommunication. Based on this, we discussed the former problems and analyzed the further of China telecommunication.

21.2 Methodological Framework

21.2.1 Computation of Efficiency

The non-parametric statistical method was mostly used for calculating the telecom efficiency. Considering the DEA characters of input indeterminacy, explicit expression among outputs and the strong observation of estimated results, the SBM model based on input relaxation measure was introduced in this paper to overcome the defect of traditional DEA model and to compute overall technical efficiency (OE), pure technical efficiency (PE) and scale efficiency (SE). In formula (21.1), s presents the slack of inputs and outputs, λ is a weight vector, the target function p is strictly decreasing about S^-, S^+ and $0 \leq \rho \leq 1$. When and only when $S^- = 0$, $S^+ = 0$,

the target unit is efficiency. If $\rho < 1$, the target unit is inefficiency and it's necessary to mend on inputs and outputs.

$$\begin{aligned}
\min \rho \quad &= \frac{1-(1/m)\sum_{i=1}^{m} S_i^- / x_{i0}}{1+(1/s)\sum_{r=1}^{s} S_r^+ / y_{r0}} \\
\text{st} \quad x_0 \quad &= X\lambda + s^- \\
y_0 \quad &= Y\lambda - s^+ \\
\lambda \quad &\geq 0, s^- \geq 0, s^+ \geq 0
\end{aligned} \tag{21.1}$$

21.2.2 Concepts of Convergence and Computation of Convergence Statistics

α-convergence and β-convergence tests were applied in convergence analysis of telecom efficiency. The α-convergence calculation, created by Friedman, was used to figure up the annual change of Chinese telecoms industry during a certain period of time. β-convergence test was drew lessons from Heli A. Koski's [8] process to approach Wilcoxon signed rank test and Kendall's W consistency check. Among this the Wilcoxon Matched-Pairs Signed Rank Test measures intra-distributional movements between the each sampled year and the base year. Kendall's W measures the same difference in means over the whole sampled period. The changes of efficiency distribution was directly tested by these two methods, which means that via β-convergence significance test it can be analyzed whether if the previously region with poor efficiency turned into more efficiency compared with the previously region which have high efficiency. The first possibility is that both α-convergence and β-convergence occurred. This indicates that the originally poor efficiency regions were catching up the originally high efficiency regions. The second possibility is the presence of α-convergence rather than β-convergence. This implies that the variance of the distribution of performance measure decreases as time goes on-which means that catching up occurs—but no leap-frogging is taking place. The third option, β-convergence without α-convergence, shows that catching up occurred even if the α-convergence indicates that the variance of the distribution of the performance measure has not decreased, and the efficiency of backward areas lifted more quickly than the previously advanced areas. The fourth possibility is that neither α-convergence nor β-convergence occur which illustrating intra-distributional stability and inter-distributional stability across time. These two test statistics are calculated as follows:

The Wilcoxon matched-pairs signed rank test:

$$Test\ statistics\ z = \frac{T_+ - \frac{n(n+1)}{4}}{\sqrt{\frac{n(n+2)(2n+1)}{24}}} \tag{21.2}$$

where T_+ = the smaller of the positive and negative rank sums. The hypothesis that the probability distributions of the rankings of the countries for the two years considered are identical

Kendall's W:

$$Test\ statistics: \ W = \frac{12S}{m^2(n^3 - n)} \tag{21.3}$$

Where m is the number of rankings, n is the number of countries and S is the sum of squares of deviations of the annual rankings of the countries around their mean rankings. Kendall's W ranges from 0 to 1. The smaller the value of W, the greater the mobility within the distribution.

21.3 Data and Models

Index selection is of great significance to the efficiency measure results. Uri's [1] research was referenced in this article and the labor, capital and material were input variables while the output indicators were gross telecom industry and telecom users (including the number of fixed-line and mobile phone users). Labor input was measured by the number of workers and staff and capital input was the total amount of investment in the fixed assets the next year. The switch capacity should be taken as input variables alone. Data involved in this paper mostly derive from China Statistical Yearbook, China Telecom Industry Statistics Bulletin.

The gross of telecom industry was widely considered as an index reflecting the economic benefit of telecom industry while the amount of telecom users can commendably show the customer care of telecom. Consequently, we derive three evaluation models since the different output index under the condition of the invariant input index. Model 1 is about the economic efficiency in which the gross of telecom industry is the output index. Model 2 is about service efficiency in which the number of telecom users is the output index. Model 3 is a comprehensive efficiency in which the aggregation of the before two is the output. It is necessary to calculate the overall efficiency, pure technical efficiency and scale efficiency of the three models according to the different output variables. To facilitate the analysis, we can divide China into three major economic zones including the East, West and middle regions.

21.4 Empirical Analysis

21.4.1 Results of the Efficiency

Table 21.1 presents the mean of DEA efficiency based on output about all districts. According to model 1, the efficiency of Chinese telecom have generally improved especially in the eastern part with a rate of 0.815 is higher than national average 12.5 %. The annual rate growth of the western part (2.61 %) is the fastest one

Table 21.1 Annual changes of efficiency from 2003 to 2009

Economic efficiency

	Mean efficiency			Growth rate (%)			Average annual growth rate (%)		
	OE	PE	SE	OE	PE	SE	OE	PE	SE
East	0.815	0.835	0.976	4.51	2.82	1.69	1.03	0.68	0.29
Middle	0.66	0.67	0.985	3.08	1.93	1.16	1.38	1.13	0.19
West	0.685	0.751	0.925	10.76	4.72	4.88	2.61	1.08	0.92

Service efficiency

	Mean efficiency			Growth rate (%)			Average annual growth rate (%)		
	OE	PE	SE	OE	PE	SE	OE	PE	SE
East	0.938	0.949	0.988	−2.97	−3.64	0.73	−0.5	−0.59	0.12
Middle	0.910	0.915	0.994	−8.52	−8.21	−0.34	−1.3	−1.27	−0.06
West	0.870	0.907	0.962	−2.66	−3.89	1.3	−0.4	−0.63	0.22

Comprehensive efficiency

	Mean efficiency			Growth rate (%)			Average annual growth rate (%)		
	OE	PE	SE	OE	PE	SE	OE	PE	SE
East	0.911	0.928	0.982	1.27	−0.89	2.16	0.44	0.03	0.39
Middle	0.824	0.830	0.992	−5.89	−6.46	0.67	0.17	−0.06	0.12
West	0.809	0.856	0.950	5.72	0.71	4.56	1.56	0.44	0.82

which is 1.6 % higher than national average level. VRS value indicates that the pure technical efficiency increased by 3.3 % and its average annual growth rate is the highest. SE demonstrates that the integrity level of scale efficiency in Chinese telecom is pretty high and the western part has the fastest average annual growth rate (0.92 %). Model 2 reveals the continued high-level service efficiency of Chinese telecom infrastructure but the overall efficiency and the pure technical efficiency descended, thereinto, the middle part has the greatest reduction while the western has the minimum. Looking from the SE results, the middle area takes the top spot on the efficiency and the western part has the highest growth rate (0.994). According to model 3, the comprehensive efficiency is promoted. The average TE of the east is the highest while the scale efficiency of the middle is the best with a rate of 0.985. However, the TE and SE growth rate and the average annual growth rate of the west is the fastest. In a word, the results of model 1–3 indicated that the service efficiency of the Chinese telecom in recent years has achieved a high level, while the average annual growth rate is less than 1 %. The development level of eastern telecommunications industry is higher, mid area is mainly affected by the operation scale, and the western region has good development potential with the fastest average efficiency.

21.4.2 Convergence Analysis of the China Telecom Efficiency

Table 21.2 provides the coefficient variation and Wilcoxon matched pair rank test of Chinese telecom efficiency. The annual average convergences speed of overall efficiency in the three model were 0.32, −9.38, and −5.71 % in accordance with

Table 21.2 Convergence of the China telecom efficiency

Years	Model 1		Model 2		Model 3	
	Coefficient of variation	Wilcoxon Z	Coefficient of variation	Wilcoxon Z	Coefficient of variation	Wilcoxon Z
2003	0.158777693		0.074003		0.097797	
2004	0.182166653	-4.288499^R	0.078764	$-0.96223**$	0.112308	-2.618799^R
2005	0.139617298	$-0.097304**$	0.057822	$-1.9569**$	0.098034	$-0.276297**$
2006	0.180101556	-4.267930^R	0.087307	$-2.43261*$	0.148016	-4.184089^R
2007	0.128770312	-2.560758^R	0.088518	$-0.14055**$	0.101742	$-0.768855**$
2008	0.158501135	$-0.854116**$	0.094418	$-1.52444**$	0.129184	$-1.729800**$
2009	0.13788374	$-2.396212*$	0.110865	$-1.86143**$	0.110347	$-0.431947**$
AV. CON.	0.003248502		-0.093849		-0.057067	

* means that H0 hypothesis cannot be rejected at the 0.01 level. ** means that H0 hypothesis cannot be rejected at the 0.05 level Superscript R means that H0 can be rejected at the 0.01 level

the coefficient of variation results. Model 1 indicates that regions with comparatively inefficient in telecom field are undergoing the slow growth but the model 2 and model 3 share an opposite conclusion. Wilcoxon matched pair rank test displays a complicated outcome about the efficiency changes of Chinese telecom. A conclusion that can be deduced in model 1 is the rank of regional telecom economic efficiency β-converged in the year of 2004, 2006 and 2007 while model 2 holds no brief, and the same measuring result in Model 3 appears β-converge observably. This result implies that the significant changes have occurred in the ranking position of different areas in Chinese regarding to the overall efficiency and several backward areas have caught up previously more advanced areas, that is the so-called "efficiency leapfrog".

Table 21.3 shows the Kendall consistency check of the efficiency in the three models. From the overall fluctuations during 2003–2009, it proved β-converged significantly, or in other words, the obvious change in distribution of input variables and the values of efficiency indicates that "leapfrog" phenomenon appeared during the development of Chinese telecommunication industry. This conclusion and the results of overall efficiency in models based on Wilcoxon inspection displayed inconsistent. The distinctive of investigation period is one of the factors lead to this inconformity. The non-obviousness in service efficiency of Chinese telecom-deduced from model 2 is mainly owing to that Wilcoxon inspection in the rank of each area between the sampling year and the base year (2003) while

Table 21.3 Kendall coefficient of concordance

	Kendall coefficient of concordance: W	$\chi2$
Economic efficiency	0.487927256	90.75447 R
Service efficiency	0.130400301	24.25446 R
Comprehensive efficiency	0.305328198	56.79104 R

Superscript R means that H0 can be rejected at the 0.01 level

Kendall consistency check takes the rank changes in all the 7 years into account vidlicet the place variation of ranking in the regions. On the other hand, the Kendall'W value of Chinese telecom is quite small although β-converge appeared, which means the efficiency ranking experiences great movement on one time and another. The same conclusion during 2003–2009 different regions show poor consistency and convergence and divergent appear alternately was drawn contrasted with Table 21.2.

21.5 Conclusion

As the foundational, prescient and strategic industry, telecommunication is playing a non-substitutable role in the development of national economy. The conclusion of this paper indicated that although the efficiency of China telecoms is improving, it remains to be extensive growth based on user scale-driven and witnessed great regional variation. In addition, although leapfrogging phenomenon emerged in the process of telecommunication progress, but this leapfrog was not stable as a result of the immature telecoms market. Therefore, asymmetrical controlling measures combining with the present practice of China should be carried out to realize effective competition and regional harmonious development of China telecommunication.

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Chapter 22
A New Method for Fault Type Identification Based on HHT and Neural Network in Distribution Network

Zhongjian Kang, Aina Tian and Yanyan Feng

Abstract In order to identify the type of distribution network fault accurately and reliably, the article divided the fault into two types-asymmetric ground fault and others by the zero-sequence current, extracted the energy distribution at different moments and different frequency bands by the Hilbert-Huang transform, trained the two neural networks with the energy distribution characteristics and the code of the fault type and inputted the energy distribution characteristics of the tested fault into the corresponding BP network to identify the specific type of fault. A number of simulations prove that this identification method improve the accuracy of various types of fault identification in a large degree and the fault distance, fault time, the grounding resistance and the system operation mode can't impact the identification.

22.1 Introduction

Fault classification is the classification and recognition of the 10 kinds of fault line fault types (AG, BG, CG, ABG, ACG, BCG, ABC/ABCG, AB, AC and BC). References [1–5] discussed the fault location in transmission network in-depth.

In distribution system, fault classification is the basis of distribution network fault analysis and plays a very important role in the fault analysis [6]. The

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traditional methods of fault identification are mostly based on the set threshold, based on some kind of logical relationship [7]. However, the voltage, current information obtained is usually affected by some random factors including system operating mode, the fault location, the transition impedance, fault time, etc. References [6–12] had a positive discussion on fault classification of the distribution network. References [8, 9] constructed the membership function by using the relationship of the phase angle between the current sequence components, established the fuzzy rules and classified the fault by fuzzy reasoning. But the membership function is artificial given and cannot adjust self—adaptively. Reference [10] pre-processed the fault current/voltage signal and extracted the band energy by stationary wavelet transform and identified the fault type by the comparison of the band energy and the established threshold. But the threshold relies on the expertise. Reference [11] pre-processed the fault signal to filter out a large number of harmonics and non-periodic component by using the wavelet transform technique and accurately extracted the power frequency to constitute the neural network training sample set then identified the fault type by building wavelet neural network. Reference [6] used the wavelets transform to extract the fault features band signal, structured the eigenvectors of the fault classification which is the input of the adaptive neural-fuzzy inference system and completed the fault classification of the small current grounding distribution system.

In this paper, all faults are classified into two categories by zero-sequence current. The distribution of the current energy is extracted by HHT. Then the neural network is trained by the current energy distribution and the encoding of the type of fault. Ultimately, a new method that extracted the fault features of the three-phase transient current by the Hilbert-Huang transform and identified the fault type by neural network is formed and then was tested in Matlab/Simulink.

22.2 The Theory of HHT

Hilbert-Huang Transformation (HHT) is a new time–frequency analysis method proposed by Huang [13–15]. It has good local time–frequency properties. HHT overcomes the difficulty to select wavelet base function in wavelet transform. From signal itself, the scale of the characteristics of the signal, the decomposed intrinsic mode functions (intrinsic mode, the IMF), which are extracted from the scale characteristics of the original signal.

22.2.1 Empirical Mode Decomposition

Empirical mode decomposition (EMD) is a new signal processing method proposed by Huang [13]. EMD can decompose the signal into some IMFs with different frequencies [14, 15]. The decomposition process of EMD is shown as following [14, 15]:

Step 1 Use the local maximum value and the local minimum value of the signal to evaluate the average value of the upper envelope and the lower envelope.

Step 2 The original data series minus the average envelope, we can get a new data series without the low frequency signal from the original series and the new data series is denoted as H. We can continue to decide whether or not H is the IMF conditions. If H is a IMF, H is regarded as the new signal, or we can repeat the above process until H meets the IMF conditions. Thus, we let c1 is equal to H and c1 is regarded as IMF1.

Step 3 Letting $r = x(t) - h_1$ and r is a new signal, we repeat the step 1 and step 2. So we can get IMF2, IMF3, and so on until r meet the given conditions. Thus, the original data series are decomposed into some IMF components and a mean or tendency component, which is represented as the following equation

$$x(t) = \sum_{t=1}^{n} c_t + r \qquad (22.1)$$

22.2.2 Hilbert Transformation

For any continuous time signal, its Hilbert transformation is defined as

$$Y(t) = \frac{1}{\pi} \int_{-\infty}^{+\infty} \frac{X(\tau)}{t - \tau} d\tau.$$

The analytical signal of the original data signal can be obtained from the complex conjugate, which is denoted as the following equation

$$\begin{aligned}
Z(t) &= X(t) + jY(t) = a(t)e^{j\theta(t)} \\
a(t) &= \sqrt{X^2(t) + Y^2(t)} \\
\theta(t) &= \arctan[Y(t)/X(t)]
\end{aligned} \qquad (22.2)$$

The instantaneous frequency is defined as $f(t) = \frac{1}{2\pi}\frac{d\theta(t)}{dt}$.

The IMFs, obtained by EMD, meet the conditions to make instantaneous frequency has a real physical significance.

22.3 Short-Circuit Fault Type Identification Method Based on HHT and Neural Network in Distribution System

Regardless of the complexity of the distribution network, when any incentive is added to the first terminal (three-phase were added), the response is determined and the relationship is one-to-one. When the fault type and the fault phase are different, the response will be different. In this paper, the frequency-domain

characteristics of the three-phase current are taken as the criterion of the fault type identification. The frequency characteristics of the three-phase current are analysis as follows (Fig. 22.1):.

There are apparent different between the current stimulus response of the fault phase and the non-fault phase from the simulation waves. For fault phase, there are high energies in the lower and higher region, but for the non-fault phase, there is not. So that we can extract the energy within the corresponding frequency band by using the HHT to distinguish the fault phase and the non-fault phase. Therefore, the use of three-phase current frequency-domain characteristics to distinguish the fault type and fault phase is very effective.

The original fault current signal is decomposed into some IMF by EMD. The highest frequency components energy exists in the first IMF and the lowest frequency component energy exists in the last IMF. Those IMF containing high frequency components and low frequency components are transformed by Hilbert transformation. After that we can get the amplitude spectrums and the energy distribution characteristics, noted as P, of every IMF.

Ten categories of fault are divided into two types: the asymmetric Ground Fault and other faults according to whether the zero-sequence current is zero. From the above analysis, when the fault type is different, the feeder-side current's frequency energy is different. So, the samples of the BP neural network are the P in the condition of various types of fault in different time, with different grounding resistance and the encoding of the type of the fault (three binary coded). Inputting the current frequency characteristic in different fault conditions into the BP neural
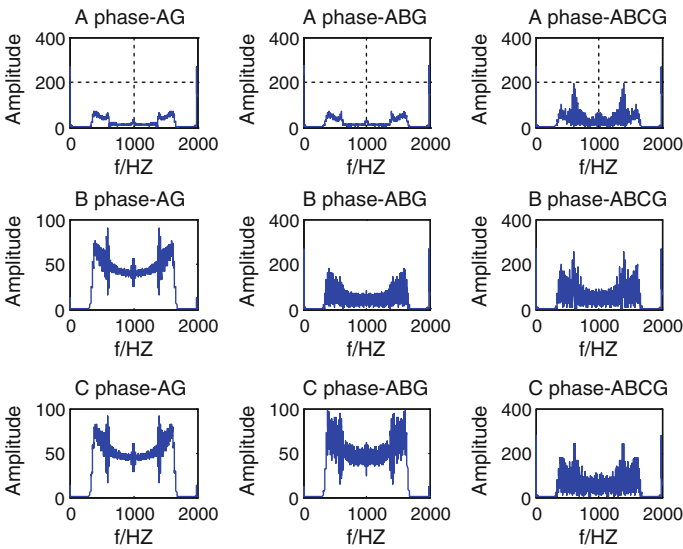
Fig. 22.1 The frequency-domain characteristics of each phase current in case of single-phase, two-phase and three-phase short-circuit (AG, ABG and ABCG)
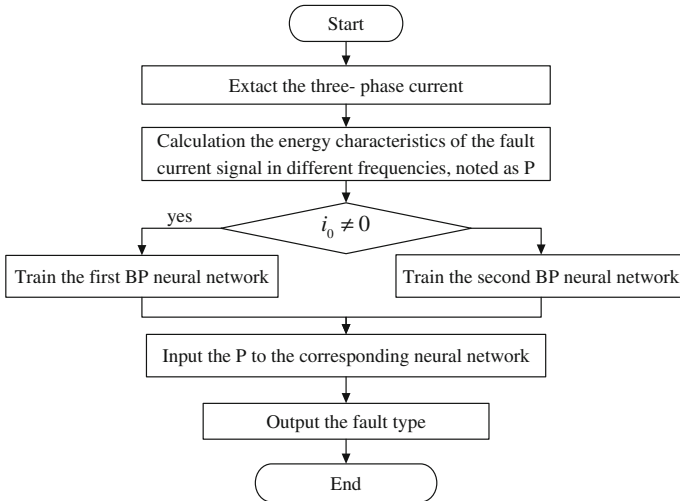
Fig. 22.2 The flow chart of the method based on the HHT transform and artificial neural network

network can get the output that is the codes of the various faults. Finally, according to the fault code, we can identify the specific type of fault.

The flow chart of the method for fault type identification based on HHT and neural network in distribution network is shown in Fig. 22.2.

22.4 Simulations in Different Fault Conditions

22.4.1 The Simulation Model

The distribution network simulation system model is built in Matlab/Simulink, which is shown as Fig. 22.3.

The line is used as the distributed parameter model and the overhead lines positive-sequence and zero-sequence resistance, inductance and capacitance are 0.17 Ω, 1.2 mH, 9.697 nF respectively and 1.93 Ω, 5.48 mH and 143 nF respectively. The sampling frequency is 100,000 times per second.

22.4.2 Simulation Cases

We set the fault in different location, different time with different transition resistance and load. For each type of the fault, we set fifty different conditions. The
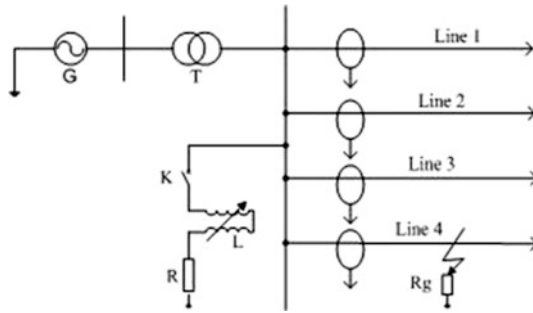
Fig. 22.3 Equivalent circuit diagram of simulation model

Table 22.1 The results of the fault type identification

Fault type	Load/ %	Location/km	RF/Ω	Time/s	Fault encoding			Result
AG	120	3	0	0.03	1.0023	0.0026	−0.0061	AG
AG	100	22	300	0.07	1.0004	0.0012	0.00062	AG
AG	80	7.5	32	0.04	0.9998	−0.0002	−0.0030	AG
BG	120	4	16	0.02	0.0018	1.0019	0.0015	BG
BG	100	20	144	0.07	−0.005	0.9998	0.0035	BG
BG	80	25	192	0.06	0.0025	1.0015	−0.0009	BG
CG	120	5	20	0.03	−0.001	−0.0010	1.0005	CG
CG	100	15	100	0.04	−0.001	0.0013	0.9981	CG
CG	80	7.5	30	0.02	0.0011	0.0005	0.9965	CG
ABG	120	6	24	0.01	0.9994	0.9998	0.0012	ABG
ABG	100	23	160	0.05	0.9995	0.9997	0.0012	ABG
ABG	80	7.5	36	0.04	1.0003	0.9977	0.0025	ABG
BCG	120	5.5	20	0.08	0.0034	1.0014	0.9946	BCG
BCG	100	20.5	140	0.05	−0.003	1.0001	1.0033	BCG
BCG	80	19.5	132	0.04	0.0176	1.0169	0.9509	BCG
ACG	120	21	144	0.02	1.0053	0.0004	0.9891	ACG
ACG	100	12.5	72	0.06	1.0008	0.0009	0.9987	ACG
ACG	80	4.5	12	0.07	1.0251	0.0224	1.0072	ACG
AB	120	4	-	0.01	0.9780	0.9879	−0.0172	AB
AB	100	13	-	0.05	1.0025	1.0011	0.0023	AB
AB	80	24	-	0.06	1.0019	1.0008	0.0022	AB
BC	120	6.5	-	0.02	0.0010	1.0009	1.0011	BC
BC	100	18	-	0.06	0.0029	1.0024	0.9999	BC
BC	80	25	-	0.05	0.0074	1.0023	0.9998	BC
AC	120	23.5	-	0.04	1.0116	0.0037	1.0033	AC
AC	100	14	-	0.05	1.0001	0.0015	1.0026	AC
AC	80	11	-	0.04	1.0101	0.0015	1.0027	AC
ABCG	120	16	104	0.02	1.0040	0.9939	0.9902	ABCG
ABCG	100	29	208	0.04	1.0002	1.0001	1.0018	ABCG
ABCG	80	7.5	36	0.06	0.9910	1.0065	0.9861	ABCG

recognition results obtained by this method are shown in Table 22.1 (because the space is limited, this paper lists only three fault conditions for each type of fault).

A large number of the simulation examples show that the method can accurately determine the fault type and be not affected by the fault distance, grounding resistance, fault time and the operation mode.

22.5 Conclusion

This paper did a simple classification, extracted the energy distribution within the corresponding frequency band by HHT, trained the BP neural network with the samples which is the energy distribution and the encoding of the fault type and was tested by a large number of simulation cases. The neural network established according to this method has good robustness, and can accurately identify the fault type in various fault conditions and be not affected by the fault distance, grounding resistance, fault time and the operation mode. Moreover, this method is equally applicable for the neutral point ungrounded distribution network.

But, when the topology of the distribution system changes greatly, this method is no longer suitable. The versatility should further strengthen.

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Chapter 23
A Fast and Practical Algorithm for Absolute Dominators Searching for Very Large Scale Integration

Xiaojing Hu and Peng Li

Abstract Absolute dominator search is an effective topological analysis method to improve performance of computer-aided design (CAD) and automatic test pattern generation (ATPG). In this paper, we present a new algorithm for searching absolute dominators of multiple-output circuits to solve inefficient and complex computing in tradition algorithm. Compare with the tradition algorithm, the new algorithm analyzes the relations between different fanout nodes, and identifies absolute dominator for every fanout node in circuit, thus, the overall dominator graph is constructed without any changes for original circuit directly. The experimental results based on ISCAS85 and ITC99 benchmarks show a signification improvement in runtime, and it can meet the requirement of modern design and test for Very Large Scale Integration (VLSI).

Keywords ATPG · Dominator gate · Circuit graph · Fanout

23.1 Introduction

The growing advances in modern VLSI technology have imposed challenges on how to effectively design and test circuits using CAD and ATPG tools. Space searching algorithms are applied in these areas commonly, such as ATPG [1, 2], fault simulation [3], compiler design [4], satisfiability [5] and logic optimization [6].

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Dominator search is an effective topological analysis method to improve performance of searching process. Absolute dominator provides information about all paths between the original and the end of reconvergent node.

Absolute dominators in TOPS test generation algorithms [1] are used to find mandatory observation nodes, which must have a unique assignment, mandatory observation assignments. These nodes denote a set of gates in a combinational circuit which need to be visited in order to observe a fault effect on a gate. Mandatory observation assignments are required to successfully propagate a fault to at least one primary output, which can reduce the search space significantly.

Absolute dominators are applied in the area of circuit re-synthesis for logic optimization [6]. The goal of the algorithms presented in these papers is to simplify the circuit by removing some target wire w and adding another wire in another part of the circuit while retaining the functionality of the circuit outputs. Absolute dominators are employed to find the set of mandatory assignments for a specific target wire w.

Efficient signal probability analysis is used to improve the coverage of test vectors for random generation. The average switching activity correlates directly with the average power dissipation of the circuit [7], thus its analysis is useful for guiding logic optimization methods targeting low power. The computation of signal probabilities and switching activities can be efficiently partitioned along the dominator points.

Absolute dominators can be found quickly in single-output circuits. However, traditional algorithms for finding absolute dominators in multiple-output circuits have more complex. Some researches have solved this problem based on algorithm of single-output circuits, and they have to transform the multiple-output circuit into single-output by separating circuit into several primary cones, or adding a fake node which connects all output-nodes of the original circuit. This paper presents an efficient algorithm for searching absolute dominators in multiple-output circuit without any changes for original circuit. The efficiency of our algorithm is due to the property of special node. The experimental results show that this method is particularly suitable for large benchmarks.

The paper is organized as follows. Section 23.2 summarizes the previous work. Section 23.3 presents the notation. Section 23.4 introduces the new dominator algorithm. The experimental results are shown in Sect. 23.5.

23.2 Section Heading Previous Works

The problem of dominators searching was considered in global flow analysis and program optimization firstly, where dominators provide information about what kind of code is safe. Lorry and Medlock [8] presented an O (n4) algorithm for finding all immediate dominators in a flowgraph with n vertices. A well-known algorithm for computing dominators based on a Depth First Search tree (DFS-tree) is presented by Lengauer and Tarjan [9]. The above algorithms find dominators in

global flow graph which has only one source vertex, that is, they all use in single-output graph.

However, actual circuits are multiple-output graphs, the previous algorithms for solving this problem is due to [2] and [10]. The algorithm in [2] consists of two main steps. First a fake node is added to the circuit graph which connects all primary outputs of the circuit. Next the dominator tree rooted at the fake node is computed by the algorithm in [2]. Another solution in [10], the algorithm compute the dominator tree for every primary output separately using the algorithm [10], and then intersect of all dominators for all outputs reachable from a node.

23.3 Preliminaries of Dominators

Let $C = \{V, E, O\}$ denoted to a directed acyclic multiple-output circuit graph, where each node $v_i \in V(i = 1, \ldots, N)$ represents primary input, primary output and gate, and $E = \{(v_i, v_j)|(v_i, v_j) \in V \times V\}$ is a set of edges connecting the gates and primary inputs. The set of primary outputs is represented by $o_j \in O(j = 1, \ldots, M)$.

A vertex $u \in V$ is an absolute dominator of another vertex $v \in V$ if u contained in every path from v to every primary output. Vertex u is immediate dominator of v, denoted by $u = iDom(v, O)$, if u dominates v and itself, and does not dominate any other dominator of v [2]. The edges $\{<iDom(v, O), v> |v \in V - O\}$ construct the dominator graph of circuit. For example, considering original circuit in Fig. 23.1a, the dominator graph is shown in Fig. 23.1b.

In Fig. 23.1a, d and f is an absolute dominator of a, while d is an immediate dominator of a.

23.4 Absolute Dominators Searching

In this section, we introduce an effective algorithm for solving absolute dominator search problem directly.
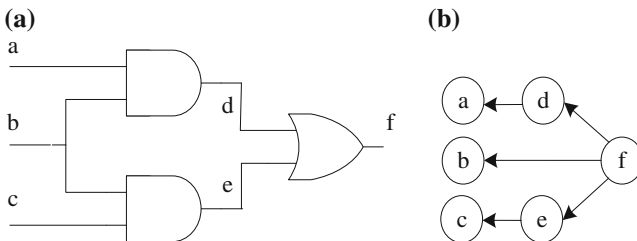
Fig. 23.1 Example of dominator graph. a Original circuit. b Dominator graph of circuit

23.4.1 The Fanout Node

The most important different between multiple-output and single-output circuit is property of fanout node. In single-output circuit, all branch paths from fanout node reconverge at the same node, however, some paths from fanout are divergent. This different cause absolute dominator searching in multiple-output circuit is more complicated. We identify two types of fanout gates: narrow fanout and wide fanout. A node with one input (stem) and more than one output (branch) is said to be a fanout.

Definition 1 If there are no other fanouts on the paths from fanout A, then A is a narrow fanout, otherwise, A is a wide fanout. We will use narrow fanout node as the beginning point of following definition related absolute dominator.

Definition 2 Let A be a narrow fanout. If one or more path from A can reach primary output O without converging with other path from A, then fanout A is a non-reconvergent fanout. Otherwise, if all paths from fanout A reconverge at a gate G, then G is absolute dominator of fanout A.

Theorem *Let A be a narrow fanout located on a path from a wide fanout B to primary output O.* (a) *If A is a non-reconvergent fanout, then B is also non-reconvergent.* (b) *If A has an absolute dominator G, then absolute dominator of B only locate at subsequent paths from gate G.*

Proof Since there is a path p_1 between B and A, paths from B to O contain all paths from A to O. (a) Considering definition 2, let us assume that path p_1 from fanout A to O without reconverging with other paths $p_2, \ldots, p_k$ from A. Thus, one path from B to O through p_1 does not reconverge with other paths though $p_2, \ldots, p_k$, that is, B is non-reconvergent fanout and does not have absolute dominator. (b) Gate A has an absolute dominator G, and every path from A to O contains G. Since A locates on a path p_1 from B, one path from B to O contains G. Hence if B has an absolute dominator G', G has to be contained in path from B to G'. □

The circuit in Fig. 23.2 is used throughout this section to illustrate the above definitions.

Fig. 23.2 Example of fanout node
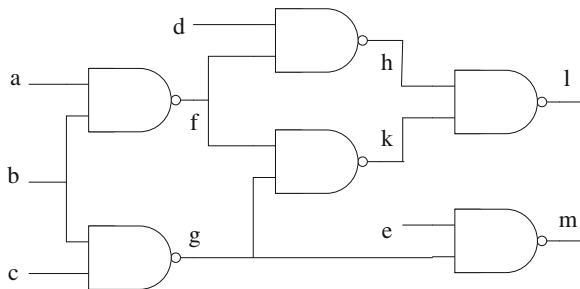
In Fig. 23.2, *f* and *g* are narrow fanouts. Fanout *g* is on a path from *b*, therefore *b* is a wide fanout. Gate *g* is non-reconvergent fanout. Thus, *b* dose not have absolute dominator. All paths from *f* reconverge at gate *j*, and then gate *j* is absolute dominator of *f*.

Using these relations, we can identify all fanout nodes which have absolute dominator in the circuits without large mount of intersection. This reduces processing time and provides the information to construct overall dominator graph of circuits directly.

23.4.2 New Algorithm

The new algorithm consists of two main parts, shown in Fig. 23.3.

Using above theorem, the dominator of every fanout node is computed by function FanoutDon (*v*) firstly. The circuit graph is computed by queue data structure Q in Fig. 23.4, where fd_v and tr_v are fanout degree and traverse time of node *v* respectively. Subsequent nodes of fanout *v* are repeatedly executed until end condition met. In current iteration, if subsequent node *u* is primary output, then is non-reconvergent fanout, else if traversed time of *u* equal with fanout degree of *v*, then *v* is reconvergent fanout and has absolute dominator is *u*. if *v* is wide fanout node, then, according to theorem, we analyze the narrow fanout node on its fanout.

As an example, consider fanout node *g*, *f* and *b* in Fig. 23.2, where the functionality of the new algorithm is illustrated in Table 23.1. The node set in queue Q and current processing node *u* for each fanout *v* in each process iteration are listed in the second, third and fourth column of Table 23.1. The last column contains the absolute dominator for *v*.

In the second part of the algorithm, The edges $\{<iDom(v,O),v>\,|\,v \in V-O\}$ construct the dominator graph G(O). The immediate dominator of node v is computed by function $idom(v,O)$, then

$$idom(v,O) = \begin{cases} \textit{transitive fanout of } v & \textit{if } fd_v = 1 \\ FanoutDon(v) & \textit{otherwise} \end{cases} \qquad (23.1)$$

where fd_v is fanout degree of node *v*.

Fig. 23.3 New algorithm for absolute dominators searching

```
Procedure Absolute Dominator Search Algorithm
    for each fanout node  v in the circuit
        FanoutDon (v);
    end
    for each node  v ∈ V − O
        G(O) = idom (v,O);
    end
end
```

```
Procedure  FanoutDon( v )
   for i=1 to fd_v
      push(fanout node  g_i of v, Q);
   end for ;
   while  (Q!=NULL)
      u=pop(Q);
      if tr_v==fd_v then
         u is absolute dominate of   v;
         return (u);
      end if ;
      if u is PO then
         v is non-reconvergent fanout;
         return (Null);
      end if ;
      if u is fanout node  then
         if u is non-reconvergent fanout   then
            v is non-reconvergent fanout;
            return (Null);
         else then
            push(absolute dominate of u,Q);
         end if ;
      else then
         push(fanout node of u);
      end if ;
   end while ;
end
```

Fig. 23.4 Pseudo code of function fanoutdon (v)

Table 23.1 Absolute dominator of every fanout

v	Iteration 1		Iteration 2		Iteration 3		Absolute dominator
	queue Q	u	queue Q	u	queue Q	u	
g	{m, k}	m	{k, PO}	k	{PO, PO}	PO	non
f	{h, k}	h	{k, l}	k	{l, 1}		l
b	{g, f}	g					non

The following example presents how the new algorithm performances. First, the absolute dominator of all fanout nodes in Fig. 23.1 are computed as follows, g, f, b. Then the immediate dominator of every node in circuit is processed in Breath First Search (BFS) order, $a, f, b, g, c, d, h, e, k$. The computation of the immediate dominator of node a is straight forward, because the only one node f in the transitive fanout of a, thus $f = idom(a, O)$. The computation of the immediate dominator of node f is by $l = $ FanoutDon (f). The new dominator graph is constructed as Fig. 23.5. Node b and g do not have absolute dominators.

The sets of absolute dominators of every vertex v are shown in Table 23.2.

Fig. 23.5 The overall dominator graph
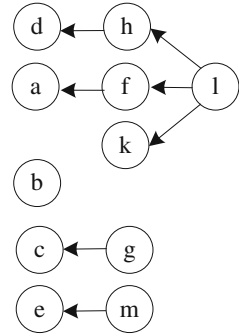
Table 23.2 Dominator set of every vertex

v	Absolute Dominator Set
a	{f, l}
b	-
c	{g}
d	{h, l}
e	{k}
f	{l}
g	-
h	{l}
k	{l}
l	{l}
m	{m}

23.5 Experimental Results

This section contains the experimental evaluation of the proposed algorithm and a comparison with Kirland [2] and Krenz-Baath [10]. The algorithm was tested on ISCAS85 benchmark and ITC99 benchmark. The experiments were performed on a PC with a 2.0 GHz Pentium 4 CPU and 1 GByte memory. Table 23.3 provides detailed test data of benchmarks. The column labeled Benchmarks, PIs, POs and Gates report the name of circuits, the number of primary input, primary output and gates in the circuits, respectively. Column 5 shows the number of fanout nodes which have absolute dominator. For a comparison, column 6, 7 and 8 present the total runtime operated by Kirland, Krenz-Baath and new algorithm. One can see that, our new algorithm is faster than other two algorithms.

Table 23.3 Experimental results obtained by new algorithm

Benchmarks	PIs	POs	Gates	Fanouts have absolute dominator	Time/ms [2]	Time/ms [10]	Time/ ms new
C432	36	7	203	1	0.88	0.56	0.39
C499	41	32	275	0	6.52	3.06	2.28
C880	60	26	469	22	1.26	0.79	0.53
C1355	41	32	619	200	8.22	3.53	2.64
C1908	33	25	938	214	4.67	2.38	1.67
C2670	233	140	1,566	195	-	-	2.42
C3540	50	22	1,741	186	7.17	4.34	3.15
C5315	178	123	2,608	382	15.10	7.18	4.62
C6288	32	32	2,480	0	27.10	14.48	10.82
C7552	207	108	3,827	718	16.20	8.06	6.71
b14	277	299	10,343	522	-	-	8.26
b17	1,452	1,512	33,741	627	-	-	20.46
b21	522	512	21,061	815	-	-	17.13
b22	767	757	30,686	1,088	-	-	28.82

23.6 Conclusions

Absolute dominator provides information about all paths between the original and the end of reconvergence node. In this paper, we present a new algorithm for searching absolute dominators of multiple-output circuits. In contrast to the algorithms proposed by Kirland [2] and Krenz-Baath [10], the new algorithm need not any changes for original circuit. In Kirland [2], algorithm first computes dominators for every vertex with respect to every output and later intersect the intermediate set, while in Krenz-Baath [10], they add a fake node which connects the primary outputs of the original circuit, and construct the dominator tree for new circuit graph. The new algorithm analyzes the relations between different fanout nodes, and identifies absolute dominator for every fanout node in circuit, thus, the overall dominator graph is constructed directly. The experimental results show a signification improvement in runtime, and it can meet the requirement of modern design and test for VLSI.

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Chapter 24
Constant Modulus Blind Equalization Algorithm for Multi-Carrier Combining of Digital Phase-Locked Loop and Pilot Sequence

Ye-cai Guo, Qu Chen and Jun Guo

Abstract Due to the characteristics of frequency division multiplexing (OFDM) system providing a higher rate of transmission, a new blind equalization algorithm based on an OFDM system for underwater acoustic channel is proposed. In this proposed algorithm, the frequency domain response of channel is simply estimated by a pilot sequence firstly, then the multi-carrier system is equivalent to multiple parallel independent single-carrier system, and the received signal of each subcarrier is equalized by single-tap constant modulus algorithm (ST-CMA). As the constant modulus algorithm is not sensitive to phase information, a digital phase-locked loop (DPLL) technology is used to overcome a constellation offset caused by the equivalent channel on each subcarrier. The computer simulation in underwater acoustic channel shows that the performance of the proposed ST-CMA + DPLL outperforms the constant modulus algorithm within the direct modulation of the single-carrier system.

Keywords Orthogonal frequency division multiplexing (OFDM) · ST-CMA · Blind equalization · Underwater acoustic channel

24.1 Introduction

With the continuous development of communication technology in recent years, how to develop an efficient underwater communication system has become a new hot spot of the field of communication. Generally speaking, the underwater

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acoustic channel is an extremely complex random channel [1], whose transmission rate is particularly low compared to wired communication. Furthermore, in the case of a higher rate transmission, a serious inter-symbol interference is existed [2]. In the traditional single-carrier system, equalization technology is used to compensate for the pulse response of the channel. A more usage method is the constant modulus type algorithm, especially the constant modulus algorithm (CMA). However, when the multipath and channel fading is serious, the structure of equalizer is complex and convergence rate is slow. So, orthogonal frequency division multiplexing (OFDM) technology is introduced to the underwater acoustic communication system.

OFDM is a new multi-carrier modulation scheme, whose basic principle is converting high-speed serial date into multiple parallel low-rate date. Due to the technology of serial parallel conversion, it can be used to effectively suppress multipath fading and proper to high-speed data transmission.

With the combination of OFDM and underwater acoustic communication system, the complexity of equalization technology can be well resolved. According to the OFDM underwater acoustic communication system model and on the basis of adaptive equalization given by literature [3, 4], the frequency response of channel is firstly estimated by pilot sequence, and then the equalizer is simplified as a single tap structure to equalize each subcarrier by combining constant modulus algorithm. Considering the phase factor brought by channel, digital phase-locked loop is used to compensate for the phase lack of constant modulus algorithm.

24.2 OFDM Underwater Acoustic Communication System and Single Tap Blind Equalizer

24.2.1 OFDM Underwater Acoustic Communication System and Its Equalization Principle

Now consider a discrete time baseband OFDM transmission system with cyclic prefix. Assume that a parallel data block through serial parallel conversion and constellation mapping is sent into an OFDM system.

Assume that S_k is a parallel data block, which is input of the OFDM system, where, $k = 0, 1, 2, \ldots, N - 1$, $n = 0, 1, 2, \ldots, M - 1$, N is the number of sub-carriers, M is the transmitted symbols per sub-carrier. $X_k(n)$ is achieved by the inverse discrete Fourier transform algorithm (IDFT), which procedure is given by

$$X_k(n) = \sum_{k=0}^{N-1} S_k(n) \exp\left(j\frac{2\pi kn}{N}\right) \tag{24.1}$$

The Eq. (24.1) shows that the modulation process must meet the characteristics of mutual orthogonality. However, due to the actual channel multipath delay, inter-carrier interference (ICI) is existed between sub-carriers. Accordingly, the receiver cannot obtain the correct signals when the carrier signal is demodulated. At present, the common way of eliminating ICI is to insert Cyclic Prefix (CP) before the beginning of an OFDM symbol, which is the same as the short tail signal of the OFDM symbol [5]. If the length of channel is larger than the length of CP, ICI and ISI can be well cancelled [6]. In the receiver, the demodulation is carried out by discrete Fourier transform algorithm (DFT), and the process of demodulation is as follow

$$
\begin{aligned}
Z'_k &= FFT[Y_k] \\
&= FFT\{IFFT[S_k] \otimes h + \tilde{n}_k\} = S_k \times H_k + N_k
\end{aligned}
\tag{24.2}
$$

This formula shows that demodulation signal contains only the channel frequency response and the Fourier transform of noise. Therefore, the purpose of equalization is to eliminate the channel factor H_k corresponding to each sub-carrier.

24.2.2 Channel Pre-Estimation Based on Pilot Sequence

A frequency domain channel estimation algorithm is mainly used for estimating the channel of OFDM system. For invariable parameter channel, the pilot is a massive pilot. In this paper, Frank sequence is used to produce a pilot. The expression is given by

$$
\theta_{frank}(i) = \theta_{frank}[i = p + q * \sqrt{U}] = 2\pi pq \Big/ \sqrt{U}
\tag{24.3}
$$

In the above formula, U means the length of pilot, $0 \le p \le \sqrt{U} - 1$, $0 \le q \le \sqrt{U} - 1$, $\theta_{frank}(i)$ is the phase of each point. If the sending and receiving Frank sequence is X_F and Y_F, respectively, according to formula (24.2), the estimated channel parameter H'_k is written as

$$
Y_F/X_F = H_k + N_k/X_F = H'_k
\tag{24.4}
$$

Then Z_k in Fig. 24.1 can be expressed as

$$
Z_k = Z'_k \Big/ H'_k
\tag{24.5}
$$

Because only a pilot sequence is sent, it leads to a low accuracy. So to make an accurate estimation for the sending data, thus a blind equalization method is carried out.

Fig. 24.1 Constant modulus blind equalization algorithm combining of digital phase-locked loop for OFDM
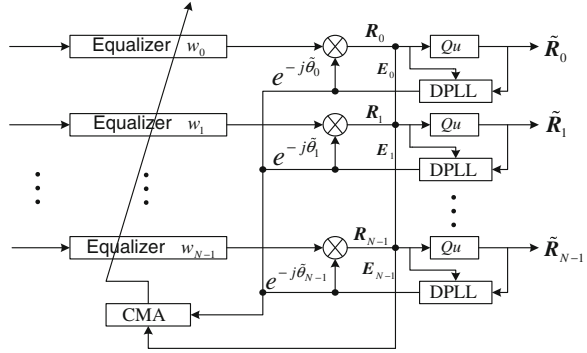
24.2.3 The Structure of Single-Tap Blind Equalization

According to literature [7], the idea of blind equalizer in each sub-channel is given. Considering the channel factor corresponding to each sub-channel is a scalar, the structure of equalizer is simplified to a single tap mode per sub-carrier. The constant modulus algorithm is used as the equalization algorithm.

Assume that E_k is error function. The taps w_k is adapted by CMA [8]. The cost function of constant modulus algorithm is always defined as

$$J_k(n) = E\{1/4[E_k^2(n)]\} = 1/4E\{[R_{CM} - \|R_k(n)\|^2]^2\} \tag{24.6}$$

where, R_{CM} is modulus value of input signals. $R_k(n)$, $E_k(n)$ and R_{CM} is defined respectively as follows.

$$R_k(n) = w_k^* \cdot Z_k(n), R_{CM} = E\{\|S_k(n)\|^4\}\Big/E\{\|S_k(n)\|^2\}$$
$$E_k(n) = R_{CM} - \|R_k(n)\|^2 \tag{24.7}$$

Because that the performance of CMA with a single sub-carrier is unreasonable in OFDM, so a new way to measure the performance is defined, i.e. Average Mean Square Error (AMSE). Its mathematical expression is written as

$$AMSE(n) = 1/N \sum_{k=0}^{N-1} MSE_k(n) = 1/N \sum_{k=0}^{N-1} E_k^2(n) \tag{24.8}$$

The Eq. (24.8) shows that the convergence curve is the mathematical average on each convergence curve. The cost function $J_k(n)$ is adjusted by the stochastic gradient method [9], i.e.

$$w_k = w_k - \mu \nabla_w J_k(n) \tag{24.9}$$

where μ is step-size and a smaller positive number. $\nabla_w J_k(n)$ is the partial derivation of $J_k(n)$ with respect to w_k, whose result is given by

$$\nabla_w J_k(n) = -(R_{CM} - \|R_k(n)\|^2)Z_k^*(n)R_k(n) \tag{24.10}$$

The iterative formula of equalizer tap for CMA can be obtained through substituting Eqs. (24.6) and (24.9) into Eq. (24.8).

$$w_k = w_k + \mu E_k(n)Z_k^*(n)R_k(n) \tag{24.11}$$

24.3 Constant Modulus Blind Equalization Algorithm for OFDM Combining of Digital Phase-Looked Loop

Despite the restoration of received data in a certain extent through pre-estimation of channel, the received data is still influenced by a residual factor of channel. If the residual factor can be defined as $\tilde{H}_k$, according to Eq. (24.4), the Eq. (24.5) can be expressed as

$$Z_k = S_k \times \tilde{H}_k + \tilde{N}_k = S_k \times |\tilde{H}_k|e^{j\theta_k} + \tilde{N}_k \tag{24.12}$$

where, $\tilde{N}_k$ is the equivalent Gaussian noise. The formula shows that signal of each balance contain an additional phase in receiver. Since the angle θ_k is introduced by FFT, it is a constant. Because first-order phase-locked loop can track constant phase rotation, Constant Modulus Blind Equalization Algorithm Combining of Digital Phase-Locked Loop for OFDM (ST-CMA + DPLL) can be obtained. The system block diagram is shown in Fig. 24.1.

In Fig. 24.1, R_k is output of equalizer through phase compensation, $Qu[g]$ is the decision device, $\tilde{R}_k$ is decided signal, $\tilde{\theta}_k$ is estimation of phase rotation.

24.3.1 First-Order Phase-Locked Loop

The basic principle of first-order phase-locked loop is to compensate for phase of out of equalizer by using the estimated phase difference [10, 11]. The formula is given by

$$R_k = w_k^* Z_k \exp(-j\tilde{\theta}_k) \tag{24.13}$$

where, $\tilde{\theta}_k$ is decided by the two inputs R_k and $\tilde{R}_k$ from DPLL blocks, and the iterative formula is

$$\tilde{\theta}_k(n+1) = \tilde{\theta}_k(n) - \mu_{DPLL}\Delta\tilde{\theta}_k(n) \tag{24.14}$$

Where, μ_{DPLL} is the gain of PLL and usually between 0 and 1. $\Delta\tilde{\theta}_k$ is the difference between real phase and estimated phase rotation from PLL. Its expression is

$$\Delta\tilde{\theta}_k(n) = \sin^{-1}\left\{\frac{\mathrm{Im}[R_k(n)\tilde{R}_k^*(n)]}{|\tilde{R}_k^*(n)||R_k(n)|}\right\} = \mathrm{Im}\{R_k(n)\tilde{R}_k^*(n)\} \qquad (24.15)$$

Thus the final expression of $\tilde{\theta}_k$ is

$$\tilde{\theta}_k(n+1) = \tilde{\theta}_k(n) - \mu_{\mathrm{DPLL}}\mathrm{Im}\{R_k(n)\tilde{R}_k^*(n)\} \qquad (24.16)$$

24.3.2 Constant Modulus Blind Equalization Algorithm Combining of Digital Phase-Locked Loop

Due to the lack of phase information for CMA, CMA combining with digital phase-locked loop can effectively correct the phase deflection. Whose mathematical expression is

$$\begin{aligned}
\tilde{R}_k(n) &= Qu[R_k(n)] = Qu\{w_k^*Z_k(n)\exp[-j\tilde{\theta}_k(n)]\} \\
E_k(n) &= R_{CM} - \left\|w_k^*Z_k(n)\exp[-j\tilde{\theta}_k(n)]\right\|^2
\end{aligned} \qquad (24.17)$$

The iterative formula of taps for constant modulus algorithm combining of digital phase-locked loop can be obtained by re-derivation of the cost function.

$$w_k = w_k + \mu E_k(n)Z_k^*(n)R_k(n)\exp[j\tilde{\theta}_k(n)] \qquad (24.18)$$

The above three formulas form the constant modulus blind algorithm combining of digital phase-locked loop. The performance of the equalizer can be improved by introduction of phase factor in the iterative formula of tap coefficients.

24.4 Computer Simulation

In order to verify the performance of ST-CMA + DPLL in OFDM system, it is compared with ST-CMA in OFDM system and CMA beneath single-carrier system. Channel is the two paths acoustic channel and $h = [e^{-0.7j}, 0, 0, 0.3e^{-1.8j}]$. The sending signal is modulated by 16PSK and its variance is 1. The number of sub-carriers is 64, and noise is Gaussian noise, SNR = 25 dB. CMA beneath direct modulation of single-carrier system uses 16 taps with the eighth tap initialized 1 and the others are 0, step size $\mu_{CMA} = 0.003$, 1,000 Monte Carlo simulations are carried out. The tap of each sub-carrier of ST-CMA and ST-CMA + DPLL is 1, the step-size $\mu_{STCMA} = 0.0008$. $\mu_{STCMA+DPLL} = 0.00085$, and $\mu_{DPLL} = 0.01$, 100 Monte Carlo simulations are carried out. The simulation result is shown is Fig. 24.2.
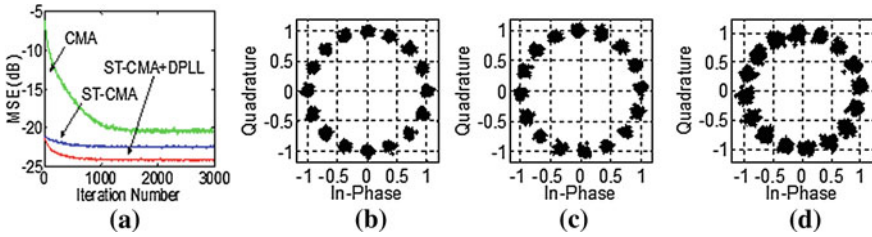
Fig. 24.2 Comparisons of ST-CMA + DPLL, ST-CMA and CMA. **a** Curves of MSE, **b** Output of ST-CMA + DPLL, **c** Output of ST-CMA, **d** Output of CMA

Figure 24.2a shows that the convergence speed is the same as ST-CMA and about 500 steps faster than CMA. ST-CMA + DPLL can also effectively correct the constellation rotation and the steady-state error is respectively deceased 2 dB and 5 dB than ST-CMA and CMA. So compared with ST-CMA and CMA, ST-CMA + DPLL based on OFDM has better performance.

24.5 Conclusions

According to the characteristics of transforming time domain channel into parallel frequency domain channels, a constant modulus blind equalization algorithm combining with phase-locked loop based on independent sub-channel is proposed in this paper. Because CMA cannot correct phase rotation, a first-order phase-locked loop is used to overcome the phase angle from the channel parallel process. Underwater acoustic channel simulation shows that ST-CMA + DPLL has lower steady-state error, faster convergence speed and more clear and compact constellation comparison with ST-CMA and CMA.

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Chapter 25
Circuit Simulation Design of Duffing Chaotic Demodulator of OOK Modulation Signal

Jian-qun Han and Hong Sun

Abstract Duffing chaotic system has higher ability to detect weak periodic signals; moreover, it can also resist the disturbance of other carrier frequency signals very well, so it is suitable for demodulating OOK digital signals. But at present there is no relevant circuit design for Duffing system's demodulating digital signals, therefore, in this paper, Duffing chaotic equations were combined with operational amplifier function, and simulation circuit was set up by method of decomposing equations. In addition, Duffing chaotic system demodulator was designed by the circuit design simulation software Multisim, which is applied innovatively into demodulation process of OOK digital modulation signals. Simulation results show that Duffing chaotic receiving system can demodulate OOK signals effectively.

25.1 Introduction

With the intensive study and widespread use of chaos theory in the field of modern science in recent years, people began to apply the chaos theory to detect the weak signals. And according to the research and application in different types of

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background noise, many theories and methods are proposed to detect weak signals by chaos [1–6]. Due to the particularity of sine signals, the detection theory and method to detect those signals are of great importance in various kinds of theories to detect the weak signals. According to documents [7, 8], The SNR detected by Duffing System to sine signals reached $-111.46\,\text{dB}$, while by time-domain method, the current method of processing signals, the lowest SNR is only $-10\,\text{dB}$ [9]. This feature of Duffing system can be applied to demodulate OOK signals in the field of digital communication, because that in design of communication system SNR is always expected to be reduced under the effective communication. And this requires the receiving system should have the ability to detect weak periodic signals, while Duffing system just has such ability.

A research of demodulating digital signals by Duffing chaotic system has been done in documents [10, 11], but circuit demodulation implementation of Duffing oscillator has not been further studied. Therefore, through the circuit design simulation software Multisim, OOK chaotic demodulator is established in this paper. And the amplitude and baud rate of detectable digital carrier signal are mainly studied, which can provide reference for applying Duffing oscillator to detect weak signals in the field of communication.

25.2 OOK Signal Detected by Duffing Chaotic System and its Circuit Implementation

Duffing system produces chaos driven by the external periodic force; its dynamic Eq. (25.1) is as follows

$$\begin{cases} \dot{x}_1 = x_2 \\ \dot{x}_2 = x_1 - x_1^3 - bx_2 + c\cos\omega t \end{cases} \tag{25.1}$$

where, c and ω are amplitude and frequency of the impressed periodic driving force; b is dumping ratio; $x_1 - x_1^3$ is nonlinear restoring force. According to documents [12], Let $V_1 = \cos\omega t$, $U_1 = -\left(\frac{R_5}{R_1}V_1 - \frac{R_5}{R_2}U_4 + \frac{R_5}{R_3}U_4^3 + \frac{R_5}{R_4}U_3\right)$, $\dot{U}_2 = -\frac{1}{R_6 C_1}U_1$, $U_3 = -\frac{R_8}{R_7}U_2$, $\dot{U}_4 = -\frac{1}{R_9 C_2}U_2$, then Eq. (25.1) can be written as

$$\begin{cases} \dot{U}_4 = -\dfrac{1}{R_9 C_2}U_2 \\ \dot{U}_2 = -\dfrac{1}{R_6 C_1}U_1 \end{cases} \tag{25.2}$$

when $b = 0.5, \omega = 1, c = 0.8$, system is chaotic, so parameters designed through circuit simulation in (25.2) can be taken as $R_6 = R_9 = 1\,\text{M}\Omega$, $R_1 = R_2 = R_3 = R_5 = R_7 = R_8 = 10\,\text{k}\Omega$, $C_1 = C_2 = 1\,\mu\text{F}$, $R_4 = 20\,\text{k}\Omega$. Through circuit
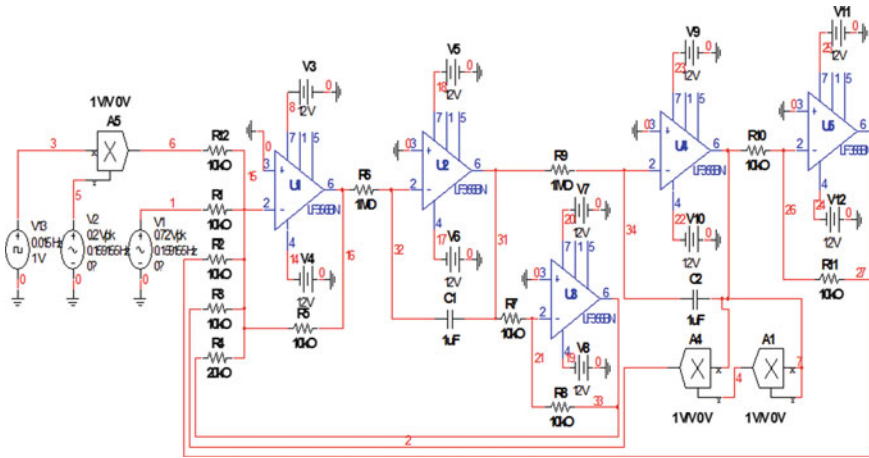
Fig. 25.1 Circuit simulation diagram of OOK signal demodulated by Duffing chaotic system

simulation design software Multisim, simulation diagram is shown in Fig. 25.1. The frequency of sinusoidal excitation signal $f = 0.159155$ Hz, i.e. $\omega = 1$ rad/s, amplitude $c = 0.8$ V. When switching sine signal is not added, system is chaotic as shown is Fig. 25.2; when it is added, the state of system is between chaotic and large-scale periodic as shown in Fig. 25.3. With additional signal, the state of system is large-scale periodic (sine signal in Fig. 25.3 accordingly); without additional signal, the state of system changes from large-scale periodic to chaotic (linear part in Fig. 25.3 accordingly), and amplitude of signal is less than that in large-scale periodic state. However, there also exits large-scale obit in the chaotic state, the system can no longer operate in that obit and it will escape from it and back to the chaotic area surrounded by large-scale obit, therefore, signal amplitude in chaotic state is less than that in large-scale periodic state.
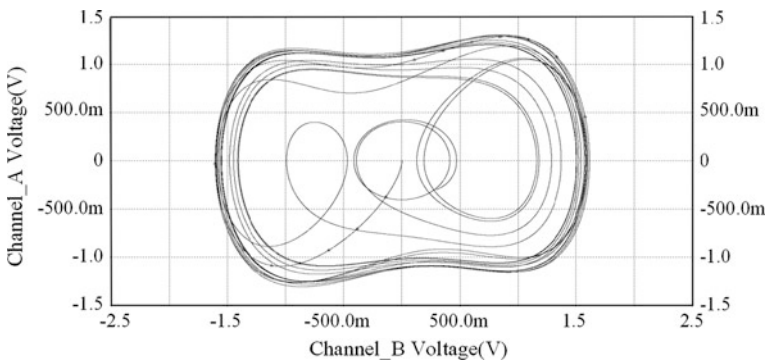
Fig. 25.2 The chaotic phase diagram of Duffing system
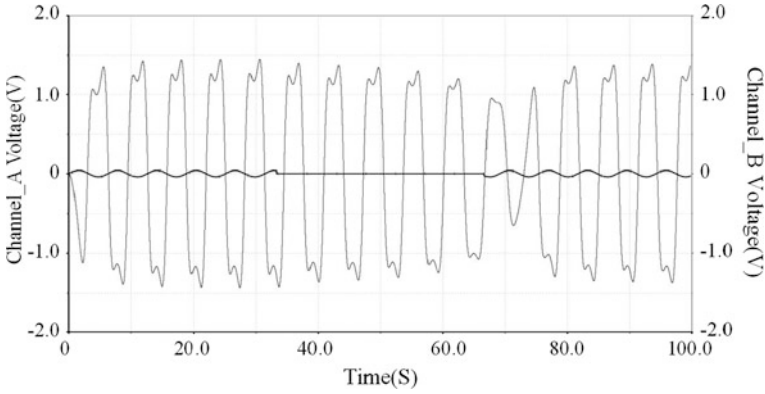
Fig. 25.3 Diagram of switching sine signal and system state signal

Equation (25.1) is only suitable for testing low frequency sine signals. According to documents [11, 12], Eq. (25.1) can be modified as (25.3), which can detect high frequency sine signals

$$\begin{cases} \dot{x}_1 = \omega x_2 \\ \dot{x}_2 = \omega(x_1 - x_1^3 - bx_2 + c\cos \omega t) \end{cases} \tag{25.3}$$

Compared with (25.2), if $R_6 C_1$ and $R_9 C_2$ are modified, the high frequency signal can be detected, which broaden the detection scope of Duffing circuit, as shown in Eq. (25.4).

From analyzing (25.4), we know that ω is frequency of sinusoidal excitation signal. The increase of ω can be realized through reducing $R_6 C_1$ and $R_9 C_2$. In this paper, let $f = 6366.2\,\text{Hz}$, i.e. $\omega = 40000\,\text{rad/s}$, $R_6 = R_9 = 1\,\text{k}\Omega$, $C_1 = C_2 = 25\,\text{nF}$, amplitude of detectable OOK carrier signal is 0.04 V. OOK and system state signal are shown in Fig. 25.4. We can see that the state changes of Duffing chaotic system can accurately reflect the transmitted information of '0' and '1'. But baud rate cannot too high in order to transmit information accurately. Here it is 100 baud.

$$\begin{cases} \dot{U}_4 = -\dfrac{\omega}{R_9 C_2} U_2 \\ \dot{U}_2 = -\dfrac{\omega}{R_6 C_1} U_1 \end{cases} \tag{25.4}$$

25.3 Design of Duffing Chaotic System for Receiving and Demodulating OOK Modulation Signal

From analysis of the second part, we know that Duffing chaotic system can detect sine signals. When sine signals are put into Duffing chaotic system, system is in large-scale periodic state, otherwise, system is in chaotic state. When system is in
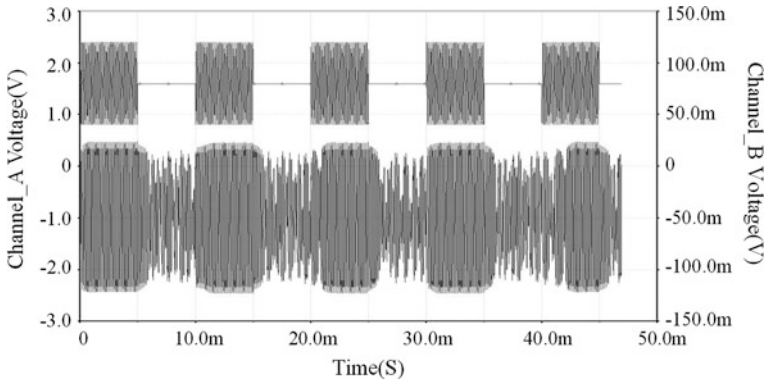
Fig. 25.4 Diagram of switching sine signal and system state signal ($f = 6366.2\,\mathrm{Hz}$)

Fig. 25.5 Integral circuit with quenching function
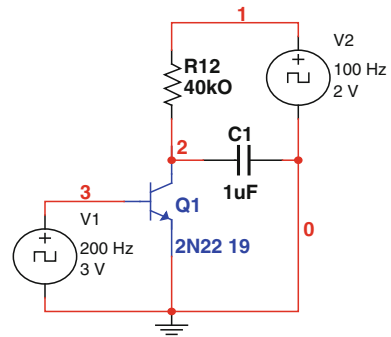
large-scale periodic state, vector length is more than that in chaotic state or that in non-periodic state, i.e. $\sqrt{x_1^2 + x_2^2}\,|_{l\arg e-scale\ period} > \sqrt{x_1^2 + x_2^2}\,|_{non-l\arg e-scale\ period}$. The change of state is corresponding to '0' and '1', digital information of OOK modulation signal. But for reasons that there are many periodic orbits in the process of chaotic state operation, large-scale periodic obit is one of them, and considering the property of chaos ergodicity, chaos passing large-scale periodic obit is at a greater probability, so we can't judge demodulation information by comparison of the instantaneous sampling data. However, we can judge by integral within a symbol cycle. $\int_T x_1^2(t) + x_2^2(t)dt > k$, here, k is predetermined threshold. The simulation realization of this integral circuit by Multisim is shown in Fig. 25.5. Because integral is within a symbol cycle, quenching to energy of capacitor $C1$ is needed in order to avoid former symbol's influence on this symbol at integral results. This function is realized by the transistor $Q1$ and pulse voltage source $V1$. Simulation result is shown in Fig. 25.6. In this figure, square wave is assumed signal received by demodulation, and triangle wave is the integral result of it. Make OOK digital information as 1010101010, demodulation signal received after OOK
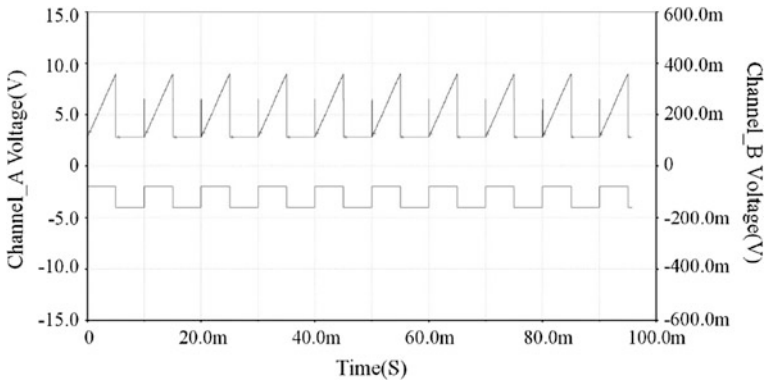
Fig. 25.6 Simulation result of integral circuit

band signal passing Duffing chaotic receiver is shown in Fig. 25.6. In this figure, slash with big amplitude is corresponding to '1' in the signal, and slash with small amplitude is corresponding to '0'. Trough demodulation of OOK signal, and judgment to the output threshold of receiving system at the switching point of symbols, digital information transmitted by sender can be recovered.

25.4 Conclusions

Through Multisim, circuit design and simulation software, circuit of Duffing chaotic demodulation system has been established. Moreover, frequency ω of excitation signal in Duffing chaotic system and circuit design of detecting high frequency sine wave has also been discussed in this paper. By simulation, we can get that if controlling parameters of circuit components with it correspondence parameter ω, then, the chaotic system can demodulate digital signals with high frequency carrier. Therefore, by utilizing the sensitivity of Duffing chaotic system to the weak periodic signals, we innovatively established chaotic receiver. From the simulation results, we can see that this receiver can demodulate OOK signal correctly, but the deficiency is that the transmitting rate is relatively low, thus, it is the research target to increase the rate.

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Chapter 26
Distributed Targets Tracking with Dynamic Power Optimization for Wireless Sensor Networks

Shuting Zhang, Guojun Li, Lan Xiao, Linhong Wang and Xiao-na Zhou

Abstract Focused on energy efficiency issues under tracking targets within wireless sensor networks (WSNs), a new dynamic power management (DPM) method for tracking distributed targets is proposed in this paper combining with the network energy consumption model and wake-up mechanism. With precedent location information of maneuvering target, the algorithm involved both cancelling noise by wavelet filter and predicting target state by autoregressive transformation is introduced to awaken wireless sensor nodes so that their sleep time is prolonged and energy consumption is reduced. According to the current location of maneuvering target, related nodes in an appointed cluster of WSNs constitute a distributed dynamic tracking unit, and the cluster head is responsible for collecting the measurement information from the nodes in the tracking unit. Simulation results show that: The dynamic energy optimization method and tracking algorithms presented in this paper can effectively in reducing the energy cost of the node to extend the life of node and network, which are fully applicable to the battlefield maneuvering target tracking on the ground.

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26.1 Introduction

Wireless sensor network (WSN) consists of a large number of smart micro-sensor nodes which contain sensing, processing and wireless communication in a specific area to accomplish complex measurement tasks. Their self-organization, robustness and concealment are very suitable for mobile target to tracking and location [1]. The most prominent feature of WSN is that the energy support in the nodes is not always available. So it has become an important research direction that how energy-efficiency is designed to reduce node power consumption and prolong network life cycle.

For maneuvering target tracking in WSN, dynamic power management (DPM) is a way to effectively reduce system power consumption without compromising system performance approaches [2, 3]. The basic idea of DPM is that the devices of a node are waked up if necessary. Based on DPM, this paper presents a new distributed tracking strategy of dynamic energy optimization, which is composed of four stages. Firstly, depending on the distance of the target, the related nodes are waked at the appropriate time [4]. Secondly, with the predicted location of the target, the node goes into the full sleep state before the target arriving at the scope of perception. Thirdly, the nodes within effective monitoring distance form a dynamic distributed tracking unit, where the Cluster head fuses the target location. Finally, based on the sequence of target location, the Sink node performs the robust tracking algorithm and wakes up the next cluster head to track the target.

26.2 Node Energy Consumption Model and Wake-Up Mode

This study focuses on the cluster-type network structure. The states of the sensor node are separately defined as working state S0, monitor state S1 and dormancy state S2 in this article. In the state of S0, the sensor node can sense, send and receive information. In state S1, the MCU is put on standby and it can be activated by the alarm command. As for the dormancy state S2, the perception module and communication module are turned off and the node requires the minimum energy consumption.

In order to describe the moving target locating and tracking methods under the condition of dynamic power management, three wake-up modes of the wireless sensor nodes are defined as normal, prediction and tension, respectively.

26.2.1 Normal Mode

As shown in Fig. 26.1, the node goes up to the working state S1 at the interval of measurement cycle T. In S1 state, if there are targets in the measurement range, the

Fig. 26.1 Normal model
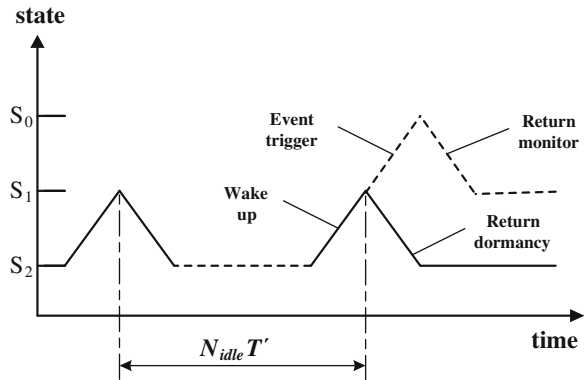
node switches to prediction mode. Otherwise, it returns to S2 state directly and still works in the current mode.

26.2.2 Prediction Model

As shown in Fig. 26.2. The node will switch to tension mode when the targets reach the range of measurement; otherwise it returns to S2 state directly and still works on the prediction mode. This paper will use the wavelet-based prediction algorithm to predict the measurement target, and use a priori information to wake up nodes dynamically.

26.2.3 Tension Mode

As shown in Fig. 26.3, nodes remain in S1 state and wake up to S0 state every measurement period T'. In this mode, the tracking of the targets is implemented.

Fig. 26.2 Prediction model
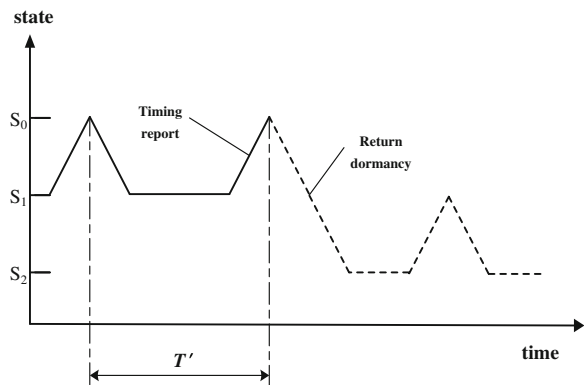
Fig. 26.3 Tension model
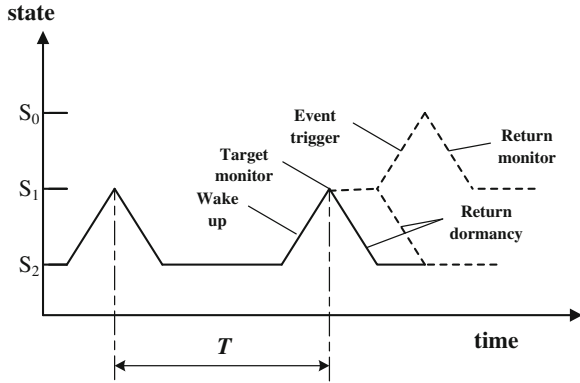
26.3 Maneuvering Target Tracking with Dynamic Power Optimization

26.3.1 Strategy for Maneuvering Target Tracking

Assume that the moving target enters the monitoring area, the location tracking process of node cluster can be elaborated as follows.

First of all, nodes work in NM mode. The parameter Δt represents measurement period, d_t represents the distance between the target and detecting nodes. When $d_t < d_1$ and $\Delta t = T'$, nodes transform into the PM mode from the mode of NM. Otherwise the nodes still remain in NM. In PM mode, the conversion of the work mode depends upon the prediction of target location based on the sequence collected by the node. When $d_t < d_2$, the node enters TM mode. If $d_t > d_1$, it represents that target has left the monitoring area, then the node returns to NM, or continues to be in PM. In TM mode, the node reports target distance d_t to the cluster head duly. It is still in TM ($d_t < d_2$), or returns to the PM ($d_1 > d_t > d_2$).

The head node fuses all data from the tracking nodes to estimate target location and updates the list of tracking nodes (including their identification code, coordinates). Then it transports the target location sequence to the Sink node. A tracking node in the lists will be automatically deleted for saving storage space, if it does not send target information for a long time.

Sink fuses the target information of the cluster heads to estimate the target trajectory and report the user a series of important parameters such as target type, speed and location. When cluster head receives alert information from Sink, it activates the cluster nodes to choose the work mode and carry out target tracking.

26.3.2 Based on Wavelet and Autoregressive Dynamic Power Management

When there is no objective within the measurement region, the network is in NM mode, at this time the network is in standby state without dynamic power management, and when there is objective accessing to effective monitoring ($d_t < d_2$), that is in TM mode, the node works full time at this time and doesn't use DPM. When the node is in PM mode, it uses the data flow detected by acoustic sensor nodes to predict target state within the K measurement periods to determine whether the target comes into its effective monitoring of the range (d_2), if $d_1 > d_t > d_2$ the detection node in the K measurement periods can enter completely sleep state S2 to reduce node power consumption, which is the core of dynamic power management in PM mode.

How to use the data flow to detect target state's K-step prediction is the key to achieve DPM. Data series collected by acoustic sensors usually contain a strong random noise interference, in this paper, we firstly, use wavelet de-noising to remove random noise interference by the wavelet multi-resolution idea, leave the main trends of signal sequence, take into account the complexity of the algorithm and the short-term stationary of speech signals, and then use autoregressive (AR) model to carry out the K-step prediction of target state.

26.3.3 Maneuvering Target Tracking Algorithm

There are EKF, DCMKF, UKF and PF [5, 6] etc. for commonly used filtering algorithm of maneuvering target tracking. Compared with the standard Kalman filter (STKF) these methods could handle non-linear, non-Gaussian problems better, but the calculation and energy consumption are higher. This paper established a linear dynamic model, used strong tracking Kalman filter considering the computational complexity and energy consumption.

Considered the ground battlefield targets mainly are all kinds of motor vehicles, which can be approximately regarded as point sound sources. The strength and the square of the distance are inversely proportional in acoustic transfer process, and relationship-sub report refers to Ref. [3].

$$I_i = \sqrt{\frac{I_0}{1 + \alpha d_i^2}} \qquad (26.1)$$

In which I_i is the ith measured signal strength of a sensor node, I_0 is the monitored strength of target for the first time, α is a constant, d_i is the ith measured distance between the nodes and target.

The core idea of this algorithm is: the cluster head retain only the most recent circumference information, and according to whether t there is the intersection

between two circles, it corrects the position estimation of the target continuously; if the two circles intersect, take the intersection which is the closest with the target location as the current target location, or take a point on the line between two centers whose coordinate is determined by two circle radius weighted; it uses the previous target location to correct the new generated target location to improve positioning accuracy.

Once cluster head receives a circular, it amends target location. Each amendment just needs a simple judgment, and retains only the data of the current circle without storing previous information. The algorithm is easy and saves storage space.

In the WSNs ground moving target tracking system, assuming that the cluster head node report the target location data in every constant time T_f, the target move in accordance with the straight-line trajectory. Its turning and maneuver can be regarded as a straight line trajectory perturbation.

Target state can be expressed by $X(k) = [s_x(k), v_x(k), a_x(k)]$, $s_x(k), v_x(k), a_x(k)$ respectively represent position, velocity, acceleration at k moment in the X direction, $s_y(k), v_y(k), a_y(k)$ respectively represent position, velocity, acceleration at k moment in the Y direction. We use two strong track Kalman filters to estimate the motion state in the X and Y directions. In the both directions the processing is the same, so the following describes are only the target tracking in X direction.

Target state equation is

$$
\begin{bmatrix} s_x(k) \\ v_x(k) \\ a_x(k) \end{bmatrix} = \begin{bmatrix} 1 & T & \frac{1}{2}T^2 \\ 0 & 1 & T \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} s_x(k-1) \\ v_x(k-1) \\ a_x(k-1) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ T \end{bmatrix} w_x(k-1) \qquad (26.2)
$$

where $w_x(k)$ represents process noisy. Sink node can only receive the target location, so observation equation is that $Z_x(k) = HX_x(k) + V_x(k)$. Matrix form is that

$$
Z_x(k) = [1\ 0\ 0] \begin{bmatrix} s_x(k) \\ v_x(k) \\ a_x(k) \end{bmatrix} + V_x(k) = s_x(k) + V_x(k) \qquad (26.3)
$$

where $H = [1\ 0\ 0]$, observation noise $V_x(k)$ is white noise.

According to the target location information reported by cluster head node, the data center use strong track Kalman filter (STKF) introduced in [7] to estimate the trajectory of the moving target. Strong track Kalman filter has the following advantages: (1) strong robustness against model uncertainties; (2) strong tracking capability about mutation state; (3) moderate computational complexity.

The idea of STKF is to weaken the impact of stale data on the current filter by using time-varied fading factor. To reach this ideal by online adjusting the covariance matrix of predicted state and the corresponding gain matrix in

algorithm. Compared with Kalman filter, STKF bring in a fade factor λ_k in covariance matrix of predicted state $P_{k,k-1}$. λ_K is defined by

$$
\begin{cases}
\lambda_k = \begin{cases} \lambda_{0,k}, \lambda_{0,k} \geq 1 \\ 1, \lambda_{0,k} \geq 1 \end{cases} \\
\lambda_{0,k} = \dfrac{Tr(N_k)}{Tr(M_k)} \\
N_k = U_k - H_k Q_k H_k^T - lR_k \quad M_k = H_k F_k P_{k-1} F_k^T H_k^T \\
U_k = \begin{cases} \tilde{z}_1 \tilde{z}_1^T, k = 0 \\ \dfrac{\rho U_{k-1} + \tilde{z}_1 \tilde{z}_1^T}{1+\rho}, k \geq 1 \end{cases}
\end{cases}
\tag{26.4}
$$

where the parameter $0.95 \leq \rho \leq 0.995$ is forgetting factor, and $l \geq 1$ is weakening factor.

26.4 Simulation Analyses

Simulation environment: tracking region is $1{,}000 \times 1{,}000$ m, nodes are in a grid-like distribution, the node space is 50 m. The effective threshold monitoring of the node $d_2 = 100$ m. Long-range detection threshold $d_1 = 100$ m. Supposed that normal mode working cycle $T = 1$ h, non-normal mode working cycle $T' = 100$ms, target moves along motorized curve at the speed of 20 m/s, acceleration is 0.5 m/s^2 in the monitoring area. The variance of acceleration noise is 0.01 m/s^2, the variance of observation noise is 100 m.

Figure 26.4 depicted the estimated trajectory with 16 tracking nodes. Figure 26.5 is the estimated error in the X and Y direction. At the beginning, tracking error is larger, as time goes on, estimation gradually approaches the true trajectory, and the average tracking error is within 20 m, which shows that the localization of this paper and tracking algorithm is fully applicable to the battlefield maneuvering target tracking on the ground.
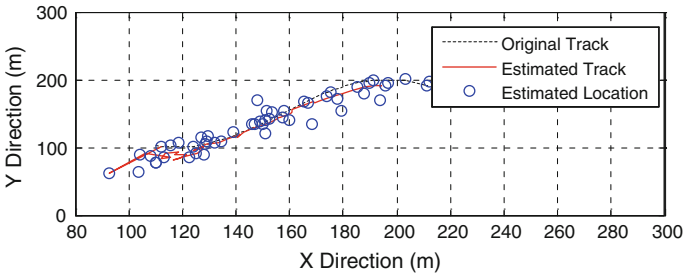
Fig. 26.4 Strong tracking Kalman filtering-based tracking results
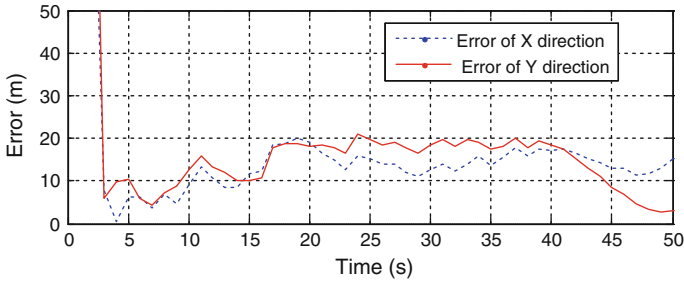
Fig. 26.5 Errors of target traking

26.5 Conclusion

To solve the problem of the energy efficiency of WSNs maneuvering target tracking, this paper presents a new kind of distributed tracking strategy of energy optimization based on dynamic power management. We use wavelet and self-regressive prediction algorithm to achieve a dynamic wake-up of dormant nodes. In order to simplify the process of target location and tracking, we adopt the locating algorithm based on based on the relative position of two circles. In the system, sensor node, cluster head and Sink fuse together to achieve target tracking. This strategy minimizes the network energy consumption, and solves the problem of easy losing and low precision in the process of target tracking.

When maneuvering targets move faster, we must take the monitoring error of the sensor into account. In this paper, we adopt strong tracking Kalman algorithm to improve the robustness of the tracking algorithm. The simulation results show that the proposed forecasting, locating and tracking algorithm not only meet the accuracy requirements of tracking and locating, but also significantly reduce network energy consumption.

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Chapter 27
QoS-Aware Dynamic Resource Reservation Method in Wireless Communication

Zhongqi Duan and Shuyue Chen

Abstract In this paper, we propose a resource reservation stratagem to allocate the resource before handoff. First, we would predict the directions of the MS movement which is based on signal measured. Therefore, we distinguish the resource reserved time which is a threshold of resource establishment by the type of transmitted data. Finally, there is a checking mechanism to compare and modifying again to ensure the resource reservation correctly.

Keywords Wireless communication · Quality of service · Mobile resource reservation protocol

27.1 Introduction

The second generation wireless system (GSM) provides service attention voice and messaging, E-mail service [1]. But on the 3 G, and most of them are mobile multimedia data transmission service, including real-time and the real-time data. In exchange, the multimedia data need more bandwidth and can't suffer too much delay the time. These two factors happen because of the influence of the handoff quality. So we propose a strategy to ensure the quality of the transmission before switching to improve the successful communication and reduce the blocking probability.

The third generation of wireless communication system need to incorporate multimedia services, such as voice, video and continuous flow of data, such as the desired effect of wireless network next generation and personal communication

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system, the battery, the total cells, and the hybrid cells, DORA's structure was also use to support a bag's increasing demand for resources needs [2]. Smaller cell signal and variable in the spread of the cause great frequent. Usually, this type of service can be divided into two types of real-time and the real-time service.

27.2 Signal Measure and Analysis

In the wireless communication, the radio is spread by air has some of the interference factors make attenuation of signal strength. According to the theory of communication, we can get the equation.

Attenuation $= P_1/P$

P_1 received signal (power)

P transmitted signal (power)

Attenuation: $P_1 / P = 1 / d_2$

Base on [3, 4] the distance and power relationship, we can get the equation.

According to the equation, we get the signal strength and distance relationship shows in Fig. 27.1.

In order to perform the location estimate using signal strength, there is defined two signal-thresholds S1 and S2.

We consider a cell in a wireless network with a base station is partitioned into three concentric zones by S1 and S2 signal strength (Fig. 27.2). The cell's radius is R. After computation, we can get the radius of the S1 and S2 which are R1 and R2.

R1 = R * sin45

R2 = R * sin15

According the attenuation equation, we can derive and get the S1 and S2 value.

S1 = S / R12 = S /(R * sin45°)2

S2 = S / R22 = S /(R * sin15°)2

In contrast to the model, if the MH is from [X] cell to [Y] cell and signal strength is lower than S1, it located between large round and middle round and estimate it will go into [X + 1] or [X−1] cell (Fig. 27.3a). If the MH signal strength is between S1 and S2, it locate between middle round and inner round and estimate it will go into [X + 2] or [X−2] cell (Fig. 27.3b). If the MH signal strength is higher than S2, it locate in inner round and estimate it will go into [X + 3] cell (Fig. 27.3c).

Fig. 27.1 Signal strength and distance relationship
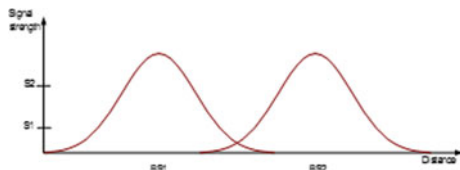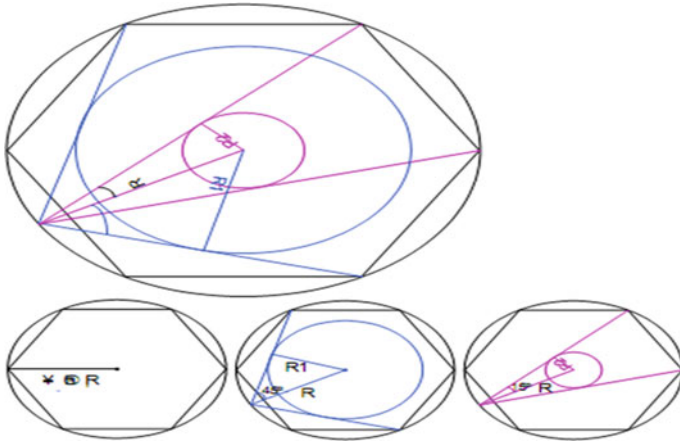
Fig. 27.2 Cell assignments by signal strength

Fig. 27.3 Location and estimation relation **a** MH signal strength < S1. **b** S1 < MH signal strength < S2. **c** MH signal strength > S2
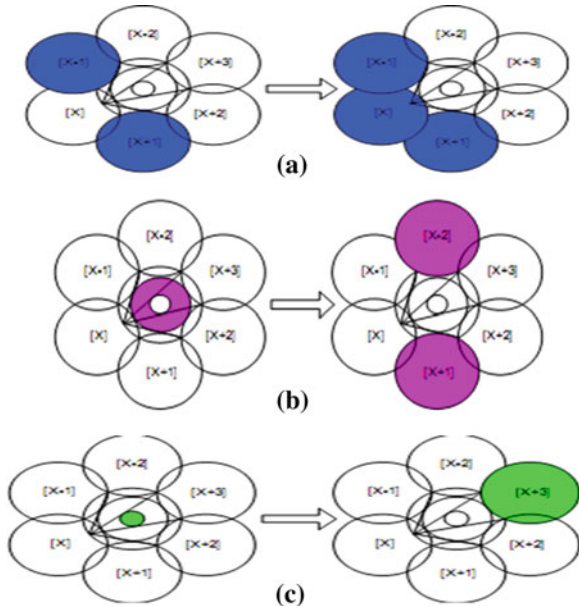
27.3 Resource Reservation Algorithm

In this section, we propose the resource reservation algorithm (Fig. 27.4) to ensure the QoS. The algorithm almost distinguishes into three parts including resource prediction, resource reservation created and checking mechanism. We assume the MH movement from [X] cell toward [Y] cell. And MH into cells and cells begin to

Fig. 27.4 Resource
reservation algorithm
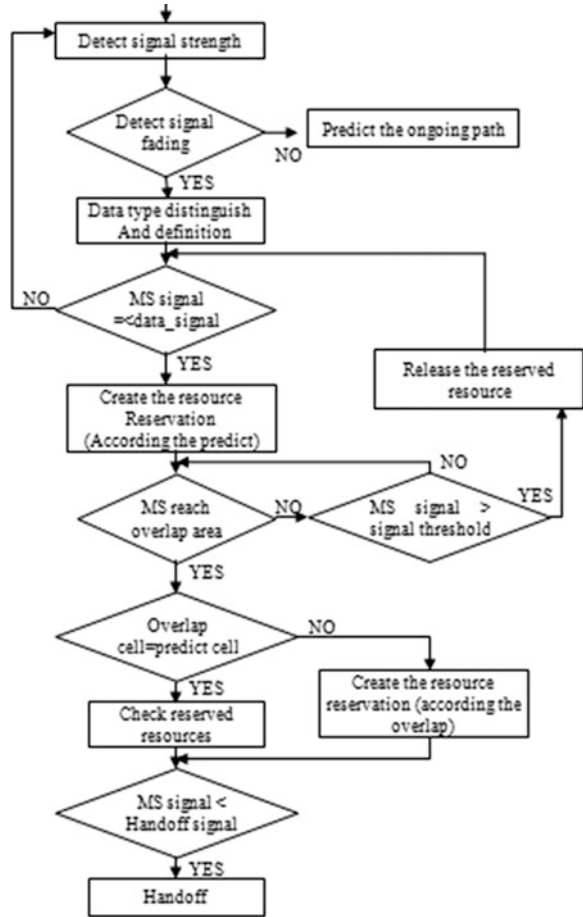
service, the algorithm is installation and testing mechanism of signal strength
unceasingly. Ah it will be in resource prediction process may last forecast path if
the continuous measuring signal strength belongs to harvest. Otherwise, it will
make an appointment mechanism set up different resources threshold value will be
the type of data being transmitted by using threshold of the installation time point
resources reserve. When resources have been reserved, this plan will enter
examination mechanism.

The previous section explains the algorithm schedule; we can get correct
resource reservation by prediction modifying and check process. The Fig. 27.5
shows t the prediction which has been pass the check mechanism and reserved
resource relationship.

Fig. 27.5 Prediction and resource reservation relationship passed check mechanism **a** Measured cell [X−1]. **b** Measured cell [X + 1]. **c** Measured cell [X + 2]. **d** Measured cell [X−2]
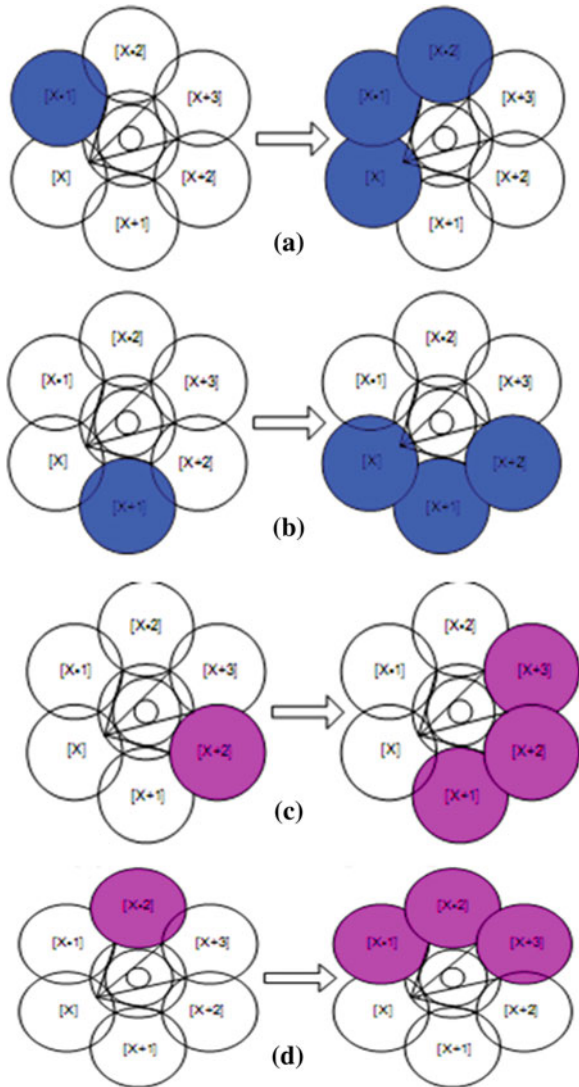
27.4 Research Analyses

There is divided into three parts to analyze the reserved resource properly.

In the paper, we propose a reserved strategy, focusing on the prediction to create reservation amounting to three cells. The algorithm can achieve the most correct reservation if the MH direction of movement does not change. Even though the reservation is wrong, we can use the check mechanism to modify it and reach the correct reservation.

Compared to the Mobile RSVP (MRSVP) method, our proposed reservation strategy provides the more efficient resource allocation than it. Because MRSVP would reserve all of surrounding cell and whole the time until the MH moves into one of reserved cell. Oppositely, our method reserve neither whole the time nor all of surrounding cell. It will begin to reserve resource while the MH signal strength is lower than the threshold. And it just reserves the adjacent three cells.

The Time and Cost of Analysis

We assume that a MH moves from X_0 cell to X cell. Then it removes from X cell to Y cell after a moment. There is assumed that the 'T' is the staid time of MH in X cell and t_1, t_2 represents MRSVP and our method reserved time for Y cell resource during the MH stayed X cell. So we can get reserved time during MH stayed X cell. The t_1 means the reserved time for Y cell while MH move from X cell to Y cell. Because the MRSVP method is reserved all the time of stayed X cell period so the reserved time t_1 would equal T. The t_2 means the cost time of using our method. The t_2 would be small than t_1 because it is not reserved all the time just reserved a part of period until the signal reach the threshold, it would trigger the reserved mechanism.

$$t_1 = T \tag{27.1}$$

$$0 < = t_2 < T \tag{27.2}$$

$T - t_2$ means the time of MH signal strength higher than threshold segment when MH is stayed in X cell. According to (27.1 and 27.2), we can get

$$t_2 < t_1 \tag{27.3}$$

We assume that r is the basic unit of resource reserved and R_1, R_2 represent MRSVP and our method reserved resource during the MH stayed X cell. The MRSVP method reserve six cell of the surrounding cell, so

$$R_1 = 6r \tag{27.4}$$

Our method just reserve three cell, so

$$R_2 = 3r \tag{27.5}$$

According to (27.4, 27.5) we can get equation

$$R_2 = 1/2 \; R_1 \tag{27.6}$$

We use the C to express the cost and C_1, C_2 represent MRSVP and our method reserved resource during the MH stayed X cell. So the reserved cost can be expressed the following equation.

$$\text{Cost}(C) = \text{Resource}(r) * \text{Time}(t) \tag{27.7}$$

The cost of MRSVP is

$$C1 = R1 * t1 = 6r\,t1 \tag{27.8}$$

The cost of our method is

$$C2 = R2 * t2 = 3r\,t2 \tag{27.9}$$

According to (3), we can derive

$$
\begin{aligned}
r \cdot t2 &<= rt1 \\
3r\,(t2 &< 6r)\,t1 \\
C2 &< C1 \\
C2/C1 = (3r\,t2)/(6r\,t1) &<= 3r\,t1/6r\,t1 = 1/2
\end{aligned}
\tag{27.10}
$$

Compare with MRSVP, the cost of our method is less than MRSVP. Even it is equal or less the half of MRSVP cost.

27.5 Conclusion

We put forward an algorithm to maintenance resource reserve resource efficiently quality, so it can increase the probability of successful, lower switching failed switch. In addition, this method can effectively keep resource allocation, reduce the waste of resources. Finally, this paper proposed algorithm and the data structure are based on signal strength and the calculation method is simple and efficient. In the coming days, we will transmit data more details, and can get the exact threshold, it will improve the comprehensive resource management efficiency.

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Chapter 28
Study on ZigBee Wireless Sensor Networks Tree Routing and Distributed Addresses Assignment Mechanisms

Jingfu Yan

Abstract The advantages of tree routing and distributed addresses assignment mechanisms in ZigBee wireless sensor networks are its simplicity and less resource consumption. However, they bring some constraints on the network configuration and may reduce the network connectivity. This will cause the expected network operations and functionality to be unreached and also waste the corresponding deployment costs of the isolated sensor devices with failed joining. This paper proposed an efficient connection shifting mechanism to reduce the isolated device and improve the overall network connectivity.

Keywords ZigBee · Wireless sensor networks · Tree routing

28.1 Introduction

ZigBee is a standard designed for low data rate, low cost, low power wireless sensor network. It uses IEEE 802.15.4 as its physical layer and MAC layer, can be applied to various home automation, industry control, environmental sensing, target tracking, battlefield supervisory and control, etc. [1, 2]. More and more relevant document is published recently, but ZigBee connection problem is really not too concerned about in these studies such as routing algorithm or data broadcast method [3, 4]. For example, many papers focused on the sensor network

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coverage also assumed that network communication connection is good [5, 6]. As the network connectivity will affect the performance of network operation, should pay close attention to its really good [7].

ZigBee in network, even if a device has a radius of up to join other communication network node, it will still refused to join the network due to some network configuration parameters (see following part). The purpose of this article is to improve the join ratio (link) ZigBee devices in the deployment of sensor network.

28.2 Zigbee Network Joining

ZigBee defined three types of devices: ZigBee Coordinator (ZC), ZigBee Router (ZR), and ZigBee End Device (ZED). ZC will initiate the network and accept the join requests come from ZRs or ZEDs. Only ZC or joined ZRs can accept join requests and forward packets. And, each device can join to one device at most. A tree topology network (Fig. 28.1) will be formed for the purpose of using default Tree Routing scheme to forward packets. ZigBee uses this routing scheme to simplify matters of general routing protocols [8].

As shown in Fig. 28.2, ZigBee designed a Distributed Address Assignment Mechanism to allocate network addresses for the joined nodes and defined three related configuration parameters: nwkMaxChildren, nwkMaxRouters, and nwkMaxDepth relative to this mechanism. They respectively indicate the constraints on a ZigBee network: The number of children a device is allowed to have number of router any one device is allowed to have as children, its depth and a device. So even if a device has a radius of other join node communication network, it can be refused to join the network because these parameters.

Fig. 28.1 ZigBee devices and tree topology

$nwkMaxChildren (C_m) = 4$
$nwkMaxRouter (R_m) = 3$
$nwkMaxDepth (L_m) = 3$

Depth, d	Offset, $Cskip(d)$
0	17
1	5
2	1
3	0

C : $Cskip$ Value
A : Address
● ZigBee Coordinator (ZC)
● ZigBee Router (ZR)
● ZigBee End Device (ZED)

$$C_{skip}(d) = \begin{cases} 0, & \text{if } d = L_m \\ 1 + C_m \cdot (L_m - d - 1), & \text{if } R_m = 1 \\ \dfrac{1 + C_m - R_m - C_m \cdot R_m^{L_m - d - 1}}{1 - R_m}, & \text{otherwise} \end{cases}$$

$Address_{ZR} = Address_{Parent} + 1 + C_{skip}(d) \cdot (i-1),$ for i^{th} ZR child

$Address_{ZED} = Address_{Parent} + C_{skip}(d) \cdot R_m + j,$ for j^{th} ZED child
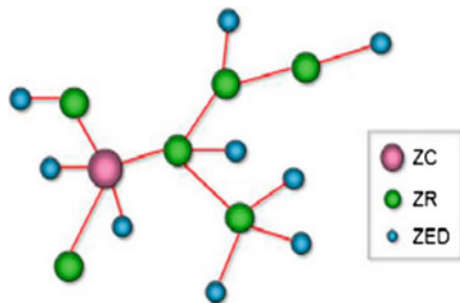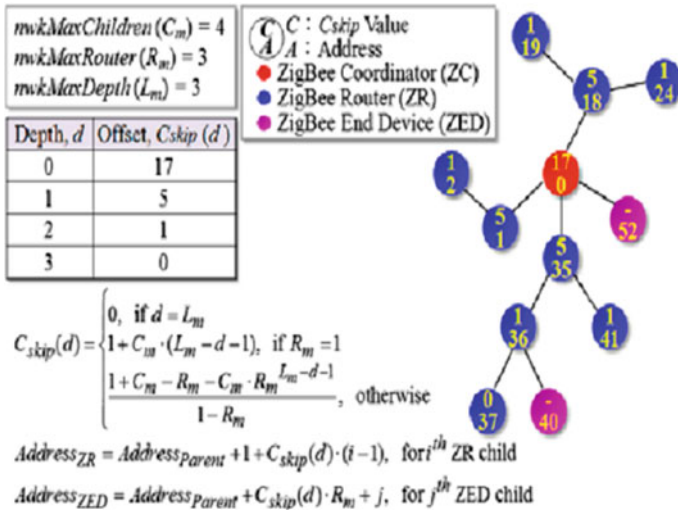
Fig. 28.2 ZigBee distributed address assignment

28.3 Connectivity Improvement

28.3.1 Problem Description

An example of connectivity problem in a ZigBee network is shown in Fig. 28.3. It is illustrated in Fig. 28.3a that the network configuration parameters described in previous section will cause some join failures and bring the isolated sensor nodes in the tree-based ZigBee network. Assume that three parameters nwkMaxChildren, nwkMaxRouters, and nwkMaxDepth are equal to 3, 2, and 3 respectively. The ZR node D will get failures to join the network through node A or B due to the excesses of the ZR children of A or B even though A and B are both in the communication range of D. Besides, although node C has no child, D will still get failure to join C due to the excess of depth limitation. Therefore, node D becomes an isolated node of the ZigBee network and it is unable to accept any join request comes from other nodes because of only the joined nodes in the network are allowed to accept join requests of other enjoined nodes. So that both of the ZR device M and ZED device N will become isolated nodes, too. For the same reason described above, the node P will become isolated from the network because of the similar situation.

Our base idea for improving network connectivity is shown in Fig. 28.3b. Since there is a remained capacity of one ZR children at node G, the ZR child E of node A, in fact, does not have to join the network through node A. The node G can be the other choice to which allows ZR node E to join. If node E selects G instead of A to join, A will become joinable for the isolated node D. Accordingly, ZR node
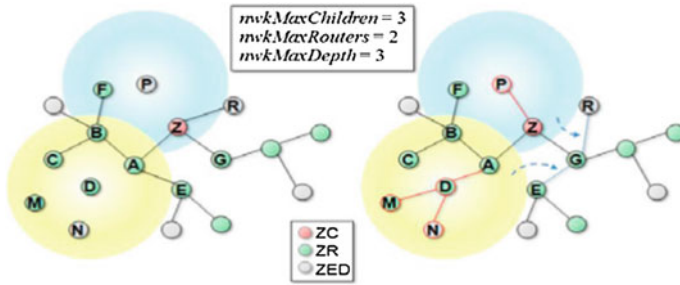
Fig. 28.3 Illustration of ZigBee connectivity issue

M and ZED node N will be allowed to join to D. Similarly, ZED node P can successfully join to node Z after the ZED node R performing the change of join target from Z to G. In this paper, we called the connection change of node E from node A to G and the connection change of node R from Z to G, as shifting, and called the joining which succeeded by means of a shifting, as extended joining. In the illustration, shifting of node E and R will make the ZigBee network an increase of four nodes extendedly join to participate in the operation of network functionality. This improvement contributes not only the reduction of isolated sensors and wasted costs but the performance growth of the ZigBee sensor network.

28.3.2 Propagation of Joining Information

To improve the network connectivity describe as before, there are four processes in a single node can join a potential parents node at home and abroad: (1) a node can decide how it is a change can node; (2) the potential for parents can determine that it has a child transfer ability; (3) the parents can announced that potential, this is joinable position, because it can change the child; (4) in the process of the requirements of the potential parents to join.

First, in our proposed mechanism we make use of the MAC beacon payload of ZigBee for an already joined node checking whether it has a neighbor as another choice to join. The following Fig. 28.4 shows the format of MAC beacon payload defined in ZigBee. Router Capacity field has a TRUE/FALSE value that indicates whether the beacon broadcasting node has capability to accept a ZR device as its child. End Device Capacity field similarly indicates that whether the node can accept a ZED device as it child. Therefore, when an already joined node receives a beacon frame from its neighbor, it can check the Router Capacity or End Device Capacity field for determining that whether it has another choice to change the parent and become a shiftable node.

Subsequently, there are two situations should be respectively considered how the parent node can be aware of having the shift able child which may be a ZR or a ZED device. If the shift able child is a ZR device, the MAC beacon was utilized in
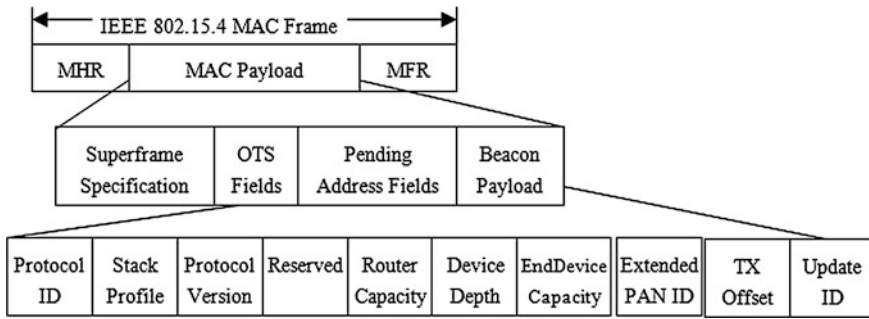
Fig. 28.4 Payload format of ZigBee MAC beacon

our proposed mechanism for the child notifying its parent of that it is a shift able ZR device. We use one of the 2 reserved bits in MAC beacon payload as a Shift able flag field (as Fig. 28.5) to imply the information of whether the beacon broadcasting child is a shift able node which has an alternative neighbor can be chosen and become its new parent. We add a new field, Shift able, to the ZigBee neighbor table (as Fig. 28.6). After a parent receiving a beacon frame from its child, it will check the Shiftable flag in the payload and update the Shift able field in neighbor table for further determining whether it can accept an extended join request.

Since MAC beacons are sent periodically in ZigBee networks, utilizing the beacon and reserved field to notify the Shift able information has the advantage of taking no additional message and communication overhead. However, in a ZigBee network, only the ZC device or joined ZR devices can periodically send the beacon frames, ZED devices cannot perform sending beacons. Therefore, in our proposed mechanism, when a child which is a ZED device wants to notify its parent the Shiftable information, it needs to send a short message. We design that a ZED child sends a notification to its parent only when the change of its Shift able status occurs, that is, when the status of Shift able changes from SHIFTABLE to NOTSHIFTABLE or the contrary. This scheme is used instead of periodically sending notification message and it will reduce the communication overhead as far as possible for notifying the ZED Shift able status. For the scheme, a new message command (Table 28.1) is added to the existed ZigBee command list.
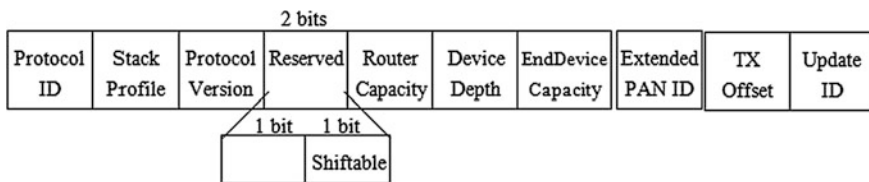
Fig. 28.5 Define shift able flag in beacon payload

Fig. 28.6 Propagation
of joining information
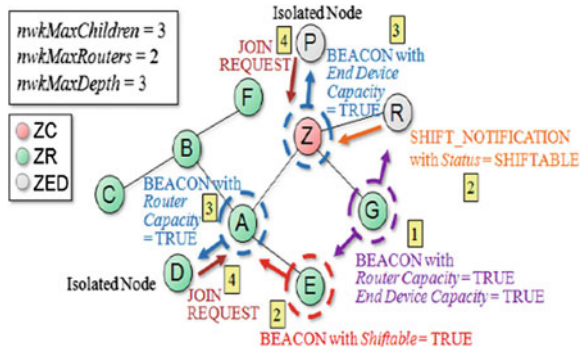
Table 28.1 Add SHIFT_NOTIFICATION command

Command identifier	Command name	Parameter	Description
0x0B	SHIFT_NOTIFICATION	Status = {SHIFTABLE, NOTSHIFTABLE}	A command used by a ZED to notify its parent with the status of shift capacity

The next process is how a potential parent to announce the status that it is acceptable for an extended joining. For the principle of reducing the communication overhead as far as possible, we also utilize the MAC beacon to imply the joining information instead of sending additional message. A new attribute item named nwkUseShifting was added to the existed ZigBee NIB (Network Information Base) for our proposed mechanism (Table 28.2). This attribute indicates whether the ZigBee network will use the proposed shifting mechanism to improve the network connectivity. In the mechanism, if nwkUseShifting is set to FALSE, the fields Router Capacity and End Device Capacity in the MAC beacon payload will imply original joining information that whether the potential parent has the capability for accepting normal join request. Otherwise, if nwkUseShifting is set to TRUE, the Router Capacity and End Device Capacity fields in MAC beacon payload will imply both normal joining and extended joining information that can indicates whether the potential parent has shift able children for further providing extended joining and accepting join requests. In other words, if nwkUseShifting is TRUE and a potential parent node has no router (or end device) capacity for accepting a join request of ZR (or ZED) device, the potential parent will check

Table 28.2 Added attribute item in ZigBee NIB

Attribute	ID	Type	Read only	Range	Description	Default
nwkUseShifting	Oxaa	Boolean	No	{TRUE, FALSE}	A flay that determines whether the device uses the shifting mechanism	TRUE

whether it has a shiftable ZR (or ZED) child and set Router (End Device) Capacity field of MAC beacon payload to TRUE (or FALSE) if it has a (or has no) shift able ZR (or ZED) child.

Since the Router Capacity and End Device Capacity fields in MAC beacon payload can imply the information of both normal joining and extended joining provided by a potential parent node, the join process is transparent to the joining nodes. A ZR (or ZED) node which has not joined to the network can send a join request to the potential parent after receiving a beacon with RouterCapacity (or EndDeviceCapacity) = TRUE from that potential parent. Following Fig. 28.6 is an illustration of propagating joining information that described above.

28.4 Conclusion

It can increase some existing equipment expected, so ZigBee network operations can prevent waste sensor deployment. The results of simulation in the network, it shows the join proportion, can improve the mechanism of the sensor deployment.

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Chapter 29
Study of Heritage Track of Taijiquan Based on Contemporary Communication Strategy

Jianjun Wang

Abstract Taijiquan as the carrier of the traditional culture in China, which has had a long history of development, set fitness, self-defense, slim, character, entertainment and other functions in one, and it is a typical Chinese traditional sports project, has the bright Chinese characteristic. The rich Chinese philosophy and culture color of traditional health fitness value has drawn characteristics such as different people, is the best of the domestic and foreign media effect a traditional ethnic sports as the best in Martial arts dissemination separated, mode of transmission and spread to the rest of the content relative to martial arts project has been relatively mature. In this paper, through the literature material method, logical induction and expert interview and so on, first of all, in the comprehensive martial arts dissemination of literature on the basis of Taijiquan communication arisen with development are briefly summarized, and the Taijiquan communication content, function, principle as well as the gatekeeper four aspects has carried on the classification research. On the basis of Taijiquan communication from the social sports, school sports and competitive sports in three aspects has carried on the analysis of the current situation, put forward Taijiquan communication problems as heavy routines, light culture; heavy competition, light traditional; teachers limited. Finally, we put forward some advice for the Taijiquan communication problems and the development trend in the future, in Taijiquan communication process; we should pay attention to not only the content of Taijiquan, but on the basis of Taijiquan culture and its unique technology, mining sorting and development, including traditional Taijiquan technology of mining. To Taijiquan, we should strengthen the social sports, school sports and competitive sports in three aspects of communication, strengthen the teacher's faculty.

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29.1 Introduction

Taijiquan as Chinese traditional culture is most colorful "philosophic boxing", with distinct Chinese characteristics, therefore in the spread of Taijiquan in the process, the rich Chinese traditional culture can be spread, can let the Taijiquan audience in learning Taijiquan at the same time to understand Chinese culture [1]. This also martial arts for the external development and dissemination of culture from some cultural barriers, have basic understanding of Chinese martial arts, to promote the development and popularization of foreign martial arts, promote the Chinese martial arts and the spread of Chinese culture and carry forward. Although Taijiquan a fist and not representative of all martial arts project, but with distinct Chinese traditional culture "philosophic boxing", from the audience, the most widely practiced, popularization, the most crowd, from the channels of transmission that is relatively broad, spread effect in martial arts is the best, to a certain extent can be said to be the martial arts of the successful transmission of a typical case [2].

29.2 Origin and the Development of Taijiquan

According to Professor Fang Hanqi research, "spread" in 1,400 before it appeared, was found in the history of the north. This is intended to spread widely announced long [3]. China's authoritative dictionaries "dictionary" 1979 edition entries "spread", not only "spread", but to "spread" is the interpretation of "communication". "Modern Chinese Dictionary" 1996 edition of "communication" is interpreted as "widely scattered", communication with the community, the common nature of human information exchange activities.

Taijiquan set of Chinese traditional philosophy, medical, military and many other classical culture in a body, into the fighting, fitness and self-cultivation in one, in the long history of the dissemination of more profound, more philosophical, become Chinese philosophic boxing, the Chinese Martial arts is a bundle of flower [4]. And communication with the community, the common nature of human information exchange behavior and activity, so that Taijiquan requires the development of communication, communication is a necessary condition for the development of Taijiquan; on the other hand, Taijiquan can enrich the communication content, make the communication more specific content, this is the Taijiquan and communication relationship.

According to the official conclusion, Taijiquan is from a small village in Chenjiagou begins to spread, and then spread all over every corner of China [5], to spread to the rest of the world. Taijiquan Chuan arisen with the function of communication, exchange and dissemination of human nature is the important human society, the spread of existence, is the essence of all social intercourse spread. Taijiquan's dissemination and development must have the aid of the medium is the media (media), is a carrier of information, channels, intermediary, tools or techniques, also engaged in information collection, processing, production and dissemination of social organization and communication mechanism. Since the end of Qing Dynasty, Taijiquan for the reform and development of the pioneers, gradually get rid of parochial prejudice, sectarian influence, so that Taijiquan from Wenxian County Chen Village walk [6]. Taijiquan is an epitome of Chinese traditional culture, dissemination of "inheritance of social civilization, the social heritage of be handed down from age to age" the function of Taijiquan in the play, naturally or half unconsciously culture civilization function, affect the social strength to tired day in and day out [7]. Today, Taijiquan exercise gradually into the school, to the public, traveled the whole of China, to the world. Taijiquan through the media constantly publishing and broadcasting, as well as various human cultural exchanges and realize to be inherited, develop the useful and discard the useless, fusion. The Taijiquan has achieved in the global spread, reflect the culture of the Chinese nation and the global cultural exchange new results, new form

29.3 Taijiquan Communication Theories to Refer to Current Situation Research

Human communication process and the progress of human civilization development, the human from the invention of text to use various materials for storage and transmission of information, and the continuous improvement of information recording methods, in order to improve the communication speed, breadth and depth. Study on the propagation theory of Taijiquan and for the study of Taijiquan communication present situation analysis the theoretical basis.

29.4 Taijiquan Communication Content Theory

Now social Taijiquan communication is the main content of Taijiquan as the sport spread. Many people aware of Taijiquan Chuan is a fitness items, ignoring the Taijiquan generalized aspects of cultural content, namely Taijiquan not only is the Chinese nation tradition sports project, it is Chinese nation's traditional culture

important component. Therefore Taijiquan communication contents to be from narrow sense and broad sense point of view [8].

A narrow way, Taijiquan is simply a boxing. In the ancient fighting value and health, prolong life and other effects, along with the age of cold steel of the exit, the modern society advocating peace, refused to force, Taijiquan fighting value gradually fade out the historical stage, replace sb. Taijiquan belongs to the Chinese martial arts, martial arts is the essence of Martial arts, no fighting value, cannot become a "martial arts martial arts". Even though the Taijiquan Fighting value changes with the times is in abate, Taijiquan belongs to the martial arts fighting nature still will not change, therefore, Taijiquan as a form of martial arts, its essence core has not changed. In modern society, Taijiquan fitness value orientation is Taijiquan function value center of gravity with the needs of the community and the transfer of Broadly, Taijiquan is not only the Chinese national traditional sports, it more than sports this words, which belongs to a part of Chinese traditional culture in modern times, experienced the traditional to the modern transformation, is Chinese nation's traditional philosophy, medical, military and many other classical culture in one of the national culture, is the Chinese traditional culture. In much traditional cultural nutrition, Taijiquan itself has become a kind of culture. It not only contains the Taijiquan boxing and Taijiquan routines, also contains the transmission process by carrying the historical heritage, as well as the ethical and Chinese philosophy, medicine, art, aesthetics, fusion and extension. Therefore, from the broad sense, Taijiquan communication content is more than of Taijiquan boxing and routine exercise, should also include Taijiquan and the cultural fusion. "Outside the box, can attack jade", from the dissemination study angle to the Taijiquan Chuan deep culture communication research and refinement of the dissemination of research, can provide Taijiquan culture and Martial arts culture research provide a theoretical model.

Taijiquan communication is the main function of cultural heritage, the Taijiquan fighting skill and Taijiquan culture inheritance and spread down, to be handed down from age to age and with other cultural fusion. Taijiquan communication can promote different kind of genre of technological and cultural exchanges, and in exchange to generate new styles and genres, such as the Yang, Wu, Wu, sun style, Zhao Bao and other schools in Taijiquan is generated on the basis of different schools. This is the Taijiquan to meet the need of social development performance. In addition, Taijiquan culture also makes Taijiquan fighting skill and Taijiquan culture has been spread and preservation. In the long history, whether it is handed down from generation to generation or other sects, the Taijiquan in the spread of technology development and accumulation, in the process of communication, the previous theory as a foundation, with rich traditional culture as the background, to develop the useful and discard the useless, draw lessons from somewhat, be innovative to Taijiquan theory more rich and perfect. Therefore in Taijiquan communication process, attention should be paid to Taijiquan Cultural Inheriting function of Taijiquan in the future, so that the

transmission process gives the concept is not just an empty set shelf, but full of the traditional cultural connotation of "philosophic boxing", expand communication object.

29.5 Taijiquan Communication Strategies

Taijiquan Chuan at home and abroad has a wide spread foundation. But Taijiquan soft action, fitness effect, suitable for all age classes of people practicing, at home and abroad a wide spread area. Internationally, Taijiquan has also been widely spread. Taijiquan has different value function, suitable for different age groups, occupation, and rich cultural connotation and attracts a lot of people, on the whole the Taijiquan communication trends better.

29.5.1 Attached to Dissemination of Traditional Chinese Culture, Combination of Theory and Technology

For hundreds of years, Taijiquan as a kind of national traditional sports culture, in the new historical period still is maintaining exuberant vitality, because Taijiquan culture in succession in the development. This heritage is not only routine heritage, is the traditional cultural heritage. Belgium's Mark Boehm thinks, Asian martial arts in the West during the spread of focusing on technical communication, while the Asian martial arts in the intron of the spiritual, cultural, artistic content is easily overlooked. Taijiquan is the variety of traditional culture of aggregates, is a traditional cultural significance is most abundant in boxing, spread to the world in the process, also existing "form" light "meaning", "Sports" light "cultural phenomenon". Although relative to Taijiquan contains fighting thought, philosophy, culture, external action skills come easier, however, this quick thinking that Taijiquan lost its vitality, from Taijiquan Chuan integral culture dissemination track. In fact, many foreigners like one of main motive is to understand Chinese culture, lack of Taijiquan theories and related cultural background of Taijiquan, is not a complete sense of Taijiquan, but not to the spread of Taijiquan, Chinese traditional culture the purpose of publicity. So the spread of Taijiquan in the process, should strengthen pair of Taijiquan contains the traditional culture and Taijiquan blend of the traditional culture communication, in recognition of the Taijiquan martial arts project at the same time also should know that Taijiquan is also a kind of culture, is the traditional culture and the martial art combining a typical Chinese "philosophic boxing". Therefore, Taijiquan during the spread of Taijiquan should not only attach importance to the spread of technology, but also pay attention to Taijiquan theory and technology with the traditional culture communication.

29.5.2 Attached to the Taijiquan Technology Development and Mining, to Enrich the Content of Communication

In 1956 the State Physical Culture and Sports Commission organized partial expert, in traditional Taijiquan Foundation, press from simple to complex, gradual, easy learning principles, mainly in the Yang Style Taijiquan as the basis, to the difficulties and repetitive movements, selection of the 24 type, into "Taijiquan". Now, 24 Style Taijiquan is currently the world's most widely practiced, the largest number of Taijiquan, and Martial arts propagation effect best, spread the widest range of projects. 24 Form Taijiquan technique is easy to learn, but did not complete show, so, pay attention to Taijiquan technology mining, especially traditional Taijiquan technology mining, enhancement of Taijiquan fighting nature of content, from the aspects of excavation and finishing of Taijiquan Chuan technology, rich Taijiquan communication content, to Taijiquan Fist communication has important significance. In the mining process for different groups of people, Taijiquan technology stress should also change. As for the public places practicing Taijiquan, its content should be easy to learn, with 24 form Taijiquan as an example, the other traditional Taijiquan finishing and simplify their routines, and the government 's promotion to spread, so that Taijiquan not only content of diversification, also increase the practicing Taijiquan participation crowd. For the school sports, in addition to simple routine exercise and Taijiquan theory teaching, attention should be paid to Taijiquan Chuan martial art technique teaching, from the angle of attack so that students understand Taijiquan is a kind of martial arts, martial arts is the essential content.

29.5.3 The Development of C Unique Health Fitness Value, Expand its Dissemination Object

People on Taijiquan fitness value understanding, can be traced back to a century ago. Guangxu of the Qing Dynasty was "Taijiquan Quan, early 13 potential lines of verse", had long pushed intended end where? Modern East–West cultural conflict and fusion, people began to use western physiology, biomechanics, biochemistry, psychology, immunology, and studies and other disciplines of knowledge on Taijiquan fitness function of a scientific research, and proof of Taijiquan exercise on human body has a good exercising effect. Taijiquan in addition to combat role, physical fitness is a major characteristics, and other strenuous exercise, Taijiquan is a static exercise, requirement of the body loose heavy nature, mind and body coordination, coordination movement, will make people breathe soft reduction, oxygen consumption, heart rate slowing, lower blood pressure, improve the overall physical quality, mobilize and train the body's physiological potential, to improve curative effect. Taijiquan in the "mind body loose" is the elimination of mental and physical stress, to help the organ, the relaxation system.

The first brain be loose to calm down, followed by muscle, bone, internal organs in consciousness but also eliminate the awkward strength, wholeheartedly betting on Taijiquan exercise. Taijiquan can effectively repair the mental strain and fatigue, improve brain function. Long term Taijiquan exercises the brain waves of the alpha wave is dominant, the peak of prominence, synchronous and orderly, and the brain into a good state of awakening. Taijiquan training system, enhance the human left and right brain balance and coordination function. The Taijiquan practice object is not just the elderly, according to school physical education, especially in the face of the pressure of college entrance examination students, because the learning pressure, spirit is relatively tight, practicing Taijiquan can make them relax, relieve pressure. In addition to the modern societies busy office workers, practicing Taijiquan can also ease the day's fatigue and work pressure.

29.5.4 Strengthen the Taijiquan on the Communication Strategy Research

In traditional society, people rarely have the opportunity to come into contact with an alien culture, and today, we on earth, almost all the countries and people are no longer strange, flooding the market with foreign corporeal product and mental product so that we can come into contact with foreign cultures, we can not only through the mass media experience various exotic customs, customs and the way of life, also can pass Internet slow travel world. Taijiquan is the Chinese national traditional sports, its unique mode of motion attracts many foreigners to practice, and so that Taijiquan in the new historical period still is maintaining exuberant vitality, but also makes the Chinese traditional culture has been more and more people's concern.

Of course, in the spreading process for different groups of people, should have different emphases. Many foreigners like Taijiquan is mainly due to its implication of the national traditional culture and unique fitness exercise, so the content of communication besides paying attention to teach people how to practice and the familiar repertoire should be more explanation is full of Chinese traditional cultural characteristics of the Taijiquan culture. Should set up Taijiquan International Communication Department, strengthen the communication power. To strengthen overseas Taijiquan audience survey, for different types of audiences with different modes of transmission, focus on audience feedback, focus on communication, namely Taijiquan instructor and practitioner of two-way communication. To develop the most artistic charm of the route of transmission, such as movies, television dramas, attaches great importance to close form of communication, such as television drama "Taijiquan" "Taijiquan", "Taijiquan" and other Zhang Sanfeng films, as well as some Taijiquan class contest broadcast programs, but in the spreading on the need to pay attention to the film translation of film quality and feedback effect.

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Chapter 30
Database Design of Wireless Sensor Network

Wenqing Zhang and Yong Liao

Abstract In order to achieve high performance of the data-center network system, and supply an effective sensor database administration processing system in the interest of observing person or consumer. This paper gives a new design for data processing in wireless sensor networks. The paper firstly discusses the necessity for building the wireless sensor network database supporting all kinds of applications. Second, the difference compared with traditional databases and some implementation keys of the "special" database are presented. Finally, we analyze the corresponding architecture, e.g. the functional compositions on the database front-end, and inside the network nodes, and the techniques to complete required query with the collaboration between nodes.

Keywords Wireless sensor networks · Database · Data model · Query process

30.1 Introduction

The application of wireless sensor networks to the physical world and information world, closely linking a large number of nodes to use various forms of sensing components to obtain the environment and of monitoring the temperature of the object, speed, electromagnetic signals. Wireless sensor networks and low cost,

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high accuracy, cannot reach many human, and cannot maintain the environmental work under the broad application prospects in military applications, environmental science and medical aspects. This approach has many drawbacks: First, the wireless sensor network is not based on application needs access to data, while no or very little use of the node processing capability for data processing, resulting in a lot of redundant data in the network transmission, wireless communications heavy burden; Second, not adapt to network dynamics and life cycle requirements, and cannot support different applications. As the sensor network size increases, these issues will become more prominent. In view of this situation, researchers proposed the concept of a wireless sensor network databases [1, 2], wireless sensor networks, data centers, built to support multiple applications and improve the performance of data management and ease of use, direct use of a variety of applications simple SQL-like language to query to get data.

30.2 Reality of the Wireless Sensor Network Nodes

30.2.1 The Composement of Nodes

Wireless sensor networks by multiple functions of the same or different wireless sensor nodes, each sensor node by the data acquisition modules (sensors, A/D converter), data processing and control module (microprocessor, memory), communication module (of wireless transceivers) and power supply modules (battery, DC/DC energy conversion) and so on (Fig. 30.1). These nodes are set in an integrated way within or near the measured object, usually small size, low cost low-power, multi-functional characteristics of nodes in the network can act as a data acquisition, data transfer station or class head node (cluster head node), role as a data acquisition, data collection module to collect the data of the surrounding environment (such as temperature humidity), directly or indirectly through the communication routing protocol data transmission to the remote base station or sink node; as a data relay station node in addition to the completion of the acquisition task, but also to receive the data of the neighbor will forward it to the distance from the base station closer neighbors or directly forwarded to the base station or sink node; responsible for collecting the data collected by all nodes within the class as a class header node, and sent to the base station or sink node after data aggregation.

30.2.2 Network Architecture

Wireless sensor networks and traditional wireless networks (such as WLAN and cellular mobile telephone network) has a different design goals, by optimizing the

Fig. 30.1 Node of sensor diagram
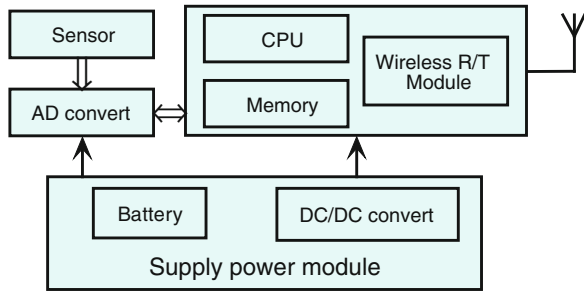
routing and resource management strategy to maximize bandwidth utilization, the latter in a highly mobile environment to provide users with a certain quality of service guarantees. As shown in Fig. 30.2. The network consists of sensor nodes, parts of the receiver transmitter, the internet or communications satellite, the task management node. Sensor nodes scattered in a specified area of perception, each node can collect data, and through multi-hop routing of data transmitted to the receiver transmitter receiver transmitters can also be used in the same way to send information to each node to receive the transmitter is directly connected to the internet or communications satellite, by internet or communications satellite to achieve the task manager node (i.e. observer) and the communication between the sensors in wireless sensor networks, in addition to the small number of nodes need to move most of the nodes are stationary. Early stage of research in wireless sensor networks, people once mature Internet technologies, combined with the Ad-hoc routing mechanism design of the sensor network is sufficient, but in-depth study showed that: the sensor network has a significantly different with the traditional network technical requirements. Order to adapt to a wide range of applications, the traditional network design follows/end-to-end edge on the ideological emphasis on all the features associated with the processing on the network on a client system, the intermediate node is only responsible for the data packet forward, this may not be a reasonable choice for sensor networks, self-organization in Ad-hoc network design protocols and algorithms may not be suitable for the characteristics and application requirements of sensor networks of node identifier (such as address, etc.) in sensor networks, it is not very important, because the application is not

Fig. 30.2 Typical sensor network architecture
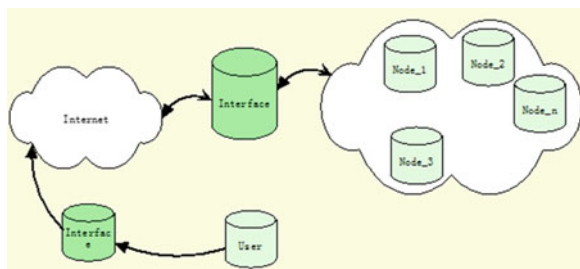
very concerned about the information on a single node, intermediate nodes on the specific application-related data processing and caching becomes necessary [3].

For a sensor network, the node by its spatial location and type of sensor to determine, and sensor networks have better fault tolerance, real-time and environmental change adaptive capacity. In addition, with traditional sensors and traditional compared to the measurement and control systems, wireless sensor network has obvious advantages: it uses a point-to-multipoint wireless connectivity, which can greatly reduce cable connections; end of the sensor nodes merged analog signal conditioning, digital signal processing and network communications capabilities, making node has a self-test function; at the same time, the system performance and reliability will be improved significantly, while the costs are significantly reduced.

30.3 Implementation of Wireless Sensor Database Techniques

Wireless sensor network databases, data distribution, storage in each node, ad-hoc network to establish a connection between the storage nodes form a distributed database [4]. At present, foreign study in this regard Berkeley's Tiny DB and the Cornell University COUGAR the two systems. The two systems have in common, but the Tiny DB better consider saving energy consumption, and the choice of a query, aggregation, grouping, and other operations to better support [5]. We will combine the Tiny DB system to discuss the design and implementation of wireless sensor network database. Wireless sensor network database is divided into two parts: First, run a database front-end at the base station, as the application to access the data interface; the second is embedded query execution engine running on each node, is responsible for the implementation of the query and the node management.

30.3.1 Design of Wireless Sensor Network Database

Wireless sensor networks, database front end running on a wireless sensor network base station, base station can be a PC, can also be a dedicated X Scale based Micro server and other equipment. Wireless sensor network database application to provide SQL-like query interface and command interface, only need to use the SQL language can be interested in the data from the sensor network. The query language has the following format:

SELECT select-list [FROM sensors] WHERE where clause [GROUP BY gb-list [HAVING having-list]] [EPOCH DURATION integer].

The main difference between the syntax of standard SQL is specified, only the data sheets of sensors and data collection interval, so that each cycle to return a query result, where the time period of a data tuple timestamp.

Figure 30.3 is a wireless sensor network database front-end structure. Receives a new SQL query front-end validation and interpretation of the query based on metadata, the query content is saved to a Java object (Q). In Q with the list not only records the query to retrieve the field information, including field name, type, etc., and record a role in the field of expression, including the aggregate operations, filtering operations. Each query is assigned a unique ID, in the implementation process in accordance with this ID to identify the query and identify the data results.

Verified query Q in the query management, registration, and then sent to the sensor network. Sent process, the contents of the Q's will be broken down into multiple message packets. Sub-rules query each field, each expression corresponds to the packets of a message, and each message packet must also include some public information. Communication interface layer calls the appropriate serial communication component of these message packets sent to the root node of the wireless sensor network (or emulator), after a relay broadcast on the network; finally, each node will receive packets restructuring query node represents and the query is complete.

Front-end structure, the core query management, responsible for sending queries and receiving results, the query request according to the complexity are stored in a different queue. During the execution of the query, it received from the communication interface layer different results packet, unpacking, analyzing the data within the packet to extract the query ID, the new data distributed queries. Multiple queries executed at the same time, each query specifies the cycle may vary in order to avoid each query request itself periodically loop waiting for data, query management process large amounts of result data packet, these packets belong to different query, the query management data distribution mechanism, to avoid the occurrence of the query blocking. The database front-end support to save the query results is stored into a relational database.

Fig. 30.3 Database front-end structure of wireless sensor networks
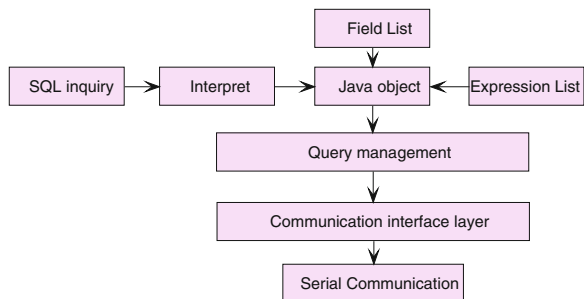
30.4 Conclusion

In the above discussion, we analyze wireless sensor network architecture of the database and data query. Wireless sensor network database is becoming a research focus of the database field. With the support of the database, you can better promote the wireless sensor network applications. The text of this architecture has good scalability, and can also be integrated into the data processing algorithms.

In future work, we will focus on how the wireless sensor network database to support applications that require high-speed sampling rate to resolve the tree topology currently in use intermediate nodes to fail easily lead to data loss of the subtree. In addition, in order to support wireless sensor networks in real-time monitoring to detect the application of wireless sensor networks designed as an active database, to increase its support of the application-defined events to enhance the nodes adaptability and intelligence, is to simplify the application complexity of an effective means.

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Chapter 31
Dynamic Priority Scheduling Algorithm to Improve Real-Time of CAN Bus Communication

Kaikai Guo, Jingzhao Li, Shanshan Wu, Xiaoqian Song and Xueqin Wu

Abstract This paper takes CAN bus real-time performance issues as the research object. Based on the systematic analysis of the characteristics of the CAN bus protocol and the main limitations of CAN bus, the article analyzes theoretically real-time problem of the CAN bus network communication. In accordance with the principle of dynamic changing the priority to improve real-time performance, this paper designs a "bubble" of the dynamic priority scheduling algorithm. Through the simulation, CAN bus real-time performance have been greatly improved? We hope to make a certain contribution to expand the application field of CAN bus.

Keywords CAN bus · Real-time performance · Dynamic priority scheduling algorithm

31.1 Introduction

In general, the real-time is that the process of the data, signal and instruction input or output can be carried out in a very short time. When the system state changes, it can make the appropriate changes, and process timely. CAN bus has been used widely [1]. It is a strong real-time performance field bus. In the CAN bus network

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system, bus arbitration can be used by the priority level of each node identifier, That is, only after the information of high-priority sites is sent, the information of low priority nodes can be sent. When the network loads of the CAN bus system is smaller, the amount of data is smaller, and the bus time occupied by high priority sites is shorter [2]. So the waiting time of low-priority sites get bus using right is smaller, At this point, it can fully meet the needs of the CAN bus system in the practical application [3]. But when the CAN bus system used in a larger network load. High-priority sites occupy the bus for a long time. For low-priority sites, the opportunity of getting the bus and the right of sending data is very small, which caused queue time increasing dramatically, the transmission delay become longer. On the other hand, there are some sudden signals which generating frequency is low, such as alarm signals or fault signals, etc. The requirement of transmission reliability and real-time is higher than periodic data. If these signals are lost, the resulting consequences will be very serious, especially in the automotive sector [4]. If real-time problems which could lead to casualty appear, we should improve real-time performance of the CAN network.

31.2 Traditional Real-Time Algorithm to Improve the CAN Bus

In order to meet the actual application, CAN bus network scheduling algorithm can reasonable allocate the occupy order and time [5]. At present, all kinds of scheduling algorithms which are used to enhance the real-time and reliability of the CAN bus have been proposed.

Static scheduling algorithm is that the time characteristics of the message and the constraint situation of the system as well as the various requirement of real-time tasks, for example, deadlines, running time, timing constraints and other parameters, is known. Based on these elements, the advantage of this algorithm is that it is easy to work, but the efficiency of the message scheduling is low, it can not be flexible deployment, and the system resource utilization is low.

Fixed priority scheduling accounts for a small memory, and it is easy to implement [6]. You do not need to know the time characteristics of all messages, the time of additional consuming is less, but it only consider the cut-off period or cycle factors, and the other characteristics of the system do not need to consider, When time characteristic changes, the transmission of the whole system is unstable [7]. The real-time processing capabilities of the emergencies in the system are lack.

In accordance with the scheduling algorithm, Dynamic scheduling algorithm is the priority methods changed with time. The most typical is Least Laxity First (LLF) Algorithm and Earliest Deadline First (EDF) Algorithm [8]. LLF means that the task with the smallest laxity schedules firstly. However, the scheduling process is complex, the resource consumption is greater. When the network load is in a

large state, the scheduling efficiency will decline. The minimum deadline configurates the site priority in accordance with the absolute deadline of the messages in the network system, the deadline is smaller, the priority is higher. But it is difficult to encode EDF deadline. In the system, it need to test new priority scheduling status. When the network load is large, the scheduling performance will decline.

In view of this situation, we adopt dynamic priority scheduling algorithm. The priority of the site is setted by the principle of using dynamic allocation, which makes each site own the same rights of possessing the bus, and it also improves the winning odds of the low-priority site in the bus arbitration. The data transmission real-time in CAN bus network has been improved significantly.

31.3 Dynamic Priority Scheduling Algorithm

When high-priority sites get the bus using right and send data. The low-priority sites exit the competition and keep listening state until the bus is idle. In order to improve the chance to win in the next competition of low priority site, we can take advantage of the priority boost algorithm in order to improve the grade processing priority of the failed site. With this approach, we continuously upgrade the priority level of the failure site until it wins the bus competition. Then it sends data and init the site priority. In the course of this priority boost, more than one site would become the same priority status at the same time, that is, they will compete for bus at once [9]. Which will result in bus arbitration into an infinite loop, and CAN bus network will in a stopped state.

In view of this situation, we use the improved dynamic priority scheduling algorithm. When the communication start, we set the priority of each site by the principle of non-coincidence, because each site has a unique identifier characteristic, the priority levels are not the same. When sites begin to communicate, they will possess the bus orderly and send data in accordance with the priority level. This dynamic priority scheduling algorithm based on "bubble" avoids the same priority happening in the process of upgrade in the sites priority. We set the maximum number of sites in the CAN bus network is L. During the transmission of data frames, the effective number of identifier indicating the site priority is N, The priority rating number which can be combined is 2^N-1. P is a natural number among [0, L−1]. The initial set priority of each site is 2^N-1-P. When the process of a site competitive the using right fails. We can adopt the upgrade algorithm of the site priority, namely, the upgraded priority = the original priority−L.

If we enhance the priority in a linear manner, $f(n) = L*n$, the size of n responses the speed of the priority boost. When sites arbitration fail for n times, the upgraded priority = the original priority−L*n. Assumption that there are three CAN nodes which need to share bandwidth in the system. And they own the lowest priority; the priority of these nodes is initialized to the lowest priority. Then it send the agreement frame, if the send is successful, it waits for the next transmission.

If it fails, we must upgrade priority, and send the agreement frame again. If you still lose the arbitration and fail, it should continue to enhance the priority, until it sends successfully, Finally, we revert to the initial priority, and wait for the next sending request.

The priority we adopted is binary bit-wise arbitration in the CAN bus network. Dominant 0 is better than the recessive 1. The smaller value of the identifier has a higher priority, but the priority in the upgrade process can not become negative. According to the definition and identification, CAN protocol does not have the priority of the complement identifier. So when the priority upgrade, it will automatically stop when the priority is 0. Otherwise, it will go wrong. Such as, there is a CAN bus network, which N is 7, L is 9, $2^7 = 128$. The initial and upgrade priority of each site shows in Table 31.1

As shown in Table 31.1, we can have an intuitive understanding of the priority of each site in the CAN bus network. When a site fails in the process of the arbitration in the bus competition, then the priority of the site can be increased. According to the incremental approach in the table, the priority of each site will not have the same priority; therefore, bus arbitration errors will not occur. We adopt the largest number of sites(4) as a modulus, the priority boost use the initial priority minus L, which can ensure that we can get the same remainder modulo after changing the priority level of each site.

Because the dynamic priority algorithm bases on the global distributed FIFO queue, so any node can be real-time inserted into the queue. Each station does not need to save the global queue information. And it only needs to save and update their position in the queue. The station is located in the final of the queue; therefore, this priority algorithm is very simple. The priority of each station is identified by the location in the queue. If the station is more close to the head of the queue. The station has a high priority for sending data. Each node monitors the bus, once the information transfer finish. It automatically updates their priority identifier according to its bandwidth factor. On the contrary, once messages are sent successfully. The priority identifier is set to the maximum. When two data frames meet on the bus at the same time, according to the priority queue position. The smaller frame in the queue position has greater priority to be sent firstly. In other words, the front frame in the priority queue will be sent firstly. The nodes

Table 31.1 Dynamic priority upgrade table

The site number	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I
Initial priority	71	70	69	68	67	66	65	64	63
1	62	61	60	59	58	57	56	55	54
2	53	52	51	50	49	48	47	46	45
3	44	43	42	41	40	39	38	37	36
4	35	34	33	32	31	30	29	28	27
5	26	25	24	23	22	21	20	19	18
6	17	16	15	14	13	12	11	10	9
7	8	7	6	5	4	3	2	1	0

change with time. The mathematical expression is: $QP_i = (2^{16}-1)-f_i(t)$, QP_i is the priority of the node, $f_i(t)$ is the priority promotion function, which is monotonically increasing. If n is the number of the frames passed in the queuing process, the new frame is in the end ($n = 0$, $QP_i = (2^{16}-1)-f_i(0)$), Once the bus is idle, it is sent at once. If there is no conflict, the process of sending data wills success. If there is a conflict, that means there are higher priority frame sending, The frame is waiting, then n++, $QP_i = (2^{16}-1)-f_i(n)$. The priority get promotion, when it is waiting for priority, it receives a frame, then n ++, $QP_i = (2^{16-1})-f_i(n)$.

Now we analysis the CAN bus queue delay model, which the frame transfer rate is u, the bus bandwidth is B. Frame transmission rate is the reciprocal of the single frame transfer time T_f. This shows that: $u = B = 1/T_f$, Data generation rate of a node in the CAN bus network is α_1. The total data generation rate α of the CAN network is $\alpha = (1 + 2+3 + \cdots + n)*\alpha_1$, The CAN network load β is: $\beta = \alpha/u = \alpha*T_f$.

As the above equation show in the queuing system, When $P > 1$, the queue time will continue to increase, which result in the instability of the CAN bus network. When the system is in a stable situation, we can get the average number of data frames in the CAN network. The average number of data frames is $E = 1/(1-\beta)$, According to this formula, when a data frame in the CAN bus network arrived at the receiving end, the average number of data frames in the system is equal to all the frames of the reaching data frame in the average propagation delay time T. That is $E = T\alpha$. Therefore, we can translate the average delay time of the data frame as follows: $T = E/\alpha = 1/\alpha*-\beta/(1-\beta)$. Through the formula substitution, we can get $T = 1/B*(1-\beta)$.

When the value of P is small, that is to say it has a smaller network load. The frame average delay time can be approximated as a function of network bandwidth in CAN bus network. The bandwidth of a certain known CAN bus network is constant. This shows that frame average delay time of the CAN bus network is decided by network bandwidth instead of network load in a smaller network load. This algorithm can achieve the dynamic change of priority and improve the low-priority site bus arbitration win the chance, it can play a role in optimize network bandwidth utilization of the CAN bus. Thereby, the utilization of the network is improving. The average delay of the network has played a control role. We can implement the algorithm by software, such as Fig. 31.1.

31.4 Simulation Implement

A control command is sent on the operational control platform and starts the timer, then the command is received. According to the control bytes, the corresponding number of the frame is sent. Thanks to the operation control platform real-time monitors bus, When the bus successfully sends a data, the platform will update its monitoring variables. It stops the clock when reaching the corresponding value. So we can get the average delay of sending a frame in the whole network. The data transmission between two communication nodes shows in Table 31.2.
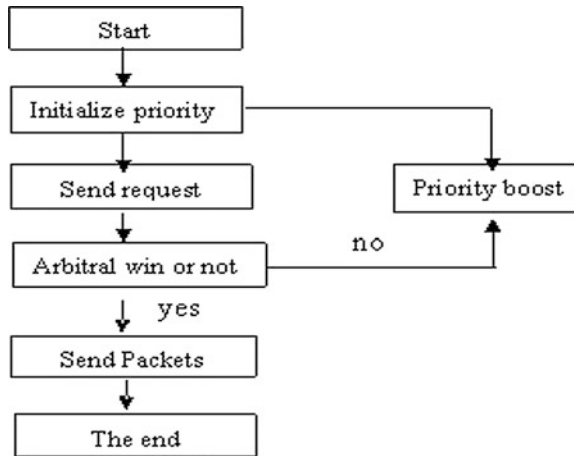
Fig. 31.1 The algorithm flowchart

Table 31.2 Communication delay

Bus bandwidth	20	100	200	1,000	2,000
500 (load 9 %)	11	56	109	548	1,093
100 (load 45 %)	29	151	300	1,510	3,054
50 (load 90 %)	1028	5,138	10,307	51,550	103,110

When the CAN bus network load reaches a higher degree, Network communication delay is rising sharply. The delay of lower priority attribute is larger in the system. It is difficult to guarantee the real-time of these nodes, even network congestion maybe happen. The communication test in the high load of the bus shows in Table 31.3.

When the priority promotion happens, CAN bus do not introduce additional bus in the scheduling process of the application layer protocol? On the contrary, when introducing, the information collision reduced. Therefore, CAN network communication delay greatly reduce more than the basic CAN in the priority promotion in the high load rate, such as Fig. 31.2. The communication test in the low load of the bus shows in Table 31.4. The corresponding curve shown in Fig. 31.3.

When the network load is low, the CAN priority promotion algorithm still works well. Because the bus load is low, so the difference is not obvious. As a result, when the bus network and the priority standard promote, it reduces the delay of network communication. Therefore, the theory is correct, and it also can be used in project.

Table 31.3 Communication test in the high load of the CAN bus

Scheduling protocol number of sending	10	50	100	500	1,000
Basic CAN	799	3,942	8,236	41,120	81,236
Priority promotion CAN	513	2,230	5,038	23,264	49,996
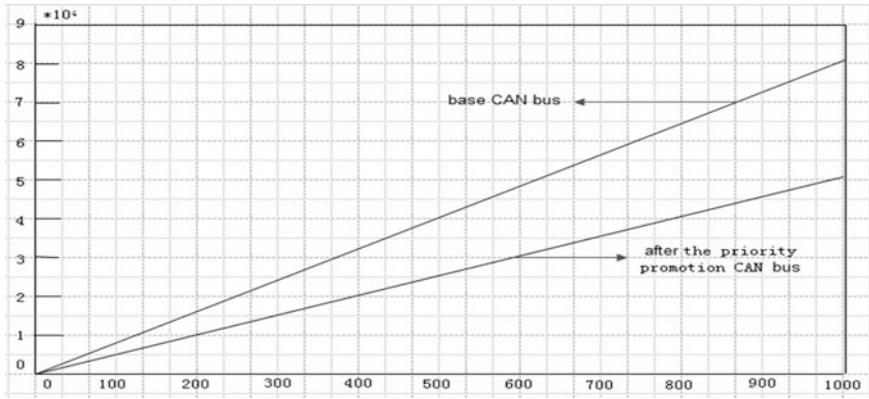
Fig. 31.2 The communication test in the *high* load of the CAN bus (bus bandwidth is 50 KPS)

Table 31.4 Communication test in the low load of the CAN bus

Scheduling protocol Number of sending	10	50	100	500	1,000
Basic CAN	14	81	135	612	1,290
Priority promotion CAN	14	78	130	599	1,185
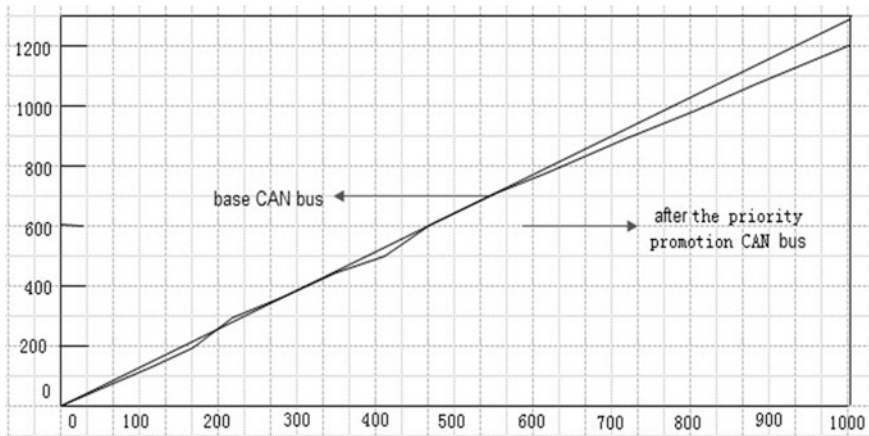
Fig. 31.3 The communication test in the *low* load of the CAN bus

31.5 Conclusion

This paper has solved the data blocking problem which caused by priority in CAN network communication by the dynamic priority algorithm. It balances the CAN network communication delay, and it provides a good theoretical basis for the application in industry.

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Chapter 32
A Novel Multi-Objective Genetic Algorithm for Cognitive Radio System

Minzhen Wang

Abstract In this paper, we use genetic algorithm to realize adaptive algorithm chromium engine. On the basis of comparative analysis of chaotic, genetic algorithm and NSGA method and weighted-sum, we can dominate sort of pare to way to decide how to allocate the structure and parameters of the system and the level of CR resource allocation and avoid interference. In addition, 2d chromosomal structures is proposed and implemented to improve performance and the speed of the algorithm. Results the two algorithm comparison, makes a good looking for CR performance by evolution algorithm.

Keywords Genetic algorithm · Cognitive radio · NSGA · Adaptive cognitive radio engine

32.1 Introduction

Today's wireless network is fixed spectrum allocation policy. But a big part of the spectrum use specified sporadic. Cognitive radio (CR) technology, have put forward a want to implement effective in reusing existing of the spectrum. CR technology provides the ability to use or Shared an opportunistic way spectrum. Through the adaptive parameter, chromium engine allows us to determine which part of the available spectrum and detect the presence of licensing users and choose the best available channel of the best performance [1]. In multi-user system, and on the basis of Shared similar to environmental spectrum, the existence of multiple users, but it also brings new challenges, new opportunities for business cooperation. Based on

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the purpose, many restrictions and conditions will be added to CR engine was the best goal. For the optimal solution of the minimum requirements into the energy consumption and reduce the transmission error and meet the safety rules of interference analysis [2, 3].

Chromium engine performance is the guarantee with the genetic algorithm (GA) execution. The traditional genetic algorithm (TV) and multi-objective strategy will drive the direction of the evolution process of the [4, 5]. In addition, the multi-objective optimization solution of the problems the Pareto optimal solution will be in the development and application of the genetic algorithm in classification (NSGA) needs is a symbolic [6]. NSGA of the working population solutions based on Pareto optimal solution also found that many convergence and maintenance of Pareto between diversity Settings.

32.2 Cognitive Radio Adaptive Engine

CR is one of secondary systems that need to be configured that satisfy the existence systems by abiding allowable interference and safety regulations defined in Federal Communications Commission (FCC) standard about coexistence and sharing spectrum in wireless networks [7].

In the traditional global optimization technology, wide range of artificial intelligence (AI) technology, neural network and genetic algorithm, and fuzzy system, pattern recognition and expert system can be used as a wireless transmission controller parameters configuration process [8]. An expert system is known as the fractal method, have stronger dependence on external experts, must collect and learn the rules in many steps and times execution. Because of using space, chromium in without permission, must solve the problem will have the best performance but not affect other wireless system interference, must ensure that the limitation of the method. SEAMCAT shows how to calculate some properties in a wireless system based on neural network's input parameters; they are path loss, transmission link gain and interference [9]. For maximum allows intervention measures, SEAMCAT received signal disturbance level, analyzing different interference occurs in user receiver mechanism in different scene permission. The software also help to evaluate the interference of a wireless system limits on the basis of analysis, the value is used as the reference points to decided to allow each secondary coexisted system.

32.3 Genetic Algorithm Application

Genetic algorithm (GA) was proposed based on the Goldberg in 1989, up to now, the algorithm is expanding and the development of a comprehensive many places. Improve the performance of the proposed algorithm, the design of chromosome to store information [10]. The traditional genetic algorithm (TV) in [11] show

Fig. 32.1 Two dimensional chromosome structure
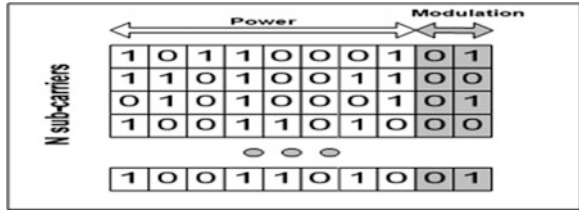
chromosome is described as a bunch of bits. The chromosome store characteristic parameters used in the system. Chaos genetic algorithms are a randomly selected groups and evolution in several generations. The selection process will be applied to choose based on their chromosome fitness score. When chaos genetic algorithm multi-objective fitness function, Weighted-sum [11] method is applicable to the engine, including weight vector for the target important degree compared. Each target weights will control his attitude how to reach the goal of this genetic algorithm engine [12]. The second method is realized based on multi-objective genetic algorithm and (MOGA) Pareto [13], has become a good candidate for technical problems to solve. Based on target with NSGA MOGA method are rapid methods of sorting, including elitism and diversity keeping [14].

Two dimensional (2D) structures for Chromosome Chromosomes with the 2D chromosome structure are shown in Fig. 32.1. In this structure, each gene in chromosome is an array of encoded string represents subcarrier's characteristic.

Each chromosome, one dimension subcarriers reflect in orthogonal frequency division multiplexing (OFDM) system. The second string array contains code of the values of the parameters.

Because the genetic algorithms in chromosomes are instead of two dimensional structures, the operation is a special way to performance. In this type of structure, data of the pointer is a arrays, and not just like this in the structure of the original algorithm [12]. In addition, a gene is 2d target, including coding data.

32.4 Objectives Configuration

32.4.1 System Model

Figure 32.2 shows the spectrum of Primary User pairs (PUP) and CR pair (CRP) in the observation bandwidth. In this range, there are 3 PUPs that overlapped by the CRP spectrum. With the overlapped spectrum by PUPs, DSA also issues spectrum for CR user by using adapting spectrum with the existing wireless environment based on interference avoidance analysis.

We consider the CRP access to a band of width W Hz. Number of overlapped PUP is L. The bandwidth of PUP *lth* is from $f_c + F_l^{PU}$ to $f_c + F_l^{PU} + W_l$. The maximum interference power that PUP 1 can tolerate is $I_l = T_l W_l$ where $l = 1, 2, \ldots, L$ and T_l is the interference temperature limit for PUP *lth*.
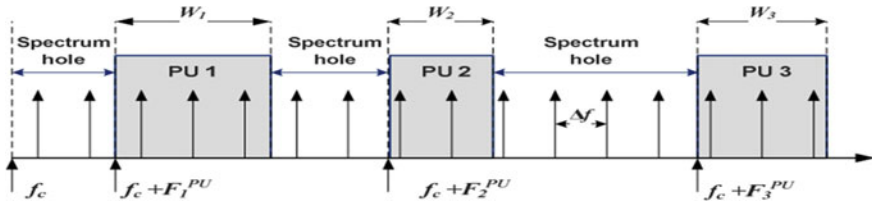
Fig. 32.2 Spectrum of PU and CR OFDM sub channels

By applying interference analysis to GA-based CR engine, the compromised solution will satisfy the optimal trade-off between interference avoiding criterion and seeking process of transmission parameters with their fitness objectives related.

32.4.2 Fitness Objectives

There are several desirable objectives that CR-based systems may want to obtain and to implement functionality and allow to adapt to the wireless network. In this paper, we derive three fitness functions used to guide the system to get the optimal parameter set which satisfies some requirements about optimizing power, bit error rate (BER) and interference. Minimizing BER is a common goal in communications wireless networks. This objective is calculated by the amount of error bits in relation to amount of bits being send. Minimizing power consumption is self explanatory and is used to direct the system to a state of minimal power consumption. When perform interference analysis by SEAMCAT [3], specific interference limit of each primary user is determined with wireless environment configuration and this value will be used as a limitation of interference that primary user can tolerate when coexisting.

Minimizing Bit-Error-Rate (BER)

Minimizing BER is the most important purpose of most of wireless system which require the high accurate and strictly transmission. This objective is also guarantee the reliability of one wireless system. Each modulation and channel type in combination requires a different formula to determine the BER of the system. For N-carrier system the objective functions is defined as [4]:

$$f_{\min\_ber} = 1 - (\log(0.5)/\log(\bar{P}_{be})) \tag{32.1}$$

where $\bar{P}_{be}$ is the average bit-wise probability of error per subcarrier for M-ary quadrature amplitude modulation in an additive white Gaussian noise channel. And the BER for BPSK, QPSK and M-QAM calculated in [4] and [13].

Minimizing Power Consumption

Saving energy is more and more important in much technical area. The standard of Power consumption's assessment is suggested with the combination relation

between the transmit power and the maximum of transmit power. So that this objective function is defined as:

$$f_{\min\_power} = 1 - \left(\sum_{i=1}^{N} P_i / (N \times P_{\max}) \right) \qquad (32.2)$$

Where P_i is the transmit power of sub-carrier *lth* and $P_{\max}$ is the maximum possible transmission power for one single subcarrier. P_i can take values within $[P_{\min}, P_{\max}]$ but can also be zero when there is no transmission on subcarrier *lth* if the channel fading coefficient is smaller than pre-determined threshold.

Minimizing Interference

Interference function must be based on the interference analysis in SEAMCAT to get the limit that allows the interference threshold for each PUP band.

$$f_{\min\_int} = 1 - \left(\sum_{l=1}^{L} \sum_{m=1}^{M_l} I_{m,l} / \sum_{l=1}^{L} \sum_{m=1}^{M_l} I_{m,l\_\lim it} \right) \qquad (32.3)$$

where $I_{m,l}$ is the interference power caused by CR sub-carrier mth to the PU receiver l, $I_{m,l\_\lim it}$ is the interference limit of PUP lth, L is the number of PUPs in the observation band, M_l is the number of CR sub-carriers overlapped bandwidth in the PUP lth.

32.4.3 Interference Analysis

One of the most important criteria used to measure the difference between the levels of interference is known as the expectations and unnecessary receiving signal receiving signals in the primary receiver. In this paper, by using the SEAMCAT, and on the basis of received signal strength interference and want to in digital TV receiver is can be measured, so we can easily calculate the probability proportionate interference jamming signal than the signal a pre-defined protection. The composition of the general level of interference accumulated a few interference mechanisms such as unnecessary emissions, jam, inter-modulation fellow receiver channel, and the adjacent interference phenomenon. Based on output received primary user tolerate interference is used as the interference limit for each user who wants to coexist CR with others.

32.5 Conclusion

In this paper, we discussed CR system and adaptive engine. We discussed the genetic algorithm and genetic algorithm and NSGA method chaos. We will also introduce used in 2d structure are put forward a new structure chromosome improving the performance of genetic algorithm.

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Chapter 33
An Efficient Mobile Ad-Hoc Networks Routing Algorithm Based on Multicast Protocol

Kun Jiang

Abstract We put forward a kind of effective multicast routing protocol tree called spanning tree (STM) on multicast. In the dynamic network, like MANETs maintenance method, the traditional spanning tree using Ω control information (E) in order to adapt to each topology changes, in E is a large number of the edge of the network. This is mainly the cost of rebuilding the tree from scratch. In most cases, E are equivalent, the worst case, the O (V2) complexity, there is a large number of nodes V tree, make the derivative multicast protocols efficiency. At the same time, OMST amortize information complexity reduce O (V), as follows. The author theoretically evaluation algorithm OMST not only use the experimental results. Our main advantage for the more easy to use and improve OMST design a multicast routing protocols, make this protocol from OMST implementation in NS-2 performance evaluation.

Keywords Multicast protocol · Ad-hoc networks · Routing algorithm

33.1 Introduction

Multicast communication is now widely used in distributed application to provide effective data from one source multicast group of all members. In the Ad-hoc network, communication between nodes is established through the use of node jump relay. Especially in the mobile Ad-hoc network there are some special characteristics may affect communication performance [1]. In mobile environment, between

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the nodes free to move and change frequently, so the network topology structure. Mobile node also has very limited battery power and network bandwidth. As a result, it is important to have multicast protocols, achieve high package delivery costs as low as possible.

Many multicast agreement put forward the mobile Ad-hoc network [1–4], and improving the efficiency and management report delivery costs. In the scope of our discussion, we classification method of existing multicast network mobile Ad-hoc divided into two classes: and mesh-based tree. A multicast tree agreement to establish and maintain a share of all the trees between team members, only a route between each pair of node. An example is typical of the technology in the multicast routing the multicast tree is immediate need to distance vector protocols (MAODV) [2].

33.2 Stem Description

33.2.1 Overview

IP multicast service STM provide mobile Ad-hoc network. As a tree agreement, in order to provide the high package delivery rate, while maintaining the STM spending as low as possible. In order to achieve this goal, we use the optimal maintenance concept of the spanning tree puts forward [5]. We simplify OMST don't change for the more is easy to implement and correctness of the algorithm of complex information.

Some requirements that we follow to design STM protocol are: (1) to use wireless broadcast mechanism for control packets instead of relying on uncast protocol to deliver them, hence it may save network bandwidth, (2) to apply retransmission mechanism to cope with collision problem in wireless networks, like the repair mode presented in [4], (3) not to use unbounded counter, as recommended in [3], to avoid problem of recycling sequence numbers mentioned in [1].

As built on top of OMST algorithm, STM enhances OMST mainly in two main subroutines: UPDATE and FIND.

UPDATE: to make the tree replica identical with the real tree, invoked by root when topological change occurs. This is a very important procedure, to help FIND routine reduce the number of messages to find the best outgoing edge to merge into current tree.

FIND: Similar to GHS-83 algorithm to choose the best outgoing edge to merge. In STM, distance between two remote nodes is selected as weight to find minimum outgoing edge.

Other supporting procedures are based on original OMST algorithm. We only focus on UPDATE and FIND subroutines with a simplified data structure of tree replica which we design to make algorithm easier to design and implement in practice.

33.2.2 Data Structure of Tree Replica

In OMST, really connected node tree embodied in each node tree in a special structure called replication (a more general terms is forest copy); In fact, this is the list of links mobile (or edge). This structure need a large memory to store node structure, especially than store "forest copy" of each node from reconstruction mechanism is a complex topology link, so we need more time to complete. Puts forward a new structure tree has the same function replica but it's more easily than financial software instead of design and implementation. Rather than management to the edge of the list, we store the mobile node tree list.

Figure 33.1 shows an example of data structure for topology management. Node 6 has three neighbors: 1, 2, 7, in which nodes 1 and 7 belong to the same tree replica as node 6. This tree is built by two edges (7, 1) and (1, 6). Intuitively, edge (6, 7) may create tree cycle, hence node 6 cannot choose node 7 as best outgoing node to merge trees, although edges (7, 6) and (6, 2) are candidates since they are not currently belonged to tree replica of node 6.

33.2.3 Root Election

In the startup, each member thinks themselves as multicast group root tree fragment that contains a single node. Based on the "tree copy" list, each fragment of causes; update the entire clip to send updated topology messages through tree fragment connected to all members. Each node chooses the best outgoing edge (minimum weight) and put the weight back to its father to the root. At that time, each node has a pointer to the next node (it's a child) the best way to outgoing edge. The root and then move to the next root node using the privilege, change the route of identity
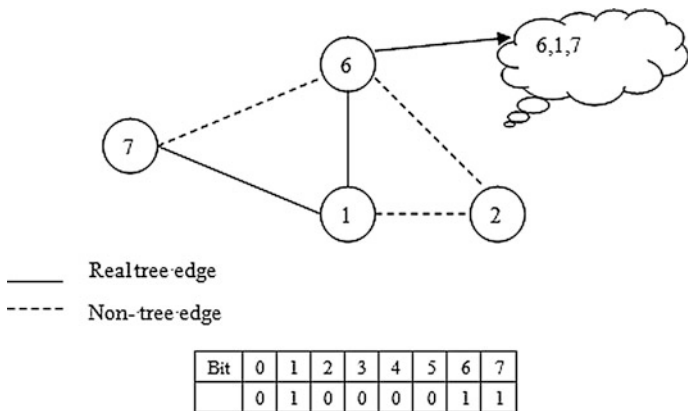
Fig. 33.1 Node list management

information contains the root node of the best outgoing edge. Adjacent to The news to go forward until it reaches the nodes have the same status as the change of the root information. This new roots will try to connect to other endpoint outgoing side using the same mechanism description of the [5]. When two end connection, agree to become a higher status by the formation of the new root pieces. This new roots will continue to this process, until only a tree fragment left.

33.3 Performance Evaluation

On the performance of the scanning tunneling microscope (STM), we have implemented it agreement expanded NS-2. To our knowledge, this is the first time to realize Monet routing protocol inspire OMST original idea. We compare the performance of the scanning tunneling microscope (STM) to puma and MAODV, represented modern methods of multicast routing protocol Monet. Like the STM, puma using radio packet transmission control mechanism does not use any potential routing protocols, but it is mesh-based DuoGe protocols that provide line receiver, and thus can be between senders, providing better usability. MAODV STM and follow the same MAODV paper paradigm, but rely on AODV broadcast packet of the use of wireless radio when STM just. On the other hand, the STM, OMST above the tree structure, creation and maintenance, the more likely than a minimum spanning tree MAODV created.

We compare the STM, puma and MAODV in NS-2. The puma NS of source code available-2 [3] and MAODV source code are from [4]. We have no and ROMANT, although ROMANT is also a tree based on agreement, because it did not achieve good performance, and for puma.

All kinds of experimental results, find out the execution of mobility and team members effect on the performance of each agreement. First established the experiment, liquidity in {2, 5, 10, 15} m/s, group size is 20; the traffic load is 10 bag/s. In a word, the second group size is set in {10, 20, 30, 40}, liquidity 2 m/s, the traffic load is 10 bag/s. Other environmental configured for simulation listed in Table 33.1.

Table 33.1 Simulation environment

Simulator	NS-2
Simulation area	1,000 × 1,000 m
Radio range	250 m
Simulation time	700 s
Sender source	CBR
Node placement	Random
Mobility model	Random waypoint model
Pause time	0
Packet size	512 Bytes

Table 33.2 Metrics definition

Packet delivery ratio	Data	Packets	Delivered
	Data	Packets	Sent * number of receivers
Control overhead	Control	Packets	Sent
	Data	Packets	Sent

Used in our metrics calculation and control than spending package delivery definition in Table 33.2. We are focused on spending efficient factor (we call it the "control management" short) refers to the useless bag than (control package) more than useful bag (data packet) cast out. Because the data packets from the source to reasoning for number of data packets at the same time, so the number of cost control simulation control by sending a package than reflection of agreement. Lower the control spending more effective than that of the network bandwidth.

Figure 33.2 shows the package delivery (physicians' desk reference made three agreements, all kinds of speed and team members. In cases, the STM and puma still keep the rate is high, about more than 80 %, although slightly higher score than American lion of the scanning tunneling microscope. Puma is the grid topology management; it can keep since as high usability. Careful network analysis shows that, because it USES two rounds of network topology iterative reconstruction (subroutines update and found), it may lead to reduce when PDR

Fig. 33.2 Packet delivery ratio in various scenarios
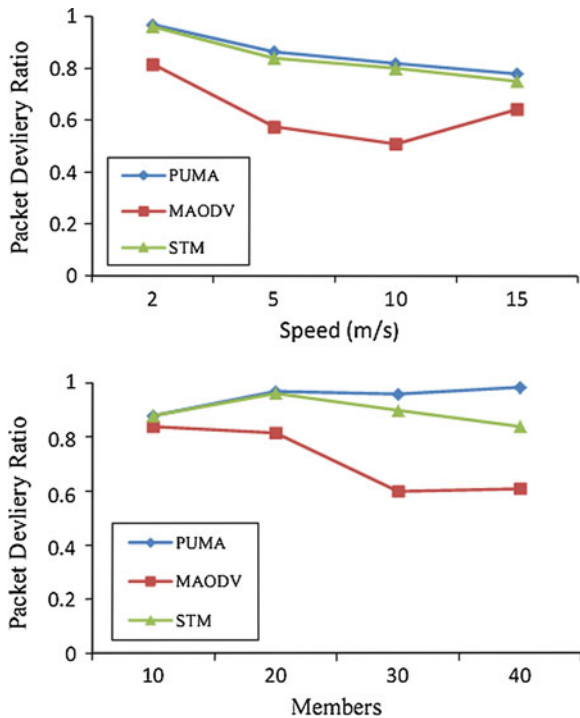
Fig. 33.3 Overhead ratio in various scenarios
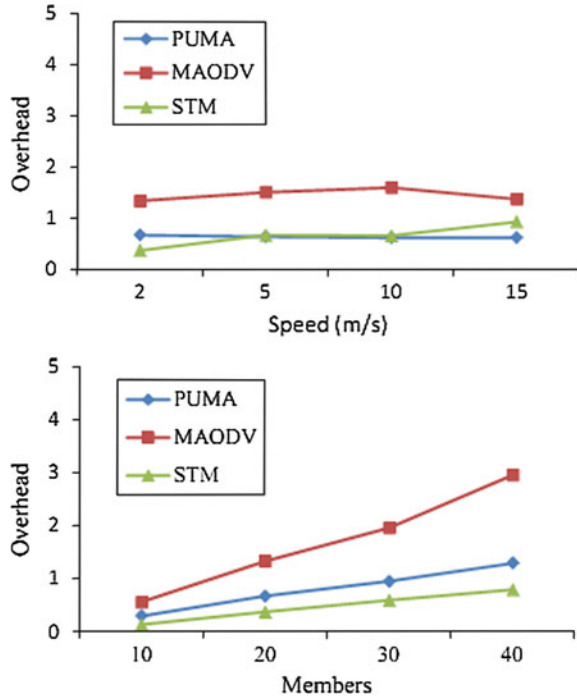
speed increases. In high dynamic network topology change occurs frequently, it lasts for reconstruction of the program to happen before is not yet complete, change. This is a scanning tunneling microscope (STM) defects. However, as shown in Fig. 33.2, scanning tunneling microscope, the agreement, physicians' desk reference tree almost at the same level, mesh-based of the agreement.

The above results show that, as shown in Fig. 33.3 and speed increase; the increase of the proportion of the head, and it's the lion in different may be a constant speed. This is because in the lion topology agreement is regularly updated information at present by public announcement core, regardless of the topological STM agreement and topology changes. Only reaction so when node faster, STM protocol spend more control the packet to reconstruct spanning tree overhead, makes the STM agreement is increased.

33.4 Conclusion and Future Works

Scanning tunneling microscope is deduced the agreement OMST algorithm is a kind of multicast protocols with the best of the complexity of the information. Amortize, puts forward a new data structure, to reflect the network topology structure, simplified in each node of the scanning tunneling microscope operations,

and do not change the correctness and the complexity of OMST information, make this agreement effective dynamic network. Reliable communications in the radio only STM forwarding rises, do not need any potential routing protocol. The results show that various scenarios evaluation can achieve high scanning tunneling microscope or similar delivery rate, while maintaining low cost control than two well-known multicast protocols and puma MAODV. We are going to improve the agreement to adapt better topology changes, highly dynamic network.

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Chapter 34
Comprehensive Evaluation of Fuzzy Matter-Element to Select Logistics Service Providers

Xian-Jun Huang and Shi-Zhen Wang

Abstract With the number of logistics service providers increasing significantly year by year, it's of great importance for the customers to make the best choice. By virtue of subjective experience or using market information to make judgments is unscientific. The author use method of comprehensive evaluation of fuzzy matter-element the fuzzy element method combined with entropy method to determine the weight of the object and calculate European close-degree of each object to evaluate the merits of each object which is very objective and feasible and is also of important guiding significance for logistics enterprises' development.

Keywords Logistics service provider · Fuzzy matter-element · Comprehensive evaluation

34.1 Introduction

In the year 2009, the State Council has announced the adjustment for the logistic industry and the rejuvenation program. The state council has pointed out that the enterprise logistic operation models that are "large and all inclusive" and "small but all inclusive" are still very popular in our country. The socialized logistic demands are in great need and the competence of the professional logistic supply falls short of. Both of the problems exist at the same time. In order to effectively improve the competitive power and the market requirement levels of the logistic industry, the planning has clearly pointed out that it should intensify the

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socialization and professional performance of the logistic services. It encourages the principles that production and commercial enterprises should act according to coordination and distributions of responsibilities. It peels off or outsources the logistic functions and integrates the logistic resources. At the same time, it puts forward that logistic enterprises should satisfy the continuous growing of logistic requirements of both the producers and the consumers. It should take this as the starting point [1]. On the basis of this, it should keep on creating the logistic service methods and improving the service levels. It can be seen that logistic enterprises will play a more and more important role.

With the gradual enlargement and development of the specialized third party logistic market, the amount of logistic suppliers will be on a great increase. Under the circumstance that the requirements of logistic supply for the clients will as well become more and more "severe", how to make the optimum choice from a great amount of logistic suppliers has been the most urgent and difficult actual problem to handle with of all of the clients. For a great amount of the clients, when they make choices about the logistic suppliers, they usually make judgment according to their experiences or the market information. However, this kind of choosing method is lack of scientific foundations. It is not convincing to do that. This paper makes use of the method of comprehensive evaluation of fuzzy matter-element and analyses all kinds of evaluation indexes of the logistic suppliers. It can greatly lower the subjective arbitrariness, which is highly equipped with practical application values.

34.2 Comprehensive Evaluation Model of Fuzzy Matter-Element

34.2.1 Fuzzy Matter-Element

Now assume that R is the Fuzzy Matter-element; N is the name for the evaluating object; C is the feature situation of the evaluating object; V(X) is the fuzzy characteristics quantity. If the object N has n characteristics C_1, C_2, C_3 ... C_n, the corresponding quantities are superlatively $V(x_1)$, $V(x_2)$... $V(x_n)$. If R_{mn} is to represent n fuzzy mater-element, then:

$$R_{mn} = \begin{bmatrix} & N_1 & N_2 & \ldots & N_n \\ C_1 & V(x_{11}) & V(x_{12}) & \ldots & V(x_{1n}) \\ C_2 & V(x_{21}) & V(x_{22}) & \ldots & V(x_{2n}) \\ \vdots & \vdots & \vdots & & \vdots \\ C_m & V(x_{m1}) & V(x_{m2}) & \ldots & V(x_{mn}) \end{bmatrix} \tag{34.1}$$

34.2.2 Quadratic Difference Fuzzy Matter-Element

The fuzzy quantity of all evaluation objects should meet with the principle of optimum membership degree. The optimum membership degree has included two circumstances, which are the larger the better membership degree and the smaller the better membership degree. If the membership degree is to be represented with $V(x_{ij})$, then the maximum value and the minimum value of the evaluation object can be represented respectively with $\max x_{xj}$ and $\min x_{xj}$. Among them, the larger the better membership degree is $V(x_{ij}) = x_{ij}/\max x_{ij}$ while the smaller the better membership degree is $V(x_{ij}) = x_{ij}/\min x_{ij}$.

If label R_{mo} as the standard fuzzy matter-element, then:

$$R_{mo} = \begin{bmatrix} & N_0 \\ C_1 & V(x_{10}) \\ C_2 & V(x_{20}) \\ \vdots & \vdots \\ C_m & V(x_{m0}) \end{bmatrix} \tag{34.2}$$

If Δ_{ij} (among it: $i = 1, 2, \ldots, m$; $j = 1, 2, \ldots, n$) is to represent the square of the differences between fuzzy matter-element R_{mn} and the standard fuzzy matter-element R_{mo}, that is : $\Delta_{ij} = \left[V(x_{ij}) - V(x_{i0}) \right]^2$, $R_\triangle$ is the square of difference of complex fuzzy matter-element, then:

$$R_\Delta = \begin{bmatrix} & N_1 & N_2 & \ldots & N_n \\ C_1 & \Delta_{11} & \Delta_{12} & \ldots & \Delta_{1n} \\ C_2 & \Delta(x_{21}) & \Delta_{22} & \ldots & \Delta_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ C_m & \Delta_{m1} & \Delta_{m2} & \ldots & \Delta_{mn} \end{bmatrix} \tag{34.3}$$

34.2.3 The Determination of Weight

There are a lot of circumstances that use the subjective methods such as the AHP to do the determination of weight. However, this is easy to result in large differences. Use the entropy method to make the weight determination can get rid of the man-made interference as much as possible, for the entropy has represented the order degree of the information system. The smaller the value is, the more order degree it has. Therefore, according to the size of the entropies, the evaluation results can be made to be more scientific and easy to represent the actual circumstances [2]. R is used to represent the judgment matrix of the above evaluation objects. $R = (r_{ij})mn$ (in it: $i = 1, 2, \ldots, m$; $j = 1, 2, \ldots, n$). Summarize the judgment matrix R into

matrix A. The element is to be represented in a_{ij}. Use $\delta_{\max}$ and $\delta_{\min}$ to represent the most satisfactory one and the most unsatisfactory one, then:

$$a_{ij} = \frac{\delta_{ij} - \delta_{\min}}{\delta_{\max} - \delta_{ij}} \tag{34.4}$$

In this case, assume n evaluation objects, m characteristics and the entropy value is H_i, then:

$$H_i = -\left(\sum_{j=1}^{n} \varphi_{ij} \ln\varphi_{ij}\right) / \ln m, \text{ in it}: \ \varphi_{ij} = (1 + a_{ij}) \left/ \left(1 + \sum_{i=1}^{n} a_{ij}\right)\right. \tag{34.5}$$

Use W_i and to represent respectively the entropy weight and the weight, then:

$$W_i = (1 - H_i) \left/ \left(n - \sum_{j=1}^{n} H_i\right)\right., \text{ and meet with } \sum_{i=1}^{m} W_i = 1 \tag{34.6}$$

$$W = (w_i)_{1 \times n} \tag{34.7}$$

34.2.4 Euclid Approach Degree

The Euclid approach degree can be used when making comprehensive evaluations. The method is to use standard object as the reference object. The closer the evaluated object is, the more similar both sides are [3].

$$R_{PH} = \begin{bmatrix} & N_1 & N_2 & \ldots & N_n \\ PH & PH_1 & PH_2 & \ldots & PH_n \end{bmatrix}, \text{ in it}: \ PH_i = 1 - \sqrt{\sum_{i=1}^{m} w_i \Delta_{ij}} \tag{34.8}$$

34.3 Evaluation and Choice of Logistic Suppliers

Because there are a lot of evaluation indexes for the logistic suppliers, this paper selects the following six as the core indexes, which are firm scale, service level, pricing level, firm reputation, operation efficiency and transport condition [4].

Now assumes that a certain client has multiple logistic service needs, in order to improve the efficiency and save the search costs, it needs to form relatively stable cooperation relationship with certain logistic service supply for long time. There are 6 logistic suppliers in the located area, which are N1, N2, N3, N4, N5, and N6. Below is to make evaluations and selection with the fuzzy matter-element comprehensive evaluation method (Table 34.1).

Table 34.1 Evaluation indexes of different logistic suppliers

Evaluation index	N_1	N_2	N_2	N_3	N_4	N_5
C_1 firm scale (10 thousand)	1,964	877	923	475	2,025	1,043
C_2 service level	0.96	0.93	0.89	0.89	0.98	0.95
C_3 pricing level	0.96	1.07	1.08	1.13	0.95	1.01
C_4 firm reputation	0.90	0.81	0.84	0.77	0.88	0.84
C_5 operation efficiency	0.91	0.87	0.86	0.76	0.92	0.83
C_6 transport condition	0.85	0.86	0.95	0.89	0.78	0.83

According to the formula (34.1), fuzzy matter-element R_{mn} is calculated:

$$R_{mn} = \begin{bmatrix} & N_1 & N_2 & N_3 & N_4 & N_5 & N_6 \\ C_1 & 0.9699 & 0.4331 & 0.4558 & 0.2346 & 1.0000 & 0.5151 \\ C_2 & 0.9796 & 0.9490 & 0.9082 & 0.9082 & 1.0000 & 0.9694 \\ C_3 & 1.0105 & 1.1263 & 1.1368 & 1.1895 & 1.0000 & 1.0632 \\ C_4 & 1.0000 & 0.9000 & 0.9333 & 0.8556 & 0.9778 & 0.9333 \\ C_5 & 0.9891 & 0.9457 & 0.9348 & 0.8261 & 1.0000 & 0.9022 \\ C_6 & 0.8947 & 0.9053 & 1.0000 & 0.9368 & 0.8211 & 0.8737 \end{bmatrix} \quad (34.9)$$

$$H_i = (0.7779, 0.7731, 0.7732, 0.7703, 0.7774, 0.7744) \quad (34.10)$$

$$W = (0.0478, 0.0488, 0.0488, 0.0494, 0.0479, 0.0485) \quad (34.11)$$

$$R_{PH} = \begin{bmatrix} & N_1 & N_2 & N_3 & N_4 & N_5 & N_6 \\ PH_i & 0.9914 & 0.8687 & 0.8727 & 0.8165 & 0.9951 & 0.8889 \end{bmatrix} \quad (34.12)$$

$$R_\Delta = \begin{bmatrix} & N_1 & N_2 & N_3 & N_4 & N_5 & N_6 \\ C_1 & 0.0009 & 0.3214 & 0.2962 & 0.5859 & 0.0000 & 0.2352 \\ C_2 & 0.0004 & 0.0026 & 0.0084 & 0.0084 & 0.0000 & 0.0009 \\ C_3 & 0.0001 & 0.0160 & 0.0187 & 0.0359 & 0.0000 & 0.0040 \\ C_4 & 0.0000 & 0.0100 & 0.0044 & 0.0209 & 0.0005 & 0.0044 \\ C_5 & 0.0001 & 0.0030 & 0.0043 & 0.0302 & 0.0000 & 0.0096 \\ C_6 & 0.0111 & 0.0090 & 0.0000 & 0.0040 & 0.0320 & 0.0160 \end{bmatrix} \quad (34.13)$$

According to Euclid approach degree, the order is N5 > N1 > N6 > N3 > N2 > N4, the best choice should be N5.

34.4 Conclusions

The quantity index and the quantity index should be both considered when making evaluations and selection on logistic suppliers. The fuzzy matter comprehensive evaluation method and the entropy method should be used so as to make the evaluation with Euclid approach degree. At the same time, it has strong guiding

meaning to the development orientation of the logistic suppliers. In the competitive marketing environment, logistic suppliers should equip with qualities and ability that the clients identify.

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Chapter 35
J2EE-Based General Document Transceiver System

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Abstract Along with the development of computer network technology, network technology is integrate into management and has become important symbol and method of modern office. Sending and receiving of documents are essential contents in the daily office work. The existing electronic office and e-government affairs systems include a subsystem of Sending and receiving document and are very similar in the basic functions. However, in each system development process, all kinds of development will be repeated. Thus, the authors separate this subsystem and analyses it in details, and also use the Struts 2 + spring + Hibernate model to design a general document transceiver system.

Keywords J2EE · Document management · MVC model

35.1 Demand Analysis

In the system, the document sending and receiving functions can be configured flexibly; the common document send-receive flow can be easily deployed in the OA system, to meet the need of OA system. The system in this paper mainly involves these features: (1) system user management to maintain basic information, authorization and roles of users; (2) the setting and configuration of document send-receive flow to implement the configurable functions of the whole flow from dispatch to verification; (3) document dispatch management to implement the document submission of users and track the real-time process; (4) document

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send-receive management to verify or actually operate the documents sent by users of the previous step and transfer the processed documents to users needing to process the documents [1, 2].

35.2 Design Principles

The principles to guide the design include six aspects. (1) Module independence principle requires all modules in the system are mutually independent with clear data interfaces and a good loose coupling and can be combined into a system. (2) Cutting principle means that some functions or modules of the system can be deployed and hence the existing functions can be used [3]. (3) Code reusability principle means that the codes can be used repeatedly, which can reduce the workload of system development and also help the system modification and maintenance [4, 5]. As a general platform, keeping codes reused helps reduce the system modification range and speed up its updating when connecting to other electronic office systems [6]. (4) Scalability principle requires new tools and functions can be added into the system flexibly and the system functions can be extended. Also, the integration can be done based on needs, and hence different levels of value-added services can be offered [7, 8]. (5) Ease-to-use principle means common users can easily use the system when there are no computer specialized technical personnel. (6) Universality principle means users can obtain the platform system easily and work with others [9]. This requires the platform should be deployed in Internet, making system expanded smoothly and serving for different users.

35.3 Overall Architecture Design

The general document transceiver system in this paper is designed and developed based J2EE platform [10]. The architecture is composed of presentation layer, business logic layer and persistent database layer as shown in Fig. 35.1. Presentation layer is used to get data from business logic layer and display it with a certain form, and also process the data in the forms of client and submit it to business logic layer.

Business logic layer can call related methods to process business logics after receiving users' forms and other data submitted by presentation layer, and also get and process the initial data from database and saves related results, and finally needs to return the processing results to presentation layer to remind users. Business logic layer is included in service package and is the core of the system's business logics, is a MVC model and is realized with spring [11]. Persistence layer and database layer are responsible for the physical connection between application and database. The persistence layer in this system is implemented with Hibernate

Fig. 35.1 The system overall architecture design
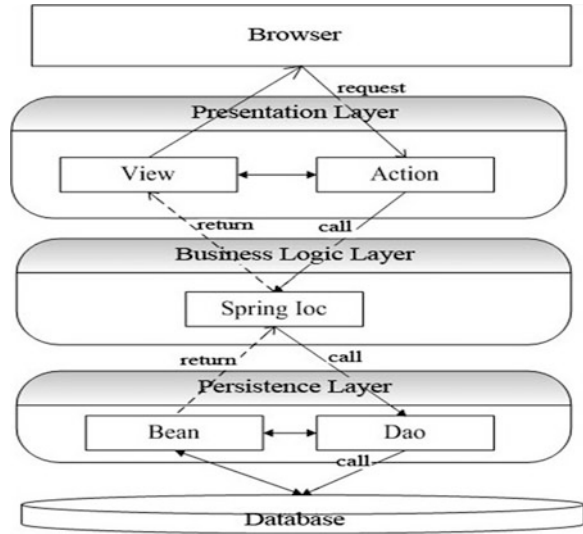
and is composed of Bean and DAO packages. The entity classes of all forms of database are in Bean; DAO is Date Access Object and is a general interface for upper-layer business logic to access database [12]. Generally each database form is corresponding to a DAO.

35.4 Selection of Development Environments

JDK1.6 is selected for JDK tool. JDK is composed of some standard class libraries and a group of Java utility programs testing and establishing documents and its core Java API is some predefined class libraries. Eclipse is selected for development tool. Eclipse is an open source and Java-based extensible development platform and can easily establish a SSH2 framework application. Tomcat 6 selected for application server. It is a Tomcat version corresponding to JDK 6. Open-source MySQL relational database is selected for database, which can greatly reduce the overall cost.

35.5 System Functional Modules Design

Through the above demand analyses, the system can be mainly divided into incoming dispatch management, system management and user management. Its overall functional modules are as shown in Fig. 35.2. Dispatch management, system management and user management modules are shown in Figs. 35.3, 35.4 and 35.5 respectively.
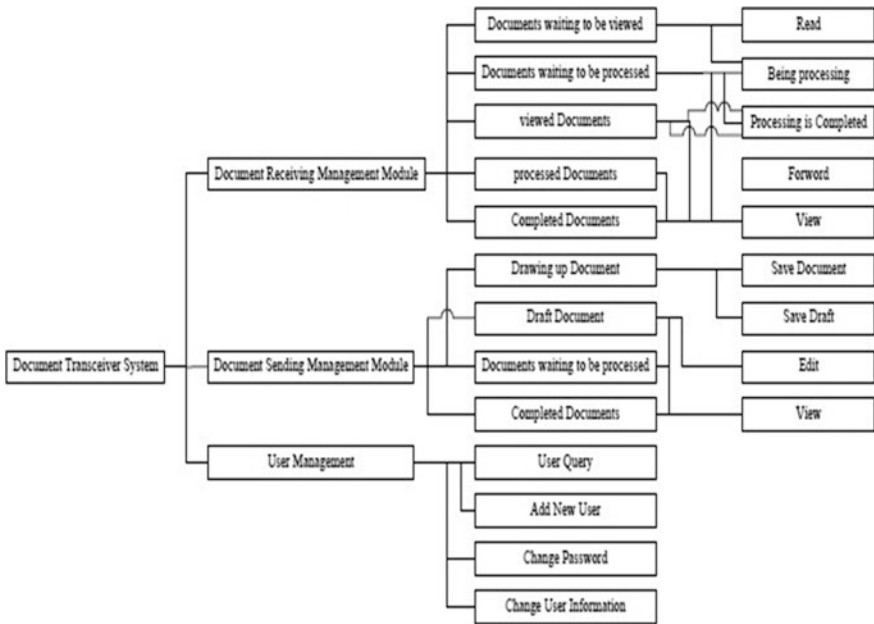
Fig. 35.2 The system overall functional modules
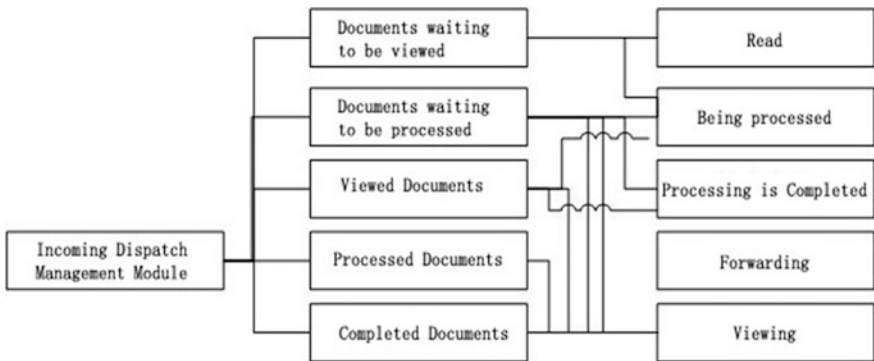
Fig. 35.3 The incoming dispatch management module

When user receives a document necessary to be processed, it will first appear in the pending document list, in which all documents may need to be processed by a group of users. If users don't need to process the read documents or the contents of the documents have nothing to do with the user, the documents can be transferred to other users or user groups through forward way. When user select to view or read the document, it will be locked and processed by the user having viewed it, and then it will only appear in the already-read or pending document list of the user. User can select a document to process when viewing the contents or directly
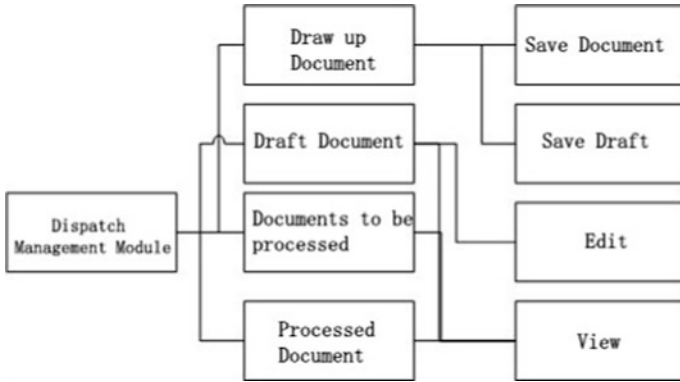
Fig. 35.4 The dispatch management module

Fig. 35.5 The user
management module
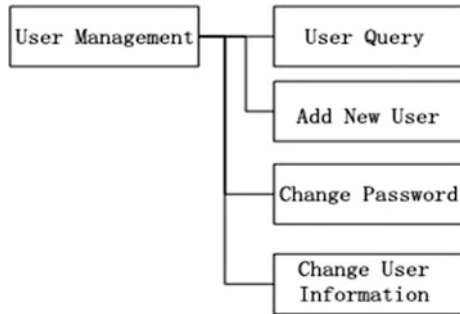
from the query list. After the work related to documents is completed, this document can be transferred to the next flow through processing. All the documents process by user can be searched in the completed document list. Thus, all processing flows can be tracked in this module.

When a document needs to be reports, drawing up it is necessary first. In the document drawing-up process, the document can be saved as draft. The saved draft can be modified, deleted, etc. After all contents in the document is input completely, is can be reported and then enters the processing flow. The document which is in processing flow and is not processed completely can be put in the pending document list in the dispatch management module. When the whole document processing flow is finished, it will appear in the already-processed document list in this module and finally is saved.

When new users are added, the user group where the users are needs to be determined first. Then, login name, Chinese name, password, contact information and other basic information are input, and a user therefore is added in the system. Any user after signing in the system can change the password. Administrator after signing in the system can do the password reset operation when changing his own password, and also can delete an invalid user.

35.6 Database Design

In this system, MySql database is mainly used to save data, and all database tables'
structure is shown below.

1. Document table is the main data table of the whole database, and saves related
   contents of each document and is named as document; its main fields are shown
   in Table 35.1.
2. Document processing flow table: it is to record related things in document
   processing, including processing time. The table name is docprocess. Its main
   fields are shown in Table 35.2.
3. Attachment record table: Each document may include one or more attachments;
   some basic information of each attachment needs to be recorded in database.
   The table is named as attachment. Its main fields are shown in Table 35.3.
4. Document and attachment relation table: Each document may include one or
   more attachments; some basic information of each attachment needs to be
   recorded in database. The table is named as docfile. Its main fields are shown in
   Table 35.4.
5. User basic information table: This records the user basic information in the
   system. The table is named as user. Its main fields are shown in Table 35.5.

Table 35.1 Document table

Field	Type	Length	Introduction
id	int		no.
title	string	100	title
Subtitle	String	100	Subtitle
keywords	string	250	keyword
creator	int		creator
abstract	string	test	abstract
content	string	test	content
create time	date time		create time
user	int		Users being processed
status	int		status
note	string	50	note

Table 35.2 The document processing flow table

Field	Type	Length	Introduction
id	int		no.
docid	int		Document no
use rid	int		User no.
process	string	125	Process content
status	int		Process status
Update time	Date time		The last process time
ip	string		Process address

Table 35.3 The attachment table

Field	Type	Length	Introduction
id	int		No.
title	string	200	title
path	string	250	Storage path
file size	long		file size
file type	string	50	file type
introduce	string	250	introduction
username	string	50	Upload user name
note	string	50	note

Table 35.4 The document and attachment relation table

Field	Type	Length	Introduction
docid	int		Document no.
Fileid	int		Attachment no.

Table 35.5 The user basic information table

Field	Type	Length	Introduction
id	int		No.
Name	String	64	Login name, (only letter and number)
password	String	64	Password
Cname	String	128	Chinese name
Email	String	128	Email address
Tel.	String	64	Contact phone number
mobile	String	64	Mobile phone number

6. User group table: This records the user grouping information in the system. The table is named as usergroup. Its main fields are shown in Table 35.6.
7. The user group corresponding relation table: This records the corresponding relation of the user group. The table is named as use rug. Its main fields are shown in Table 35.7.

Table 35.6 The user group table

Field	Type	Length	Introduction
id	int		No.
Cname	String	64	Group name
creator	int		creator
Ip	String	128	Creator address
level	int		User group level

Table 35.7 The user group corresponding relation table

Field	Type	Length	Introduction
id	int		No.
use rid	int		User no.
User groupid	int		User group no.
creator	int		creator
Ip	String	128	Creation address

35.7 Conclusion

This paper mainly conducts a demand analysis on the system to recognize its comprehensive requirements, analyze its data need and also export its functional modules. Then, an overall design, functional modules design and database tables design are made. However, the system still has shortcomings, and further optimization and analysis is necessary for its performance database.

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Chapter 36
Precision Positioning Technology for Receiving Terminal of Dual-Frequency GPS

Jian-Jun Sun, Lei Bi, Hong-Tao Chen, Ru-Qiang Yang and Ji-Zu Cai

Abstract This paper mainly studies on the precision positioning integration application technology for the receiving terminal of the dual-frequency GPS. It has included the a great amount of application technologies such as the terminal software and hardware integration design and the data processing flow and so on. They have been applied in wide area real-time precise positioning system, making the real-time positioning precision of the dual-frequency GPS receiving terminal supreme to one meter.

Keywords Dual-frequency GPS · Receiving terminal · Precision positioning technology

36.1 Brief Introduction of the GPS Receiving Terminal Precise Positioning Technology

Wide area real time precise positioning system is a satellite navigation augmentation service system. It uses the new generation networking satellite navigation enhancement technique, the real time navigation information data processing and the wide area precision single-point positioning technology as the main support. It

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is founded in the area of China and the positioning precision is supreme to one meter [1].

The GPS receiving terminal realizes the function of real time precise positioning by receiving the precise positioning information (precise orbit determination, the correcting number of clock difference and the ionosphere delay reduction-single frequency that the wide area real time precise position system and the ionosphere delay reduction-single frequency) that the wide area real time precise positioning system broadcasts.

36.2 Software and Hardware Integration Design of Receiving Terminal for Dual-Frequency GPS

The dual-frequency GPS terminal based on the precise positioning technology is mainly made up of by three parts: the dual-frequency GPS receiving machine, the industry book and the precision positioning technology software. Figure 36.1 shows the working interface relationship of the three parts.

36.2.1 Dual-Frequency GPS Receiving Machine

The dual-frequency GPS receiving machine adopts the OEM plant of OEMV-1DF by NovAtel [2]. It has such features as the small sized mother-board, the ability to receive dual-frequency GPS signals, the fast positioning speed and the high precision and so on.

It has included the several following main functional models:

1. Central Processor Unit. This is the core part of the GPS receiving terminal. The main functions of the model include power management, data transmission
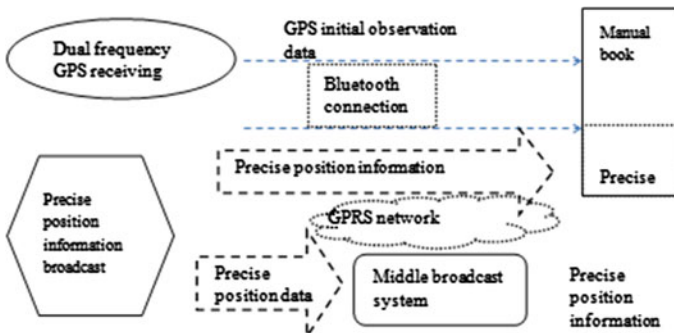
Fig. 36.1 Terminal composite picture

coordinating each model, drive of management interface and data storage and management.

2. GPS decoding module. The functions are to receive decoding GPS data and send relevant GPS data.
3. Data link module. The functions are to send or receive precise positioning information through particular data link (radio, GPRS or CDMA) so as to realize precise positioning function.
4. Bluetooth module. It offers the connections with work books.

36.2.2 Surveying and Mapping Work Book

Work book is the barrier that receives data, process data and carries on the precise position calculation. The hardware module of the work book includes the Bluetooth and the GPS communicating module. Among them, the Bluetooth module is in charge of the communications with the dual-frequency GPS receiving machine. The GPS communicating module is in charge of the communications with the precision positioning information broadcasting server so as to acquire precise position information [3]. There are a great amount of features, such as the functions are strong, the usage is convenient and it is light and quite easy to carry and so on. The operation speed of the processing machine can reach 624 MHz. It has the inner storage of 256 MB and it operates Windows CE 5.0/6.0 or Windows Mobile 6.0/6.5 system.

36.2.3 Precise Point Positioning Software

The operating environment of the precise point positioning (PPP) software is Windows CE or Windows Mobile operating system. The dual-frequency precise point positioning software can realize the following functions:

36.3 Precise Point Positioning Software Design and Data Processing Flow

36.3.1 Precise Point Positioning Software Operating Design

The precise point positioning software mainly includes the following five parts: the data receiving, initialization, data preprocessing, location computation and the graphic display. The software adopts the VC++ language compilation.

1. Data receiving part is mainly used in the acquisition of the GPS initial observation data of the interface of the receiving machine, and the broadcast ephemeris. In addition, it stores the data in the observation data Odata and the data structure of the broadcast ephemeris Nsaved. The precise point positioning information server sends tracts, the clock difference based on differential correction. It is as well stored in the data structure bodies of Odata and Nsaved;
2. The initial part mainly locates the initial coordination through the pseudo range single point. At the same time, it deals with the initial data of the preprocess and Kalman;
3. Data pretreatment part is in charge of the efficient monitoring, gross error of the data, as well as the observation and repair of the cycle slips;
4. The point position calculation part revises the data that has gone through the pretreatment. In addition, it calculated the coordinates and the precision degree of the observational station by the methods of filtering;
5. The graphic display part will locate the three-dimensional coordinate and the precise degree information of the station and display them to the clients with the satellite distribution graphic. At the same time, it will display the relevant information of the location process (Table 36.1).

36.3.2 Precise Point Positioning Software Inner Interface and Data Interaction Flow

When the precise point positioning software operates, the data realizes the interaction between the data through the method of memory interaction. Figure 36.2 displays the data interaction flow [4].

36.3.3 Precise Point Positioning Software Fault Treatment

Data receiving fault: the data received by the software includes the GPS initial observation value acquired from the interface of the receiving machine, the

Table 36.1 Dual-frequency can realize data preprocessing function

Dual frequency data quality control function
Calculation function based on broadcasting satellite ephemeris
Track and clock difference enhancing function based on differential correction
Dual frequency carrier positioning, speed measurement function
Dual frequency fuzzy determination function
Meteorological parameter evaluating function
Terminal time synchronization function

Fig. 36.2 Data flow
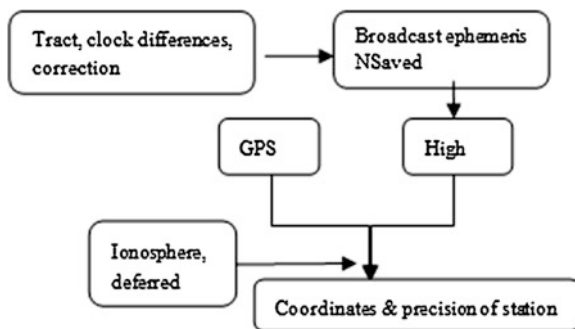
broadcast ephemeris, and the observation data acquired from the decoding binary data. At the same time, it acquires all kinds of correction information acquired from the network or other ways [5].

Data solution fault: during the point positioning process, if the data qualities are bad, the solution results may be bad. The software graphic displays the distribution photo of all of the observation satellites and the information on relevant elevation angle and so on. The point positioning process and result information are convenient for operators to understand the actual circumstances of the point positioning calculation [6].

36.3.3.1 Precision Point Position Software Backup Technology

The precise point positioning software will produce a new engineering file every time the program operates. The program will store the GPS initial observation value, the broadcast ephemeris, the precise point positioning data and the intermediate quantity and the final results of the point positioning calculation into the engineering file. The program is able to store automatically the observation data each time instead of being covered so as to find out the reasons for the problems when faults occur.

36.4 The Test Results of the Precision Point Positioning Technology Index

36.4.1 Testing Methods

In order to verify the point position precision degree of the dual-frequency GPS receiving terminal, the dual-frequency precision point position index tests are carried out in such cities as Beijing and so on. It acquires the three-dimensional
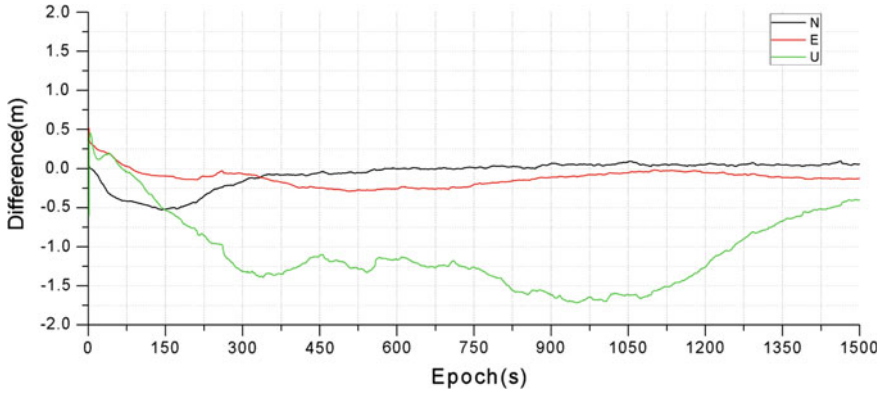
Fig. 36.3 Sequence diagram of convergence time
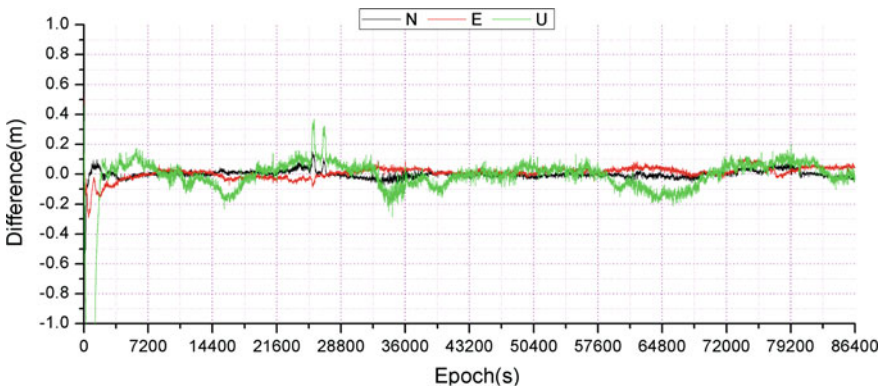
Fig. 36.4 Sequence diagram of the point position result time

Table 36.2 The statistics results are as the followings (Start to add up from 1,200 epoch, unit m)

	N(m)	E(m)	U(m)
STD	0.022	0.033	0.090

coordinates of the station. The tests require carrying out the continuous static test lasting for 24 h. In this way, the observation results can be analyzed statistically.

The precision of the static simulation result analysis methods will start to add up; the plane accuracy statistics formula is $\sigma_{RMS} = \sqrt{\sigma_N^2 + \sigma_E^2}$; the confidence interval is twice the PMS value. The statistics formula is $\sigma_{RMS} = \sqrt{\frac{1}{n}\sum X^2}$. X is the value for the sample.

36.4.2 Statistics Results

The point position precise result: horizontal precision is 0.07 m; the height accuracy is 0.18 m (Figs. 36.3, 36.4, Table 36.2)

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Part II
Service Science, Service Management and Applications

Chapter 37
Research on Rural Drinking Water Projects Management

Zhenhua Liu

Abstract Due to lack of effective management system, effectiveness of rural drinking water projects is relatively poor, which leads to rural unsafe drinking water. The participants, the classification of property right and management of rural drinking water projects are analyzed. Participants of rural safe drinking water in china are mainly management, operators and water users; the body are respectively water resources department, rural drinking water system operators and rural water users. Because of differences in sources of funding, property right of rural drinking water projects can belong to the state-owned property or collective ownership or individual ownership or private investment institutions. Rural centralized water supply projects in Anhui are mainly the village self-management, about 70.58 %; in Beijing mainly the direct management of water conservancy department, about 48.75 %. Clear property rights contribute to the management of rural drinking water projects, the appropriate management is choosing flexibly according to the actual drinking water projects. It necessary to establish a sound management system of rural drinking water projects, and give full play to the role of rural residents.

Keywords Management system · Drinking water projects · Property right · Self-management · Direct management

37.1 Introduction

In the past 10 years, the central and local government have attached great importance to safe drinking water in rural areas; a large number of rural safe drinking water projects were constructed. However, the construction of rural

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drinking water project management system is lagging behind, which seriously affected the efficiency of rural water projects, it is necessary to explore the management system of rural drinking water projects in china. Central Committee Document No. 1 on decision about accelerating the reform and development of water conservancy was promulgated by the CPC Central Committee and the State Council on December 31, 2010. It indicates that the operation and management of rural drinking water safety project will be strengthened; the body of management and maintenance will be confirmed. Thus, it is urgent that management system of rural drinking water projects is improved and perfected.

37.2 The Body Relationship Among Participants of Rural Safe Drinking Water

Participants of rural safe drinking water in china are mainly management, operators and water users; the body are respectively water resources department, rural drinking water system operators and rural water users, the body relationship among participants of rural safe drinking water is shown in Fig. 37.1. Figure 37.1 shows that among the main participants of rural safe drinking water are an interrelated whole, each plays their own role. Water resources department is mainly responsible for policy formulation, supervision and management, coordination of national and local financial investment on rural drinking water, and play a major role in solving rural drinking water safety. At the same time, health department, environmental protection
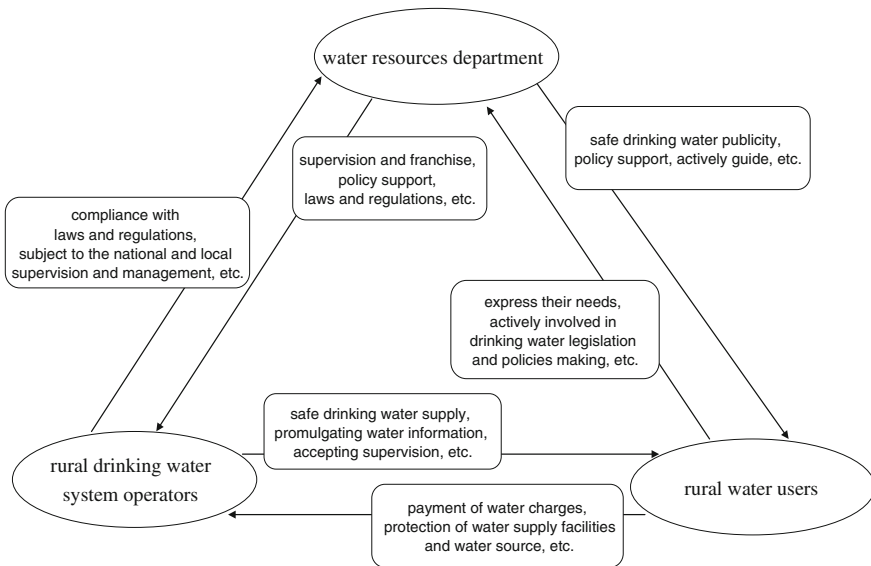
Fig. 37.1 The body relationship among participants of rural safe drinking water

department, land and resources department and other government departments assume their own responsibility for rural drinking water management. For example, environmental protection department is mainly responsible for rural drinking water source protection. Rural drinking water system operators mainly assume responsibility for water supply, including constructor and managers of rural drinking water projects. According to the definition of public goods from the perspective of public economics, rural drinking water safety has limited non-competitive or non- exclusiveness, belongs to quasi-public goods. Rural public products are the guarantee to increase farmers income and to develop agriculture and rural areas, there some problems like lack of enough supply of public products in rural areas, low supply efficiency, dislocation of main suppliers in the supply of public products in rural areas [1]. Therefore, they not only accept the government's supervision and serve rural water users, but also maximize their own interests as much as possible. Rural water users are the ultimate beneficiaries of rural drinking water safety, because rural residents are most concerned about safety of drinking water which is the most direct and practical livelihood issues. They not only need to take the obligation to pay water charges, but also participate in formulating policy on construction and management of rural drinking water project, such as water pricing. At the same time, there are other participants, such as rural water user associations, water bank, and industrial enterprises.

37.3 The Classification of Property Right of Rural Drinking Water Projects

At present, property right of rural drinking water projects is very unclear, because investment in rural drinking water projects is very complex. Clear project ownership is the basis for project management and is conducive to effective project management in order to give full play to project benefit. The biggest challenges of management of rural drinking water projects is unclear property rights, the responsibility is not clear, the running costs is ignored. To eliminate such drawbacks, the government must be clear property rights of rural drinking water projects.

According to differences in rural drinking water project investment, it belongs to the state-owned property or collective ownership or individual ownership or private investment institutions. National investment (including central and local financial investment) is the main source of funds for rural drinking water projects that is centralized and associated water supply projects, over 50 % of total investment, the main pipelines belong to the state-owned property, branch pipes belong to collective ownership, indoor water supply pipes belong to personal property. Sources of funding of rural drinking water projects is mainly raised by the village collective and villager, government investment is supporting, property right belongs to collective ownership. Sources of funding of rural drinking water projects are mainly raised by villagers personal investment, government

investment is supporting; property right belongs to individual ownership. If sources of funding of rural drinking water projects are financed by private capital investment, property right belong to private investment institutions. Because of lack of uniform criteria for the classification of property rights of rural drinking water projects, it leads to unclear property rights, which has a negative impact on rural drinking water projects management. Therefore, it is necessary to establish national unity criteria for the classification of property rights, which can promote the healthy development of safe drinking water in rural areas.

37.4 Analysis of Rural Drinking Water Project Management

37.4.1 The Body of Rural Drinking Water Project Management

The body of rural drinking water project management consists of competent administrative department for water, water resources institutions, water industries and enterprises. Because safe drinking water in rural areas is quasi-public goods with strong public good characteristics, rural drinking water projects management cannot be fully suitable for the market mechanism. Government must play a role in rural drinking water projects management; government intervention can be used if necessary. Water resources institutions assume mainly responsibility for rural residents to provide safe drinking water, and are responsible for supervision and administration on behalf of the state-owned assets. Water resources institutions belong to non-profit organizations, the development of it is guided by government in accordance with relevant laws and regulations on rural safe drinking water, his funds are directly or indirectly funded by the government. Water industries and enterprises mainly rely on local water resources, their development potential and benefits are very good, they accept the management of water resources department and lead to the monopoly, to some extent, which will reduce the effectiveness of the supply of safe drinking water in rural areas.

37.4.2 The Current Situation of Rural Drinking Water Project Management

At present, rural drinking water project management is still in the exploratory stage, and have not formed an effective management model. Property rights of rural drinking water projects is unclear, water pricing mechanisms are inadequate, it is difficult to collect water fee [2], lack of supervising system of source of drinking water in rural areas [3]. According to local conditions, local governments continue to explore suitable management model. There is mainly some management model for rural drinking water project in china, such as direct management of
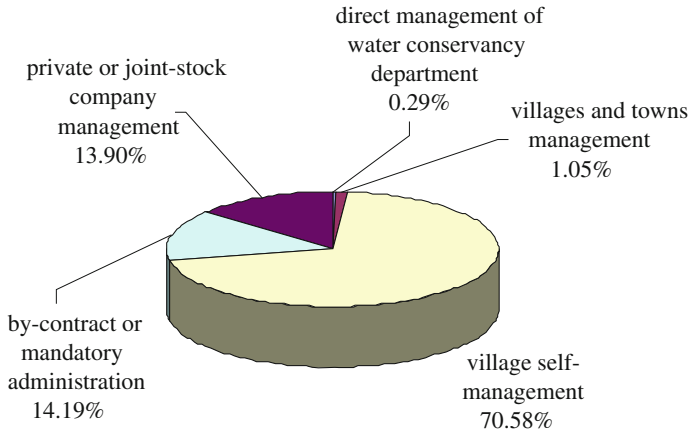
Fig. 37.2 The current situation of rural centralized water supply projects management in Anhui

water conservancy department, villages and town's management, village self-management, by-contract or mandatory administration, private or joint-stock company management. According to survey data of research on long-term benefits mechanism of rural drinking water projects [4], the current situation of rural centralized water supply projects management in Anhui is shown in Fig. 37.2, in Xinjiang in Fig. 37.3.

Figure 37.2 shows that a rural centralized water supply project in Anhui is mainly the village self-management, a minimum of direct management of water conservancy department, about 0.3 %. Figure 37.3 shows that rural centralized water supply projects in Xinjiang is mainly the direct management of water
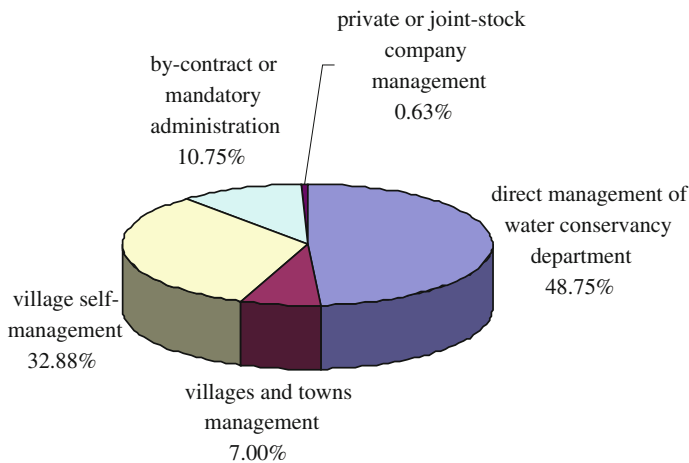
Fig. 37.3 The current situation of rural centralized water supply projects management in Xinjiang

conservancy department, a minimum of private or joint-stock company management, about 6.3 %. However, direct management of water conservancy department in Beijing accounted for 71 % of rural centralized water supply projects, no by-contract or mandatory administration.

37.4.3 Discussion on Rural Drinking Water Project Management

Opinion on strengthening water supply project management of villages and towns was promulgated by Ministry of Water Resources on October 29, 2003. It indicates that management system of water supply project of villages and towns should be established with the clear functions and explicit rights and liabilities, clear and definite management responsibilities; operating mechanism of water supply project of villages and towns should be established with the flexibility and effectiveness putting market economic means to use.

The problem is solved with electricity supply, the policy of fiscal subsidies is implemented to ensure rural drinking water safety project running steadily, lastingly and safely [5]. The large-scale centralized water supply project builded mainly by government investment are performed by the competent administrative department of local water conservancy, or entrusted professional institute responsible for management. Rural water cooperation committee is responsible for smaller-scale centralized water supply project. Water supply plant of town is responsible for water supply project extended from urban water supply pipe network, rural residents are responsible for micro-dispersion water supply project for their own use. The water supply project builded mainly by private or joint-stock company are determined supervisor mode by the investor, but which is accepted the supervision by water authorities.

37.5 Conclusion

At present, rural drinking water project management is a weak link, it is necessary to strengthen the management of drinking water projects. There are some conclusions through the analysis of Rural drinking water project management. First, there are interrelation among participants of rural safe drinking water; Second, clear property rights contributes to the management of rural drinking water projects; Finally, according to the actual drinking water projects, the appropriate management is choosed flexibly.

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Chapter 38
Characteristics of Precipitating Clouds in Typhoon Ma-on from MWRI and TMI Observations

Xiaoqing Li, Fengsheng Zhao, Yanli Qiao, Hu Yang and Ran You

Abstract Rainfall structures retrieved from multiple FY-3B MWRI observations, together with those from TMI are used to analyze the temporal and spatial evolution features of typhoon Ma-on's precipitating clouds in 201,346. Four MWRI observations and seven TMI observations with relative complete spiral shapes are selected to make analysis and comparisons. The results show that vertical hydrometeor profile and radial profile of column integrated content for four hydrometers retrieved by MWRI and by TMI are well consistent from not only temporal but spatial evolution. The peak heights of four hydrometeors varied little among these observations. Rain water content and precipitable ice content increased considerably with the increase of precipitation and rain water content made the largest contribution to precipitation. The peak column integrated contents of four hydrometers are located within 0.7° from the center. Structures of precipitating clouds retrieved by MWRI can be seen reasonable.

Keywords MWRI · TMI · Typhoon · Precipitating clouds · Vertical structure

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38.1 Introduction

The FengYun (FY) series of satellites is developed for broad meteorological and environmental applications in China. Since the November 2010 launch of FY-3B, Microwave Radiation Imager (MWRI) onboard FY-3B provides effective observations for monitoring disastrous weather, such as typhoon. MWRI scans the earth conically with a viewing angle of 450 with a swath of 1,400 km. It is a total power passive radiometer and measures the radiation at five frequencies at 10.65, 18.7, 23.8, 36.5 and 89.0 GHz, respectively with each having dual polarization [1]. It's an important issue to utilize MWRI data for monitoring, analyzing and prediction of typhoon precipitation.

Rainfall is correlated with four dimensional hydrometer structures. Generally speaking, physical profile algorithms are used to obtain this information, and Goddard profiling algorithm (GPROF) is the most mature method among them. As the operational algorithm for TRMM Microwave Imager (TMI), which has nine channels similar with MWRI, GPROF algorithm provide 2A12 product with rainfall rate and 4-dimensional rainfall structure [2]. Combined TMI 2A12 product and other products from TRMM, much analysis was made in the past 10 years and precipitation products have been extensively applied in weather process analysis, numerical prediction and climate application [3].

GPROF algorithm is not used for MWRI simply. A cloud-radiation database for MWRI must be build. We combine GPROF algorithm and an already constructed cloud-radiation database to analyze rainfall structures of typhoon tracked by MWRI and TMI in this paper.

38.2 Data Introduction

38.2.1 Typhoon Cases

Typhoon Ma-on (international designation number 1106), was generated in the middle of Pacific Ocean on 12 July, 2011, and then moved westward. It hit Shikoku, Japan in early morning on 20th July, causing storm and strong precipitation.

38.2.2 Satellite Observation

During development of Typhoon Ma-on, MWRI and TMI tracked typhoon for many times. Four track records of MWRI and 7 track records of TMI were selected for analysis of rainfall characteristic. The first letter M and T stand for MWRI, TMI
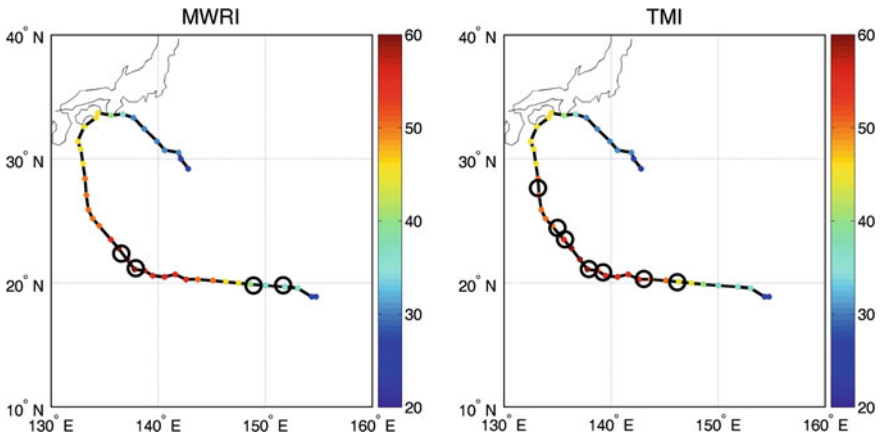
Fig. 38.1 Typhoon Ma-on's path and geographical locations observed by MWRI, TMI (*black line* typhoon path; *colored plot* intensity index; *cycle* satellite observed geographical locations)

respectively for observation record in the table. The clear geographical locations and correlated intensity index of typhoon can be seen from Fig. 38.1.

Detailed algorithm used for MWRI can be seen from reference, [4] and Li et al. had used brightness temperature observed by MWRI to retrieve precipitation and vertical hydrometeor profile of Typhoon Songda on May 27, 2011 and comparative analysis was also performed with AMSR-E precipitation products. Good consistency was found between the two retrieved results [4].

38.3 Result Analysis

38.3.1 Average Column Integrated Content of Hydrometers

Spatial average column integrated contents (CIC) were first analyzed. Figure 38.2 demonstrates the relationship between the CICs of four hydrometeors and rainfall rate in all of the MWRI and TMI observations. This relationship between hydrometeor content and rainfall from MWRI and TMI was basically consistent. Rainfall and precipitable ice made the greatest contribution to precipitation, and the content variation features of them were consistent with that of precipitation. Basically, rain water and precipitation were correlated much linearly. As the rainfall increased, the increment of precipitable ice was smaller than that of rain water.
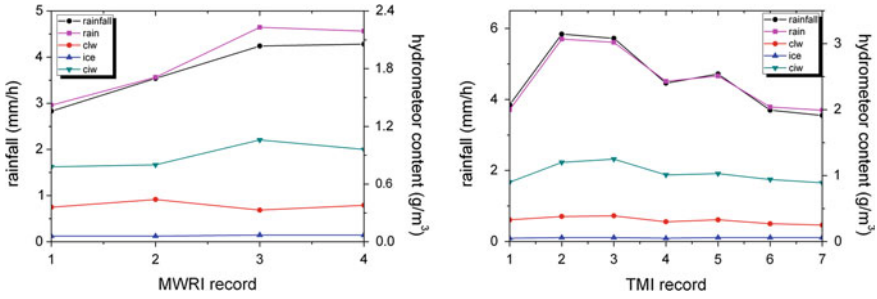
Fig. 38.2 Integrated contents of 4 hydrometers with MWRI (*left*) and TMI (*right*) (*rain* rain water; *clw* cloud liquid water; *ice* precipitable ice; *ciw* cloud ice water)

38.3.2 Vertical Hydrometeor Profiles

During the development of Typhoon Ma-on, the variation of hydrometer content was directly associated with that of rainfall intensity. Figure 38.3 showed the average vertical hydrometeor profiles at each height layer for rainfall, cloud water, cloud ice and precipitable ice during Typhoon Ma-on. As we can see from the figure, hydrometeor content varied greatly among the 4 MWRI records. On the contrary, the hydrometeor content variation was much less among the 7 TMI records. This result was consistent with the variation features of rainfall intensity at different records showed in Fig. 38.2. Of all the typhoon cases, including weak typhoons and strong typhoons, vertical hydrometeor structures observed by MWRI and TMI was highly consistent in addition to the consistency in variation of content amount. (1) Rain water was distributed at the height of 0–6 km above the ground. The Rain water content reached its maximum as about 0.7 g/m^3 in M3 and T4. Rain water content was as low as 0.3 g/m^3 in M1. (2) Cloud water content was located at the height of 0–10 km above the ground, and its peak content of $0.14/m^3$ was found at the height of 5 km. Cloud water content was the largest in M4 and T6. (3) Precipitable ice was located above the height of 4 km and extended to the height of 18 km. The peak content of precipitable ice with 0.6 g/m^3 also occurred in M3 and T4 occurred at the height of 6–8 km. Value of precipitable ice was slightly smaller than rain water; (4) Cloud ice with the maximum content as low as 0.04 g/m^3 was distributed above the height of 8 km.

38.3.3 Spatial Distribution of Hydrometeors

The cloud characteristics are derived in storm-relative coordinates. The radial variation of column integrated contents (CIC) of four hydrometers is depicted by the azimuthal mean hydrometer CIC in 0.1° wide annuli around the storm center outward to the 3° radius Fig. 38.4. Radial profile of cloud ice water is omitted here
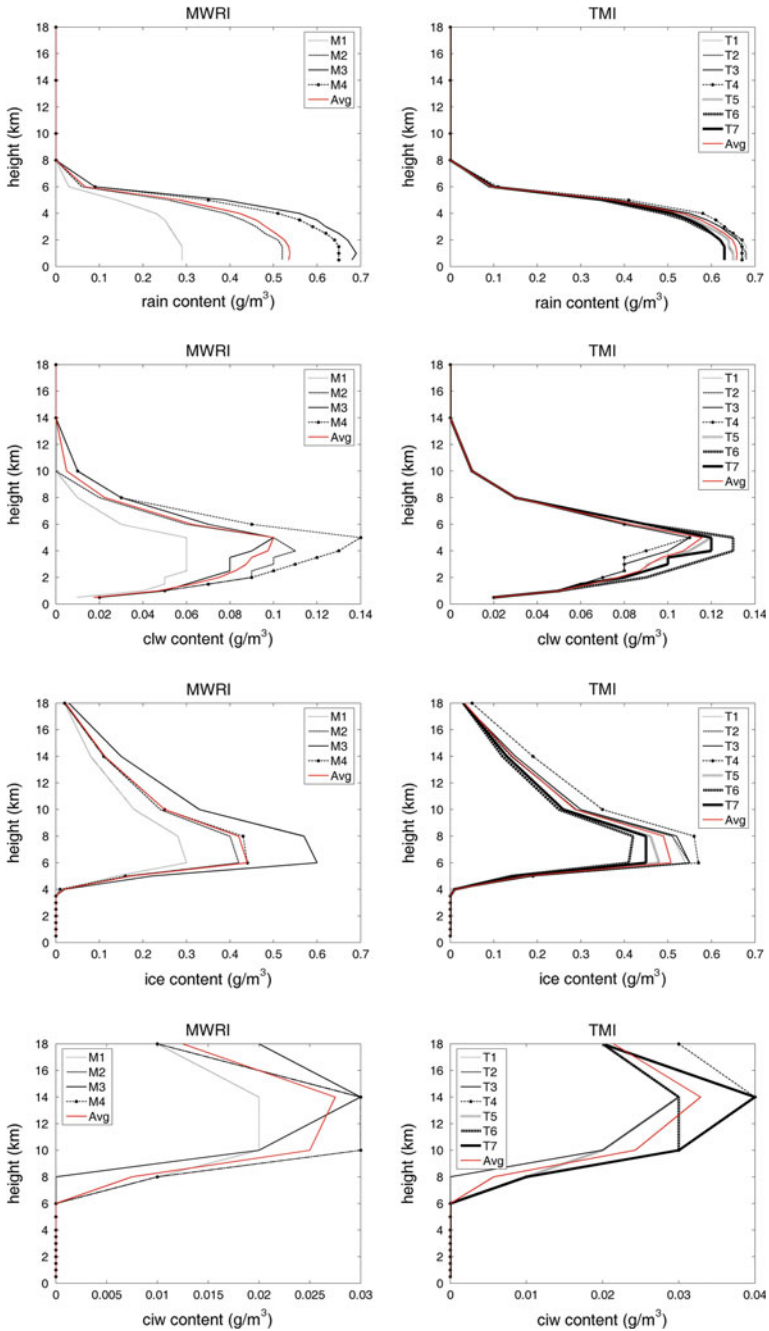
Fig. 38.3 Profiles of four spatial averaged hydrometers with MWRI (*left*) and TMI (*right*) (*rain* rain water; *clw* cloud liquid water; *ice* precipitable ice; *ciw* cloud ice water)
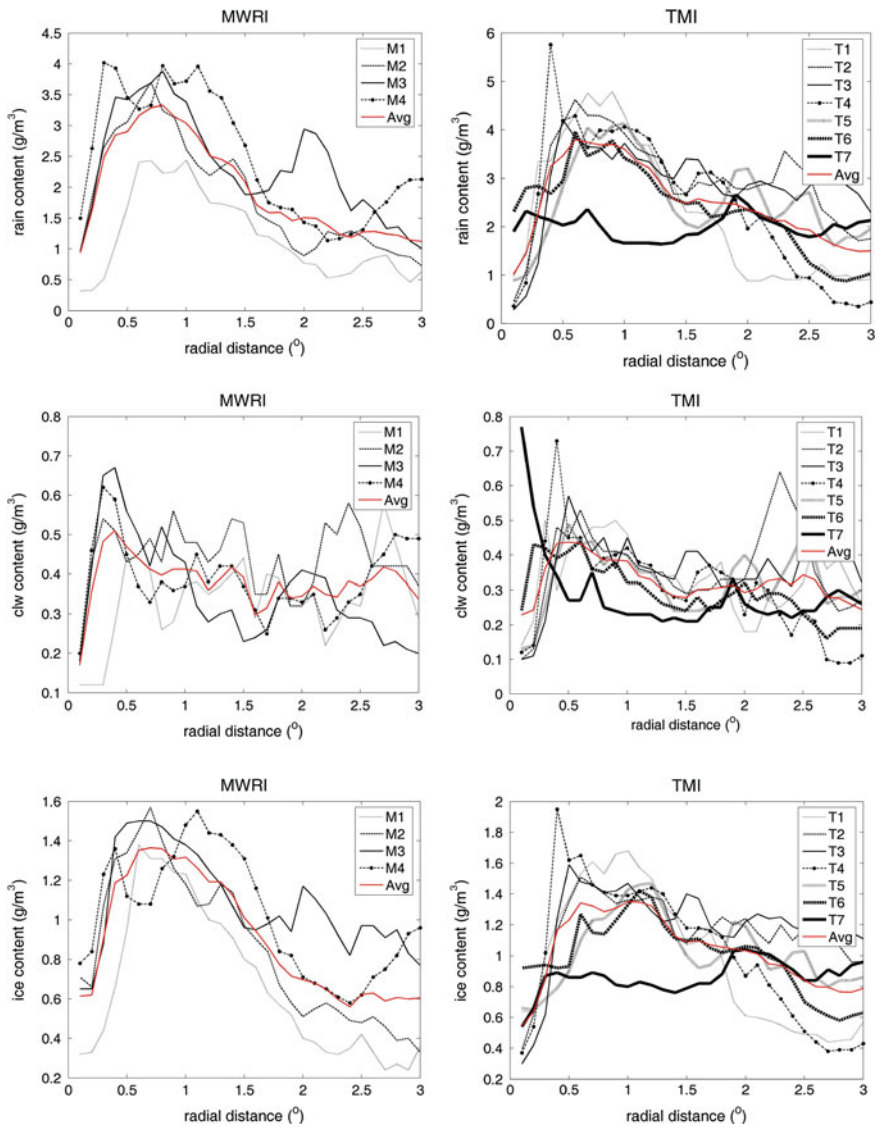
Fig. 38.4 Radial profiles of azimuthally averaged column integrated rain water, cloud liquid water, and ice water with MWRI and TMI

because of its low value relative to another 3 hydrometers. We can see that different shapes of radial profile were revealed at different observation record due to the difference of rainfall intensity. While, the average radial profiles of three hydrometers with multiple records of MWRI and TMI are very similar. The peak CICs of rain water and precipitable ice are located 0.7° from the center and is

about 3.4 and 1.4 g/m^3 respectively. The peak CIC of cloud liquid water is located 0.4° from the center and is about 0.5 g/m^3.

38.4 Summary

Using 4 MWRI observations and 7 TMI observations during the development of Typhoon Ma-on, temporal and spatial variations of precipitating clouds were analyzed. The results indicated:

(1) The spatial and temporal evolution features of the precipitating clouds from MWRI and TMI during development of Typhoon Ma-on showed satisfactory consistency.
(2) Average vertical hydrometeor profiles retrieved by MWRI and TMI were highly consistent in all observations. The peak heights of four hydrometeors varied little among these observations. Rain water content and precipitable ice content increased considerably with the increase of precipitation. The variation trend of integrated content was consistent with that of rainfall rate. Rain water content made the largest contribution to precipitation.
(3) Average radial profiles of hydrometer CICs from MWRI and TMI are very similar. The peak CICs of rain water and precipitable ice are located 0.7° from the center and is about 3.4 and 1.4 g/m^3 respectively. The peak CIC of cloud liquid water is located 0.4° from the center and is about 0.5 g/m^3.

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Chapter 39
Study on Measurement Attributes of Biological Assets in Chinese Agribusiness

Li Guo and Yun Yang

Abstract Since biological assets were main component of agriculture enterprises' assets, selection of appropriate measurement attribute for biological assets became important for agriculture accounting. International Accounting Standard 41 allowed both historical cost and fair value to measure biological assets. More importantly, it introduced fair value measurement as the preferred selection for biological assets. In 2006, China announced CAS5 which required that biological assets should be measured on the basis of historical cost at initial recognition and subsequent reporting period. However, use of fair value was allowed in CAS5 only when biological assets' fair value could be reliably obtained. Based on biological asset's nature, the article discussed arguments on using historical cost or fair value to measure biological. On one hand, using historical cost to measure biological assets was reliable but irrelevant. On the other hand, using fair value to measure biological assets was relevant but unreliable. The article strongly suggested a hybrid measurement model should be taken on this stage in China which represented majority of Chinese academician's opinion.

Keywords Biology assets · Agribusiness · Measurement attribute · History cost · Faire value · Hybrid measurement model

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39.1 Introduction

Agriculture industry was a main sector of Chinese economy whose domestic consumption and export earnings heavily relied on agricultural products. There were 68 agricultural listed companies in the Shanghai and Shenzhen stock markets. Agricultural listed companies were became an important segment in stock markets. As the essential agriculture production materials, biological assets were main elements of these enterprises' assets. Therefore, issues of biological assets' recognition, measurement and disclosure had critical effects on regulating agriculture enterprises' accounting treatment and information disclosure of Chinese agriculture business.

International Accounting Standards 41 (IAS41) defined a biological asset as a living animal or plant. IAS41 also allowed agriculture entities use either fair value or historical cost to measure a biological asset. Due to the characteristic of transformation, natural growth and periodicity, biological assets' measurement differed from other assets and became more complex. In 2006, Chinese ministry of finance promulgated Chinese Accounting Standards 5 (CAS5), which thoroughly and clearly stipulated biological assets' conception, classification, recognition, measurement and disclosure etc. According to the CAS5, biology assets were classified into consumptive biology assets, productive biological assets and public welfare biology assets. More importantly, CAS5 specified that biological assets should adopt historical cost at the initial recognition point and at the end of each subsequent reporting period unless conclusive evidence showed that fair value of biological assets could be substantially and reliably acquired. Shi and Qu [1] commented that, generally speaking, Chinese biological accounting regulations were on the initial stage and the selection of its measurement attributes were confined to history cost. That reflect Chinese basic attitude to biological assets' measurement and recognition on this stage.

Although IAS41 and CAS5 both permitted the selection between fair value and historical cost as the measurement of biological assets, the issue of the assets' measurement attribute could not be comprehensively resolved. Along with Chinese Accounting Standards introduced fair value measurement, arguments between using fair value and historical cost to measure biological assets were heated among academic researchers.

39.2 Biological Assets' Characteristics

Biological assets are living animals and plants. They rely on law of the nature and human labor to realize their nature added value. The operating efforts of agriculture enterprises were to increase biological assets' ability of transformation. Once biological assets' lives were terminated, they could not bring economic benefits to enterprises and could not be treated as assets. Therefore, holding of

biological assets not only has market risks but also natural risks such as plant diseases and insect pests, floods etc.

Ju and Zhu [2] indicated that Biological assets have hybrid characteristics of current assets and long-term assets. Basically, consumptive biology assets such as vegetables and field crops used up their value at one-time. They could not provide future services and economic inflows once they were consumed. Therefore, consumptive biological assets should be treated as current assets and listed as inventories on balance sheet. Productive biological assets like economic forests and productive livestock had some features of fixed assets. The purposes for holding this kind of asset were to produce agriculture products, render labor services. They could be used for a long time and repeatedly. Public welfare biological assets have the long-term assets features such as long growth cycle and long payback period. They refer to the biological assets for the main purpose of conservative or environmental protection, consisting of wind break and sand fixation forest, water and soil conservative forests etc.

39.3 Factors Influencing Biological Assets' Measurement Model

As economic resources, biological assets not only have ordinary assets' characteristics but also have their intrinsic biological characteristics such as natural productive value and long growth cycle. Because of these specificities, the selection of appropriate accounting measurement for biological assets was important. There were various factors affecting assets measurement. For instance, understandings of assets' nature, market environment as well as the balance between relevance and reliability of accounting information were all influential factors when an accounting made its decision on measurement pattern.

39.3.1 Market and Regulatory Environment

Using fair value or historical cost to measure biological assets was decided by market and regulatory environment. A relative mature market and regulatory environment was appropriate to realize fair value to measure their biological assets. Countries like America and Australia selected fair value as a major way to measure biological assets since they had mature equity market, developed professional evaluation techniques as well as comprehensive regulations. However, countries has insufficient market and regulatory environment, abuse introduction of fair value in biological assets might face the problems of high cost of obtaining biological assets' fair value as well as disclose them. Moreover, it could cause the issue of profit manipulation since changes in biological assets' fair value should be recognized as profits or losses in enterprises income statement.

39.3.2 Balance Between Relevance and Reliability of Accounting Information

The quality of accounting information was required to be reliable and relevant by most countries' accounting standards as well as Chinese standards. Principally, reliability and relevance should be compatible in accounting information. But the truth was that these two might contradict under certain circumstance. When there were contradictions, accountants' professional judgment might be a critical factor. If they treated reliability as a key factor, they might choose historical cost to measure assets. Conversely, if they considered relevance to be critical, they might select current cost or present value of future cash flows etc.

39.3.3 Deferent Understandings of Assets' Nature

There were two deferent views on the nature of assets. One was asset-cost view which emphasized assets subjective existence and reliable calculation on the basis of acquisition cost of an asset. Therefore, it tended to select historical cost pattern since they considered that measurement pattern should reflect the past acquisition cost. However, another understanding was asset-value view. This view held that the nature of an asset was the capability to bring expected economic benefit in the future. It supported that an asset evaluation should face the future theoretically and should reflect the value created by future use of assets. Consequently, it selected present value of future cash flows to measure assets. Currently, most authoritative accounting standard makers adopted asset-value view.

39.4 Arguments on Using Historical Cost or Fair Value to Measure Biological Assets

39.4.1 Historical Cost Measurement

Historical cost or acquisition cost was the traditional measurement attribute which had the longest history in accounting area among all measurement attributes. Because of its reliability, verifiability and objectivity, it has been the mainstream to evaluate biological assets in China. More importantly, the use of historical cost did not require active biological assets market and perfect market information. Therefore, many China's academicians contended that historical cost could be the reality choice.

More than that, historical cost could reflect real transaction information and fair value could not always be fair on this stage. They suggested that China's agriculture accounting standards making should consider its own environmental elements and adopt historical cost as the major measurement way. Most of them were

aware of defects in historical cost measurement. For instance, historical cost could only reflect changing value in operating results of biological assets' holders instead of biological assets' natural growth value. They still recommended that fair value introduced in biological assets' evaluation would not be applicable because the market was immature and most biological assets' fair value information could not be easily accessed. Internationally, French <<Plan Comptable>> and Charted Accountants of Canada (CICA) both contended using historical cost to measure biological assets. In China, according to article 5 in CAS5, biological assets' initial recognition should adopt acquisition cost. And article 17–21 in CAS5 required that biological assets' subsequent reporting period should also be measured on the basis of historical cost model with the exception of that conclusive evidence showed that fair value of biological assets could be substantially and reliably acquired.

39.4.2 Fair Value Measurement

Fair value measurement represented the future tendency in assets and liability evaluation. Due to the relevance of the measurement, IAS41 introduced fair value measurement as the preferred selection for biological assets after extensive discussions. IAS41 specified that a biological asset should be measure at fair value at the initial recognition and at each end of reporting period except that fair value of biological assets could not be obtained. Gain or losses from initial recognition and changes in fair value should be included in income statement. Many accounting standards makers followed IAS41 and taken fair value as the main measurement attributes in their biological assets, such as the Australian Accounting Standards Board (AASB), HongKong Institute of Certified Public Accountants (HKICPA).

Some Chinese academicians recommend introduction of fair value in biological assets mainly due to nature of biological assets. Yu [3] suggested that biological assets' value changed all the time and the use of fair value would be more appropriate. Especially some public welfare biological assets, for example forest, had production life cycle nearly 30 years. The use of historical cost to measure their value might be irrelevant since historical cost could not reflect the natural growth value of the assets and market changes in this long period. Furthermore, as China's market system gradually improved, a number of multi-funding share holding companies emerged. Mergence of large listed companies, perfection of capital markets made the change of accounting orientation from providing information for macroeconomic governance to providing information for individual users such as investors and creditors. The environmental conditions for application of fair value in biological assets' measurement became more realistic. Particularly, some biological assets, such as eggs and field crops, already had mature market and transparent market value. The access of fair value could be easily got. It was recommended that these biological assets might take the first step in application of fair value measurement.

39.5 Hybrid Measurement Attribute Model: Realistic Choice of Chinese Biological Assets Measurement

In order to provide more accurate and reliable measurement results, reliability and relevance were necessary elements. On one hand, using historical cost to measure biological assets was reliable but irrelevant. On the other hand, using fair value to measure biological assets was relevant but unreliable. IAS41 used fair value as a leading measurement attribute which represent the tendency in the future. However, investigation of Financial Crisis Advisory Group', founded by IASB and FASB, showed that most assets of financial institution were measured on the basis of historical cost. This result confirmed the fact that popular global accounting measurement was mixed measurement attribute system. Ge et al. [4] contended that single measurement model could not satisfy current economic situation in China and mixed measurement attribute system would be the inevitable choice.

Based on current accounting environment and biological assets characteristics as discussed before, China should take hybrid measurement attributes in biological assets. It could combine advantages of these two measurement attributes and reflect biological assets' nature. Currently, the historical cost is preferable measurement and fair value is subsidiary. As biological assets market become more mature and active in the future, fair value will take the place as the major measurement attribute.

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Chapter 40
Research on Development of Yi Folk Resources Based on Holding Festivals

Xue Xiao

Abstract The most attractive program in Liangshan tourism, Yi folklore tourism development in holding all kinds of cultural festivals plays an important role in displaying Yi folk culture, establishing a good image and promoting Liangshan economic development. However, there are some problems in the developing process. This paper analyzes these perplexities in order to awake more people to pay enough attention to promote Yi folklore tourism development.

Keywords Yi people in liangshan · Folk customs · Tourism development · Cultural festivals · Reflection

40.1 Introduction

Liangshan Yi Autonomous Prefecture, on the southwest of Sichuan Province, as an important part of the Western Development Areas—"Comprehensive Development Zone of Panxi Resources", has 60,100 km^2 and administers 17 counties and cities. Liangshan is the largest neighbourhoods of Yi people in China, and the largest ethnic category and minority population area in Sichuan [1].

Several years ago, Xichang was more famous than Liangshan because there is a satellite launching centre in Xichang. People outside knew little about the Yi people in Liangshan. In recent years, the government of Liangshan has promoted a series of festival activities with the carrier of Yis' culture in order to let outside people have a better understanding of Liangshan and to promote the development

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of the tour industry. As a result, tourism development of Yi folk customs is the most attractive project in Liangshan tourism. It is not only promoting the development of Yi tourism in Liangshan, but also plays a very important role in establishing Liangshan image and stimulating the development of local economy.

40.2 Features of Yi Folk Resources in Liangshan

From the angle of functions and values of folk tourism, Yi folk resources have the following features [2]:

1. Geographical feature. There are many differences between Yi folk resource of Sichuan and that of Guizhou, Yunnan and Guangxi because of dialects.
2. Imbalance. Development, acquired creativity and protection of Yi folk resources are very different in different areas of Liangshan resulted form different degree of economy development, different attitudes of culture and different levels of contact with outsides.
3. Vulnerability. With the rapid development of Liangshan society and economy, global economy integration and information revolution, the Yi folk culture in Liangshan exposed its vulnerability. Parts of them can not make a choice.
4. Dynamic state. Yi folk culture developed from a single to diversity, from seclusion to openness so that Yi traditional culture ecology is very complicated.

40.3 Main Cultural Festivals Held by Liangshan Government

International Torch Festival of Yi people in Liangshan are the most famous one in all cultural festivals held by the Liangshan government. Around this topic of the torch festival, they displayed the traditional finery culture of the Yi people, the traditional Bimo culture and various forms dances to show Yi ancient culture and harmony Liangshan. The torch festival delivered strong information that the officials of Liangshan decided to push forward the change from the folk cultural resources to the folk cultural capital in order to promote the development of the open policy and the tour industry so as to arouse and realize all-sided economic and social development [3].

Because of some historic reasons, the economic status of some areas in Liangshan has not been placed in a flourishing appearance for a long time. To hold tightly the historical opportunity of the west exploitation, the government had to consider what to develop and what is the most beneficial to develop. Although the history has left Liangshan poverty, it also reserved relatively complete and rich traditional folk culture. This was a cultural treasure of which the value can't be estimated. Hence, officials in each county followed the steps of the government of Liangshan to display their advantageous brand of traditional culture. For example:

On November 17, 2003, the opening ceremony of the first Bimo cultural festival was held in the cultural square which is located under the Longtou Mountain of Meigu County. The deep and low sounds of reading sutra struck the eardrum and the heart of people [4].

On October 1, 2004, 1st Finery Culture Festival of the Yi People in Zhaojue County started ceremoniously [5].

On November 6, 2007, 1st Mother-tongue Culture Festival of Yi people held in Xide County in order to propagate Yi language and folk culture [6] (Table 40.1).

All these festivals were led directly by the government of each county. They gathered manpower and collected much money. They planned these festivals with great care so that Yi people could display their traditional culture fully in the festivals.

Certainly, the torch festival is originally a traditional festival that has the long history. Now, in order to create the torch festival to be an attractive cultural tour brand, people gave new contents and expectations to it. We should make it a happy festival for people different countries to talk about their friendship, should make it a charming Dionysian to display minority's attractive tradition. Such torch festivals have become a window and a bridge for the Yi people to go to the world.

Table 40.1 Yi folk culture festivals held by government [7]

Subject	Organizer	Time	Address
1st international Yi torch festival	Liangshan government	August, 1994	Xichang city
2nd international Yi torch festival	Liangshan government	August, 1998	Xichang city
3rd international Yi torch festival	Xichang government	August, 2002	Xichang city
4th international Yi torch festival	Liangshan government	August, 2004	Xichang city, Puge county, Butuo county
5th international Yi torch festival	Xichang government	August, 2007	Xichang city
6th international Yi torch festival	Liangshan government	August, 2010	Xichang city
1st Bimo festival	Meigu government	November, 2003	Meigu county
1st Yi finery culture festival	Zhaojue government	October, 2004	Zhaojue county
2nd Yi finery culture festival	Zhaojue government	May, 2011	Zhaojue county
1st Yi mother-tongue culture festival	Xide government	November, 2007	Xide county
Liangshan winter tourism festival	Liangshan government	January, 2007	Xichang county
1st Yi folk customs festival	Puge government	August, 2008	Anha town county
1st Yi "Suoma" festival	Jinyang government	May, 2006	Jinyang county
1st Yi "Cole Flowers" festival	Yuexi government	March, 2010	Yuexi county

The Bimo culture is the spiritual culture home accumulated generation after generation, and is the spiritual need of the Yi people in hard and long lives. However, it was a fresh thing for people to display their culture in the form of festival. On one hand, such festival reflected that the government had corrected the narrow thinking of the unification of the culture. People had opened their mind to accept other culture; On the other hand, it also reflected that the godhood culture was confronting a test of commercialization and turning under the impact of the market economy.

40.4 Positive Effects of Holding Cultural Festivals to Develop Yi Folk Resources

Government and individual pay more attention to development and protection of Yi folk resources.

A Series of cultural festivals of the Yi people displayed the living fossil-called culture. It made people from different countries and areas realize that the traditional culture of the Yi people, which had ever had a label of being savage and lag now had changed to be civilized, beautiful and shocking.

In the process of the festival, in order to make the culture of the Yi people more outstanding and to create an atmosphere for tour and to extend the usage scope of the Yi language and Yi culture, the government did a lot of work and pay more attention to Yi folk resources. For example, in the past several years, although the regulation of using the Yi language had been carried out for many years, the situation still wasn't very good. We seldom saw the public facilities or the stores use the Yi language in the signs. For those signs which had Yi language on, we could hardly see where the letters were because they were too small. So, when preparing for the International Torch Festival, some related departments of the government took measures to correct such cases [8]. Until now, the situation has been ameliorated much.

The process of creating cultural festival brands has promoted the work of exploring and inheriting Yi people's ancient culture and the work of collecting and sorting materials. Liangshan government actively carried out the work of protecting Yi non-material culture. For example, Yi torch festival was officially listed as the first batch of National Non-material Culture Heritage in 2006 through positive declaration [9].

With all kinds of Yi culture festivals, government and private companies actively developed Yi handicrafts, such as clothing, lacquer ware, silverware etc., and put them into the market.

Propagating Yi traditional culture and Lianshang image in the process of holding Yi folk cultural festivals through newspapers, TV and internet.

40.5 Negative Effects of Holding Cultural Festivals to Develop Yi Folk Resources

As far as the current situation is concerned, the act of displaying traditional culture in the form of festival functions is a promotion in building up a prosperous cultural industry and in strengthening people's feeling of confidence and pride. But there are some problems existed during the process of holding these festivals [10].

We should notice that series of cultural festivals of Liangshan are to be operated by the government, so the development of Yi folk resources seriously depend on the ideas and actions of local government and officials. And then, there is a risk: some officials could pay more attention to greatness and success of cultural festivals; pursue the achievements on politics.

It is quite right that the government has promoted development in different fields by holding cultural festivals, but to most of the poor people, it is of less help, and may has a negative influence. For example, the development of the tour industry may cause the problem of prices' growing. It will make the living in the lowest rank of city more difficult. So we need to pay more attention to the problem of the increasing gap between the city and the rural regions.

If the government doesn't consider the benefit of the Yi people when developing the cultural resources, such developments are not civilized and also don't match the development view of establishing a harmonious society in a new age. We have already had such experiences. In the area where the tour industry has been developed maturely, many opportunities of getting jobs are taken by those who have higher knowledge level; the local people can't compete with them because of low-literacy. As a result, local economy hasn't got a little improvement, so such mode which can only brings benefit to a small part of people should be corrected.

How to plan for the festivals, design the activities in the festivals and make them with great competitive capacity are really difficult questions needed to be further discussed about. For example, Yi people's finery has a higher value on appreciation than that of the usage. Although developing tour souvenir is a good selling point to attract tourists, there are fewer possibilities for our brand to win the competition because of lack of mature techniques and money. In Liangshan, most people live in rural regions; their dresses are sewed by their own. In the city most people don't wear such clothes. Suppose they need, one suit is just enough. In the international ballet costume design competition in 1985, although he design which was made according to Yi people's finery won the first prize in the world, it didn't mean that Yi people's traditional finery can beat into the world market. We should notice that the Yi people's finery culture is a culture for common people. It is a public's culture, not an elite culture.

We have mentioned above that the act of promoting the development of the tour industry by holing series of cultural festivals may cause two problems. First, whether a festival gets success or not depends on its competitive capacity and the demand of the market. The tour industry has presented the trend of the overall

efflorescence. Competition is likely to be more severe than before, so we can't take up the market for a long time if we just rely on the beautiful plans and the executive means of the government. Second, the purpose of the cultural festival is to attract tourists by Yi people's unchanged and special traditions. The purpose of the cultural festival is to attract tourists by Yi people's unchanged and special traditions. In other words, we sell the traditions as goods. There is a saying, "Only the national and the local are the international and the world". It means that only by maintaining the character and personality will get the universal value recognition. The view is reasonable partly, but there is a problem: once the national character developed into something common and universal significance, how to maintain its original personality? When Yi folk customs of Liangshan are displayed to the outside world, the unique folk customs of Yi people will lose their personality gradually.

Apart from this, we should also notice that some traditional cultures that are sacred, serious and with high spiritual value are, to some extent, transmuting to commercial performance just for appreciation. For example, the performance of Bimo culture is the most important performance in all these festivals, but toward the original culture, which is to declare to be the heritage of the world culture, it is a big problem that its spiritual value are losing in such festivals. We know that in Yi people's traditional social life, a Bimo is not only the priest in religious ritual, but also a scholar who understands thoroughly about astronomy, calendar, geography, history, old Yi language and medical science etc. Bimo culture includes and inherits all aspects of the traditional culture of the Yi people. It is Yi people's precious and sacred cultural heritage and spiritual wealth. But if such culture is added up to some common customs, the missing of the spiritual culture will bring disastrous grief to the whole nation. So how to make good use of the traditional cultural resources and how to protect and spread its characteristic will be important topics to investigate and study.

40.6 Conclusion

In the past, the festival activities displaying fully the traditional culture of Yi people are mainly Yi people's New Year and Torch Festival. Now, similar festival activities are appearing profusely and quickly just like the healthy and strong spring bamboo shoot. We should say that these measures of displaying traditional culture in the form of holding cultural festivals not only do well to the development of the society and economy of Liangshan, but also have active effects on the establishment of a diversified and harmonious society. But in the process of exploring and making use of the traditional culture, the government must consider everyone's benefit, particularly the benefits of the local common people. Only in the way, they can reduce the developing cost and succeed in finding out a right way to display Yi traditional culture, develop Liangshan's economy and ensure the sustainable use of Yi folk resources.

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Chapter 41
Applications and Safety of Nanotechnology and Nanomaterials in Sports

Mi Tang, Lei Yang and Hongmei Zhou

Abstract Nanotechnology and Nanomaterials has been applied in sports widely. Such as human movement science, sports halls, facility, equipment etc. The contribution of nanotechnology and nanomaterials for physical culture and sports is significant. However, nanotechnology and nanomaterials maybe cause some potential adverse effects on body and environment. The special biological effect and the safety should not be neglected. Human beings should increase the basic research and epidemiological investigations about environment−health−safety of nanomaterials, to provide accurate exposure levels and the guiding principles of nanoparticles risk, to provide the necessary theoretical basis for establishing the standard of nanomaterials production and work place environment. With the attention of the whole world, the safety problems for nanotechnology and nanomaterials will be solved finally. We can get the most benefit from nanotechnology and nanomaterials, but the least safety trouble.

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41.1 Introduction

In July, 1990, the first international nanotechnology meetings was held in Baltimore, indicated the birth of nanotechnology [1]. Nanotechnology as synthesis technology, research on internal structure and feature of electron, atom and molecule, is used to produce all kinds of material. The material produced by nanotechnology is widely used, with the feature such as low melting point, better specific heat/expansivity/active reaction/diffusibility/strength/flexibility, unusual magnetism, etc. According to the statistics for the nanotechnology products (2003–2004) from ≪Forbes≫, the application for athletic sports become the mainstream. Many products of medical cleanse and clothing textile are used by athletes, nanometer products related to sports almost reach 50 % in total [2]. Widely use of Nanotechnology brings benefit for athletic sports obviously. However, nanotechnology material probably interact with creature, produce material with different chemical and biological features from normal material, that bring adverse impact on environment and lives, threat for human being.

41.2 The Application of Nanotechnology and Nanomaterials in Sports

41.2.1 The Application of Nanotechnology and Nanomaterials in Human Movement Science

For selection of athletes, we can analyze the genome of excellent athletes with the help of nanotechnology, find characteristic gene of excellent athletes for each event, then select suitable athletes, thus improve success ratio of selection and training of athletes. Otherwise, with nano cell separation technology we can separate epidermal cells from saliva or urine, and test DNA sequencing by nanotechnology, then rapid/noninvasive gene selection of athletes have the foundation [3].

In Athletic Training, nano-biological motor play an important role for Muscle contraction, cell locomotion/differentiation, vesicular transport, signals transmission, DNA copy/convolution/compilation. Input man-made red blood cell with oxygen supply nano pump into body of athlete by nanotechnology, the problem that organism is lack of oxygen because of strenuous exercise can be solved, and athletic ability effectively improved. Track man can embed nano pump to improve power in hand, foot, leg, arm, etc. Gymnasts can embed ultra-microcomputer in body to improve stability, flexibility and persistence of movement. Swimmer also can get benefit from the ultra-microcomputer. To improve athletic ability, the characteristic gene of excellent athletes can be embedded into cell by nanotechnology that changes the chemical composition.

In evaluation on athletes function, with genetic engineering and nanometer particle technology, specific proteins of tissue can be tested, as well as research on nosogenesis of motion sickness, judgment of athletic fatigue state, fitness of athletic training and immunity [4].

In athletic nutrition, nutrient component can be made into nano Powders or suspension by nanotechnology for better organism absorbability and nutrient biological activity. Through targeted drug delivery system, Nanomaterials can be used more effectively, athletic nutrient can have higher efficiency for athletic ability, fatigue state and health.

In sport injury restoration, traditional Chinese medicine application is ordinary method. Because of little particle size and strong selective adsorption ability, Nano Chinese medicine has stronger penetrability, more nano Chinese medicine get through skin into blood circulation, better utilization ratio and curative effect got [5]. In the field of Sports Medicine, Nanotechnology is also used for the transplantation and restoration of muscle fibers (athletic injury), the symphysis, etc.

41.2.2 The Application of Nanotechnology and Nanomaterials in Sports Halls/Facility/Equipment

Little resistance in Speed event: Nanotechnology products such as swimming Fast skin, nano particle little resistance coating on water sports boat and ski wax, provide foundation to improve sports achievement.

Little weight and better performance: Nanotechnology has been first applied in tennis/badminton racket/pingpong bat, weight lightened and elasticity/durability/hand feel got better. New Nanotechnology equipment can be suitable for special needs from different people and sports events.

Better elasticity or fastness: in Track and Field Events, nano track made of nano polyurethane has better wear resistance, flame resistance, mildew resistance, longer service life than normal track made of polyurethane; especially good rebound value and compress restoration, benefit for athletes to get excellent achievement. The pole for pole vault is made of nano-carbon fibre material, it improved world record more than 2 m. Nano tennis of Wilson has been the tennis for Davis tennis events, golf ball of Nano Dynamics is permitted in USGA events.

Waterproof and ventilative effect, textile processed by Nanotechnology not only has better drain, but also keeps the features before. It is widely used in ski suit and water events clothing. In the construction of Chinese national gymnasium, nanomaterials used in wall, ground, and glass and so on, the area of nano film for stone ground and wall reached 15,000 m^2, keep out water and avoid moisture accumulation.

Protection and health care, including: joint/muscle anodyne grease, nano silver burn band-aid, ultrathin alloy Fencing underskirt, drip-dry sport shirt. With photocatalysis antimicrobial (such as nano TiO_2, ZnO, SiO_2) and synthetic fiber,

persistence antibacterial fiber can be got; the fiber has antibacterial ability far from traditional antibacterial agent. The sport suit made of the fiber has been produced [6].

41.3 The Safety for Application of Nanotechnology and Nanomaterials in Sports

41.3.1 The Problem of the Safety for the Application of Nanotechnology and Nanomaterials

Most of nano products exposed to human body and environment, there isn't mature evaluation system for the adverse effect on human health and environment from nano products, the danger should not be neglected.

It is thought that nano material probably cause safety problems, mainly as below:

1. When material particle diameter decreased to nanometer level, the material property suddenly change, for example: inert material become catalyst (Pt), stable matter become combustible (Al). This brings hidden trouble to the safety of environment (sports hall/facility).
2. Nanometer particle size is very little, specific surface can reach several thousand in unit volume. With very high surface energy, Nanometer particles are often unstable, easily combine with other atoms, have stronger absorbability and agglomeration ability. The research on epidemiology indicates: ultrafine particles among air have very high sedimentation rate in human body breathing system, particle diameter more little, cleaned by macrophage more difficultly. Ultrafine particles breath into human body properly transfer to other apparatus, and can get through blood brain barrier and blood-eye barrier, accumulate in this place. The sedimentation velocity of nanometer particles is one ten-millionth of micrometer particles, more easily suspend in atmosphere and liquor. So nanometer particles can get into human body or animal body by the ways such as breathing system, skin touch, injection or route of medication, accumulate and transfer in body, cause biological effect, it does harm to cell, lung tissue, liver, nephridial tissue, brain tissue. And after some nanometer matter get into body, nanometer matter properly produce chemical reaction with cells in body, it stimulates cells with immunity, then cause disease and influence body immunity. Otherwise, after a period of time that nanometer matter get into body, body rejection reaction may occur, the possibility that people feel uncomfortable from the rejection reaction should be paid attention to.

However, now there isn't complete unity opinion on the safety of nanometer material. Because of complicated nanometer material, difficulty in test, no hazard evaluation system, and scientific direction not exist with few data published, So the evaluation for the hazard of nanometer material always can't be realized in fact [7].

41.4 The Measures to Improve Safety for Nanotechnology and Nanomaterials Application to Sports

41.4.1 Constitute the Safety Threshold and Standard for Nanometer Material Application

At present, some important international research institution and organization pay attention to research the safety threshold of nanometer material. We should strengthen the basic research on nanometer material environment−health−safety and the investigation on epidemiology, constitute and carry out the safety standard which nanotechnology company must comply with, to ensure the quality of nanometer material. The safety standard for nanometer material application in athletic sports as soon as possible.

41.4.2 Improve the Preciseness for Nanotechnology Development, Strengthen Hazard Precaution

First, manage and control the source of nanotechnology, the misusage should be avoided, safety hidden trouble should be put down. In all links of the nanometer material production chain, nanometer material can't be leaked out, the safe operation criterion and methods on store/transportation should be constituted. By means of improvement of arts and crafts, decreasing the liberation of nanometer material in sports hall and equipment, decreasing the absorption nanometer material absorbed by human body, and giving accurate detailed methods on decreasing the liberation of nanometer material in product instruction.

Secondly, the medicine, food and cosmetics in which nanotechnology applied, must be more seriously tested for safety before sales permission got; All nanometer material component must be listed in component tabulation, and the name "nanometer" must be emphasized with bracket.

As far as the development of Human Movement Science, when nanotechnology is applied to selection of athletes, improvement of physical ability of athletes and medical treatment, it should be ensured that nanotechnology application is Environment friendly and no harm to human body, no threat to ecology and human body health.

As nanotechnology is in progress, the technology and measures for hazard precaution should develop at the same time, it will decrease the adverse effect.

41.4.3 Develop the Technology Which Could Reduce Risks of Nanotechnology and Nanomaterials

The invention and application of a new technology will inevitably also come with certain risks. Nanotechnology is also. While creating value for human, we can develop a sister technology to minimize the potential risks of nanomaterials. Using this technology to produce nanomaterials can give full play to the advantages of nanotechnology, in order to offset the potential hazards of nanotechnology. It can be seen, the cooperation in various fields of new technologies could reduce the unnecessary dangers for the potential risks of nanomaterials.

41.5 Summary

In many ways, nanotechnology has been applied to athletic sports; the contribution for physical culture and sports is significant, the future is very bright. However, the special biological effect and the safety should not be neglected. In short, facing to nanotechnology and nanomaterials safety problem, human beings should abide by the ethical rules and live up to their moral responsibility. In order to make the development of nanotechnology would beneficial both to the development of human beings and promote ecological balance.

We need to increase the basic research and epidemiological investigations about environment−health−safety of nanomaterials, to provide accurate exposure levels and the guiding principles of nanoparticles risk, to provide the necessary theoretical basis for establishing the standard of nanomaterials production and work place environment.

With the attention of the whole world, the safety problems of nanotechnology and nanomaterials will be solved finally. With the safety threshold constitution, safety standard consummated and the preciseness for nanotechnology development, we can get the most benefit from nanotechnology, but the least safety trouble.

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Chapter 42
SO-CAL Based Method for Chinese Sentiment Analysis

Yuqing Miao, Jie Su, Shaobing Liu and Kongling Wu

Abstract To study the problem that the polarity and strength of the sentiment words not in lexicon cannot be calculated and classified effectively by lexicon-based classifiers, the EM-SO algorithm was proposed based on expectation maximization (EM) model for constructing and updating sentiment lexicon. Negative and intensifying components were designed upon semantic orientation calculator (SO-CAL) for capturing the combined effects of appraisal words and their modifiers. Experiments showed that the EM-SO algorithm and designed components outperform SO-CAL for the calculation performance of the polarity and strength of sentiment words on review sets.

Keywords Semantic orientation · Sentiment analysis · Negation · Intensification

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42.1 Introduction

With the rapid development of Internet technology, more and more users consciously or unconsciously have been involved in the process of constructing Internet content. Sentiment Analysis is a research task for identifying, mining and organizing the reviews [1]. Semantic Orientation (SO) is a measurement for text subjective opinions and usually used to capture appraisal factors and their strength for a theme or idea. Semantic Orientation Calculator (SO-CAL) uses the sentiment lexicon with corresponding functional components for sentiment analysis [2, 3].

Text classification method is a main means to solve automatic sentiment extracting problems. However, relying solely on the text corpus containing limited text number for sentiment analysis is not enough since most of the studies ignore the following two problems:

Problem 1: Although the classifiers which are created in a supervised way (such as support machine classifier) have better performance in the areas of knowledge on which they were trained, their performance would be reduced seriously when the same classifier is applied to different domains.

Problem 2: For the calculation of the sentence bias, it is not enough to classify the appraise orientation. From the pragmatic point of view, "not good enough)" may mean "barely acceptable" and "not good" gives an intuitive feeling that "unacceptable". Therefore, we must calculate and classify polarity and strength effectively for capturing the true meaning of reviews.

For the poor performance of previous sentiment analyzing methods on Chinese corpus across domains, this paper presents a sentiment analyzing method based on original SO-CAL and lexicon model. In details, firstly proposing EM-SO for assessing the orientation of new sentiment words based on expectation maximization (EM) algorithm because EM has the advantage on assessing the relevance between words and certain themes. EM-SO assigns a SO value to the word with unknown orientation and adds it to the sentiment vocabulary. Secondly, according to the idea that the combination of words and their modifiers plays a key role on judgment of semantic orientation, design and implement negation and intensification components on the foundation of lexicon and original SO-CAL model.

42.2 Chinese Sentiment Analysis

42.2.1 Orientation Assessing for New Sentiment Words

This paper selected EM algorithm as the basic method for assessing the orientations of sentiment terms because EM algorithm can be applied to assess the relevance between words and certain topic and it is a soft clustering method that an object can belong to several clusters at the same time, but the probability of belonging to each cluster is different. Unlike distance-based method (such as

K-means), EM can construct the correct statistical models of potential data resources and naturally generalize to cluster databases containing both discrete-valued and continuous-valued data [4].

The method for assessing new Chinese sentiment words can be simply stated as: (1) split Chinese sentiment words into smaller semantic units F_j; (2) find out the corresponding SO value of each sub-section F_j respectively in seed word set, every word in seed word set have their relative SO value; (3) use the SO score of each sub-section as known properties of new terms and apply EM-SO method to assess the orientation of new sentiment words.

Assume S_i, S_j as the SO value from -5 to $+5$; D is a new word, if D belongs to cluster i, $i \in [1, 11]$, $Z_i = 1$, else $Z_i = 0$; If the subsection F_j in D belongs to i, $Z_{ij} = 1$, else $Z_{ij} = 0$; t is the iteration time, N is the number of the sub-sections of new sentiment word set.

The means of each cluster i can be calculated as Eq. 42.1:

$$\mu_i^{(t+1)} = \frac{\sum_{i=1}^{11} \left(Z_i^{(t)} S_i + Z_{ij}^{(t)} S_j \right)}{\sum_{i=1}^{11} \left(Z_i^{(t)} + Z_{ij}^{(t)} \right)} \tag{42.1}$$

The covariance matrix of each cluster i as Eq. 42.2:

$$\pi_i^{(t+1)} = \frac{Z_i^{(t)} \left(s_i - \mu_i^{(t+1)} \right) \left(s_i - \mu_i^{(t+1)} \right)'}{\sum_{i=1}^{11} Z_i^{(t)}} \tag{42.2}$$

The formula for updating $Z_i^{(t+1)}$ as Eq. 42.3:

$$Z_i^{(t+1)} = \frac{z_i^{(t)} f_i \left(S_i; \mu_i^{(t+1)}, \pi_i^{(t+1)} \right)}{\pi_i^{(t+1)} z_i^{(t)} f_i \left(S_i; \mu_i^{(t+1)}, \pi_i^{(t+1)} \right)} \tag{42.3}$$

The Gaussian distribution density function for cluster i as Eq. 42.4:

$$f_i(S; \mu_i, \pi_i) = (2z_i)^{-1/2} |\pi_i|^{-1/2} \exp \left\{ -\frac{1}{2} (S_i - \mu_i)^T \right\} \pi_i^{-1} (S_i - \mu_i) \tag{42.4}$$

The log-likelihood of the word as Eq. 42.5:

$$L = \log \sum_{i=1}^{11} z_i f_i (S; \mu_i, \pi_i) \tag{42.5}$$

The EM-SO algorithm is as follow:

Algorithm 42.1 Expectation maximization of semantic orientation (EM-SO)
Input: new sentiment word set: W; seed word set: SW; a stopping tolerance: ε
  Output: the probability of D belonging to cluster i: Z_i

E-step:

For every word in W, split them into smaller semantic units respectively and return N and every S_j related to each F_j;

For every cluster i and word D, initialize Z_i and $Z_{ij} = 1$ or 0 randomly, initialize $t = 0$;

For every cluster i and word D, initialize S_i from -5 to 5 randomly;

For every cluster i and word D, calculate $\mu_i^{(t+1)}$ as Eq. 42.1;

For every cluster i and word D, calculate $\mu_i^{(t+1)}$ as Eq. 42.2;

For every cluster i and word D, update $Z_i^{(t+1)}$ as Eq. 42.3;

M-step:

Calculate $f_i(S; \mu_i, \pi_i)$ and L as Eqs. 42.4 and 42.5. If $f_i(S; \mu_i, \pi_i)$, stops. Else set $t = t + 1$, and go to 4.

42.2.2 Intensification

The intensifier uses the modifier to model in this paper towards the shortcomings of traditional intensification processing methods, every intensifier has a corresponding intensifying percentage, amplifiers are positive whereas downtowners are negative as Table 42.1.

The formula for calculating SO value of the intensifiers:

SO (Intensifier) = *SO₁* (the region being intensified) × *Percentage* (intensifying item in lexicon)

For instance, "despicable" is -3, "a little despicable" is $-3 * (1 - 30\%) = -2.1$, "outstanding" is 5, "extremely outstanding" is $5 * (1 + 70\%) = 8.5$. Intensifier formula is applied recursively from the nearest word which has a SO value: "(good)" is 3, "really very good" is $[3 * (1 + 40\%)] * (1 + 20\%) = 5.04$.

Implementing the calculation of intensifier in the way of percentage can capture the SO values of various intensifying words and the items they modify, this percentage could be applied to adjective, adverb, and verb and so on [5].

Next section, negation processing methods would be combined with the intensifier processing methods as above.

Table 42.1 Intensifier and intensifying percentage

Intensifying word	Intensifying percentage (%)
A little	−30
Slightly	−20
Really	20
Very	40

42.2.3 Negation

The most obvious way to deal with negation is to reverse the polarity of lexicon items near negative words, switch "good" (+3) to "not good" (–3), called switch negation. Whether switch negation is the best way to quantify negation? For instance, "outstanding" is a +5 adjective, negates it to "not outstanding", this negative give us an intuitive feeling far away from "horrible", a –5 adjective "not outstanding" looks better than "not good" (–3) in fact.

This paper applies shift negation to process Chinese negation for the purpose of capturing the intuitive feeling of negations and overcoming the over-quantifying phenomenon of switch negation. Shift negation (polarity shift) that shift the SO value from one polarity to another in a constant, assume constant as 4, a +2 adjective is negated to –2, a –3 adjective shift to a little positive +1. It is difficult to negate a strongly positive word without implying a less positive meaning; negative word becomes a down toner in this case.

The shift negation is calculated as following, if SO_2 is positive, do subtraction, else do addition.

SO (negation) = SO_2 (the region being negated) $\pm$ Constant
In switch negation: not good = $3 \times (-1) = -3$
Not very good = $3 \times (1 + 20\,\%) \times (-1) = -3.6$
In shift negation: not good = $3 - 4 = -1$
Not very good = $3 \times (1 + 20\,\%) - 4 = -0.4$

The switch negation model seems flawed, and shift negation can reflect the pragmatic reality of the negative, would capturing the negative effect better on reviews across domains.

42.3 Assessments and Analysis of Algorithm

The experiment references the research work of Taboada et al. [3]. Experimental setting as following:

Experimental dataset: Review set including total 400 reviews from the e-commerce website, containing eight different categories as books, cars, computers, food, accommodation, movies, music and mobile phone, 50 reviews of each category (25 positive and negative reviews). New Sentiment Word set extracted from How Net sentiment word list randomly.

Indicators of assessment: recognition and comparison percentage (RCP). (1) The RCP of Review refers to the percentage that the number of the review, whose error between SO of system calculation and SO of artificial mark not more than one, divided by the number of artificial marking reviews; (2) The RCP of New Sentiment Word refers to the percentage that the number of the words, error between SO of system calculation and SO of artificial mark not more than 0.5, divided by the number of artificial marking words.

Fig. 42.1 The relation
between RCP and new
sentiment words number
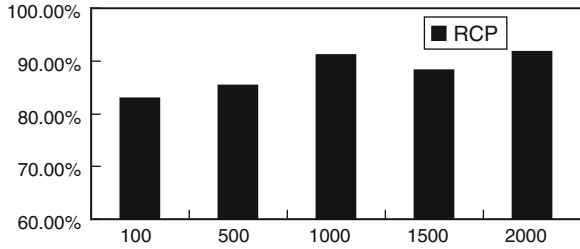
42.3.1 Performance of EM-SO

As Fig. 42.1, the performance of EM-SO does not decrease with the increase of
sentiment words scale. Because the words are extracted randomly from sentiment
vocabulary, after splitting into sub-sections, it is possible that some sub-sections of
word cannot find corresponding SO value from vocabulary. Although EM-SO was
impacted by the nature of sentiment words, overall, this method is effective.

42.3.2 The Effectiveness of Negation and Intensification
          Component

Table 42.2 depicts that the entire performance of negative reviews is better than
the positive, maybe owing to negative words contained in experimental lexicon is
much more numerous than positive words. Except for books and cars, their per-
formance of positive reviews is better and we can assume that it is due to con-
sumers' reviews for products imply much more positive realistic information
needs to be explained to readers, for instance, wireless phone or the foot space of
the rear seat in a car. Accommodation and mobile phone have poorer performance
with a comparison to other domains because lots of practical information in these
two domains is implicit, and lost by SO-CAL + Shift Negation + Intensification.

Table 42.2 Performances of
improved SO-CAL in
different categories of
reviews

Corpus	Positive reviews (%)	Negative reviews (%)	Total (%)
Books	92	88	90
Cars	88	84	86
Computers	92	92	92
Food	76	88	82
Accommodation	68	68	68
Movies	84	84	84
Music	88	92	90
Mobile phone	64	80	72

42.4 Conclusion

Sentiment analysis has been a critical concern in text mining. For existing sentiment methods, the polarity and strength of sentiment words cannot be calculated and classified effectively in sentiment analysis. This paper proposed EM-SO algorithm based on EM for constructing and updating the sentiment lexicon. The algorithm can assess the polarity and strength of sentiment words effectively through constructing correct statistical model of new appraisal words SO value. Moreover, the paper designed negative and intensifying components upon SO-CAL for capturing the combined effects of appraisal words and their modifiers. Experimental corpus extracted from 8 different domains. Experiments showed that EM-SO can assess the polarity and strength of sentiment words and would not be influenced by the scale of sentiment words. And the designed components not only improved the performance of SO-CAL, but also overcome the shortage of general classifiers that cannot calculate effectively on different review sets.

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Chapter 43
Lead Exposure and Health Risk to Human

**Hanzhou Hao, Rugang Zhong, Yongxing Wang, Chenwu Liu
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Abstract Exposure to lead causes a number of diseases, including mild mental retardation resulting from loss of IQ points, as well as increased blood pressure, gastrointestinal effects. Several other disease outcomes have been associated with exposure to lead, but evidence is considered insufficient at this time for a quantitative assessment of their impact on health to be made here. Lead, due to its multiplicity of uses (e.g. leaded petrol, lead in paints, ceramics, food cans, make-up, traditional remedies, batteries), is present in air, dust, soil and water to varying degrees. Each of these media can act as a route of human exposure, through ingestion or inhalation and, to a small degree for organic lead compounds, dermal absorption. Human exposure can be assessed directly, through body burden measurements (lead in blood, teeth or bone) or indirectly, by measuring levels of lead in the environment (air, dust, food or water).

Keywords Lead · Exposure · Human · Health risk

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43.1 Lead Hazards to Human Health

Human exposure and effects of lead in humans were reviewed by the International Panel of Chemical Safety in 1995 [1]. According to the review, in humans, lead can result in a wide range of biological effects depending upon the level and duration of exposure. Effects at the subcellular level, as well as effects on the overall functioning of the body, have been noted and range from inhibition of enzymes to the production of marked morphological changes and even death in some cases. Such changes occur over a broad range of doses. Due to developmental, neurological, metabolic and behavioural reasons, children are more vulnerable to the effects of lead exposure than adults.

Human exposure to low levels of environmental lead is inevitable, since lead is ubiquitous and one of the most widely dispersed contaminants. Among the population groups, children are the subpopulation of concern for lead exposure. They are exposed to more lead than adults due to their behaviors such as playing on the floor or outdoors, sucking on objects, and hand-to-mouth activity, which is normal developmental activity. The high gastrointestinal absorption of lead of children also causes higher uptake of lead to the system, which may lead to irreversible damage to a susceptible nervous system during its developing stage. Although classical lead poisoning is a rare occurrence worldwide these days, developmental effects in children caused by low level exposure to lead are well acknowledged.

43.2 Lead Hazards to Human Health

Human exposure and effects of lead in humans were reviewed by the International Panel of Chemical Safety in 1995 [1]. According to the review, in humans, lead can result in a wide range of biological effects depending upon the level and duration of exposure. Effects at the subcellular level, as well as effects on the overall functioning of the body, have been noted and range from inhibition of enzymes to the production of marked morphological changes and even death in some cases. Such changes occur over a broad range of doses. Due to developmental, neurological, metabolic and behavioural reasons, children are more vulnerable to the effects of lead exposure than adults.

Lead is the most studied metal and knowledge about adverse health effects of lead, especially in high concentration, are well known but the effects of low concentration long term exposure are still under study, especially during the last decade.

Lead binds to the sulphydryl (SH) groups of proteins, but the basic mechanism of the lead toxicity is not yet established. Increasingly more is known about molecular effects of lead. Among other effects lead displaces calcium and zinc inside proteins, has an affinity for cell membrane, interferes with mitochondrial oxidative phosphorylation and impairs activity of calcium dependent intracellular messengers and protein kinase C. Lead may inhibit DNA repair and exert

genotoxic effects and affects sodium, potassium and calcium ATP-ase. Therefore, the toxic effects of lead may involve several organ systems including: nervous system (central and peripheral), cardiovascular, haem biosynthesis, kidney, reproduction, the immune system, alimentary systems, and hepatic system.

Health effects induced by environmental lead exposure (i.e. at lower doses of lead exposure) are associated with effects on nervous system, effects on heam biosynthesis and effects on blood pressure.

Effects on nervous system—Both cross-sectional and prospective study were focused mostly on neuropsychological development in children and they confirmed that children represent a group being particularly at risk, especially from neurobehavioral effects.

Effects on nervous systems include a constellation of effects like decreases in IQ, poor school performance, problems with impulse control and attention deficits. Meta-analyses of the studies have concluded that doubling Pb–B form 10 to 20 than 10 µg/dl is associated with an average loss of IQ of 1–3 points. The relationship between IQ and lead exposure is very strongly linked even at low level of lead exposure.

More recent studies of Lanphear et al. [2] showed that cognitive deficits are associated with Pb–B concentration below 5 µg/dL. Social and emotional dysfunctions and academic performance deficits are correlated with increased lead exposure. Prospective studies support hypothesis that changes are irreversible or at least long lasting up to adulthood. Different investigators focused on different behaviours e.g. tests of fine motor skills, language, memory and learning, attention, and executive functioning, so that no investigation assessed a complete spectrum of neuropsychological functions.

A recent study of Nevin [3] demonstrates that (besides reduction in IQ) widespread exposure to lead is likely to have profound implications for a wide array of undesirable social behaviour. The neurotoxicity of lead is of particular concern, because evidence from prospective longitudinal studies has shown that neurobehavioral effects, such as impaired academic performance and deficits in motor skills, may persist even after Pb–B levels have returned to normal. Although no threshold level for these effects has been established, the available evidence suggests that lead toxicity may occur at B–Pb levels of 10–15 µg/dl or possibly less [4].

Effects on blood pressure—Effects of lead on blood pressure and kidney are evident at high concentration in occupational settings and animal studies, but less evident in the general population. There are a few studies on general population dealing with effects of lead on blood pressure.

Cancer—The evidence for carcinogenicity of lead and several inorganic lead compounds in humans is inconclusive. Classification of IARC is class 2B: 'The agent (mixture) is possibly carcinogenic to humans. The exposure circumstance entails exposures that are possibly carcinogenic to humans' [5]. The US Department of Health and Human Services has determined that lead and lead compounds are reasonably anticipated to be human carcinogens based on limited evidence from studies in humans and sufficient evidence from animal studies, and the US EPA has determined that lead is a probable human carcinogen.

43.3 Human Exposure

43.3.1 Lead in the Diet

The daily intakes vary by country, and the sources of lead will wary with the diet. In the EU, fruits and vegetables, cereals and bakery wares and beverages are major sources of lead, together supplying most of the intake [6]. In Japan, the daily intake of lead per person in the year 2004 is estimated at 26.8 µg Pb/person/day (Japan submission, 2005). The main contribution came from rice (25 %), other vegetables and seaweeds (20 %), seasonings and bewerages (18 %) and fish and shellfish (4 %) [7]. The average dietary lead intake of an adult Finnish person is estimated to be 17 µg Pb/day. The sources of dietary lead intake in the Finnish population are fish and canned fish (23 % of total dietary lead intake), root crops, vegetables, fruits and berries (17 %), grain and grain products (15 %), juices and other drinks (12 %), milk and milk products (11 %), meat and meat products (9 %), alcohol (7 %) and other food sources (6 %).

43.3.2 Ingestion of Soil and Dust

For infants and young children, lead in dust and soil often constitutes a major exposure pathway and this has been one of the main concerns regarding the exposure of the general population. The intake of lead is influenced by the age and behavioural characteristics of the child and the bioavailability of lead in the source material. Dust (in homes as well as in streets) and soil may contain high lead concentrations and are significant sources of exposure of children. In particular, dust in homes painted with paint containing lead pigment, and soil around lead-emitting industries may contain very high lead levels. The maximum uptake in infants seems to occur around 2 years of age, and is higher in the summer than in the winter. The hand-to-mouth behaviour of children is important for lead intake [2], and even small babies, unable of grasping objects, receive much of their lead exposure from mouthing their own fingers.

43.3.3 Lead Intake via Inhalation of Ambient Air

Airborne lead may contribute significantly to exposure, depending upon factors such as use of tobacco, occupation, proximity to motorways, lead smelters, etc., and leisure activities (e.g., arts and crafts, firearm target practice). In countries where leaded gasoline is still used, inhalation of emissions is a major lead exposure pathway. In particular proximity to heavily trafficked roads may influence airborne lead exposure.

43.3.4 Lead Intake via Drinking Water

With distribution of drinking water, the water may be contaminated with lead from lead pipes, lead-soldered copper-pipes, lead-containing brass-joints for plastic pipes, or from other parts of the water system. In particular, acidic and soft water has the potential for dissolving lead. The level is then dependent upon the time during which the water did dwell in the pipe. The lead content of drinking water may vary considerably. Hence, intakes of about 1 µg/day or less have been reported from Sweden, whereas a study in Hamburg, Germany, in an area where lead pipes are common in old plumbing systems, showed a large variation in the lead concentration in tap water: <5–330 µg/L [8]. Among the samples a mean of 15 µg/L was found. High concentrations of lead in tap water are of special concern for bottle-fed babies when formula feeding is prepared from the tap water.

43.4 Reference Levels

Provisional tolerable weekly intake—The joint FAO/WHO Expert Committee on Food Additives has established a provisional tolerable weekly intake (PTWI) of 25 µg/kg body weight (equivalent to 3.5 µg/kg of body weight per day) [9]. The Committee considered the results of a quantitative risk assessment and concluded that the concentrations of lead found currently in food would have negligible effects on the neurobehavioural development of infants and children. The Committee noted, however, that examples of foods with high levels of lead remain in commerce.

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Chapter 44
Empirical Analysis of Relationship Between Development of Public Libraries and Economic Growth

Wenwen Gao and Xiongfeng Pan

Abstract This paper employs the econometrical Granger Causality of Causality test and regression analysis to analyze the relationship between fiscal expenditure on public libraries and GDP on the yearly time series data from 1979 to 2008 in China. The results show that: there is apparent two-way causality between development of the public library and economic growth, during 1979–2008, the contribution rate of public library financial investment to the economic growth in China is about 20.84 %, and this indicates that the development of public library promotes economic growth to a certain extent.

Keywords Economic growth · Public library · Fiscal expenditure · Causality test · Regression analysis

44.1 Introduction

The purpose of this paper is to make an objective evaluation of the relationship between public library development and economic growth. At present, government of China has made big decision to promote cultural development and prosperity. Public library plays an important role in culture construction. Economic growth and cultural development promotes each other. Therefore, it is of important value to find the relationship between public library development and economic growth [1]. In this paper, the econometrics Causality test of Granger Causality and regression analysis are used to find the relationship between economic growth and

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Table 44.1 GDP and financial investment of public library

Years	GDP (units: million Yuan RMB)	Public library investment (units: ten thousand Yuan RMB)	Years	GDP (units: million Yuan RMB)	Public library investment (units: ten thousand Yuan RMB)
1979	4038.6	5,040	1994	48197.9	60,639
1980	4545.6	5,476	1995	60793.7	65,829
1981	4891.6	6,145	1996	71176.6	76,582
1982	5323.4	7,252	1997	78973.0	93,177
1983	5962.7	9,121	1998	84402.3	107,521
1984	7208.1	11,848	1999	89677.1	115,830
1985	9016.0	15,272	2000	99214.6	139,321
1986	10275.2	19,070	2001	109655.2	152,732
1987	12058.6	20,608	2002	120332.7	176,882
1988	15042.8	23,909	2003	135822.8	205,252
1989	16992.3	27,257	2004	159878.3	238,141
1990	18667.8	29,292	2005	184937.4	277,848
1991	21781.5	32,593	2006	216314.4	319,479
1992	26923.5	39,010	2007	265810.3	395,441
1993	35333.9	42,975	2008	314045.4	477,616

public library development. Public library belongs to welfare institution, it is difficult to evaluate its output, so therefore, this article selects financial investment as public library development indicator, and chooses the most commonly used GDP as economic growth index. Specific data are shown in Table 44.1.

44.2 Correlation Analysis and Causality Test Between Public Library Development and Economic Growth

Correlation analysis includes finding out whether there is dependent relationship between variables and their relation degree and the effectiveness. According to the statistics of GDP and public library financial investment from 1979 to 2008 we work out the correlation coefficient between the two variables is 0.997. It shows a closely interdependent relationship between public library development and economic growth.

Correlation analysis shows that public library development and economic growth have closely positive correlation. Whether there is clear relationship between them? Is economic growth promotes the development of public library, or public library's development promotes the economic growth, or is there a two-way causality? We adopt Granger Causality of Causality test to estimate the causality between public library investment and economic growth [2]. The results are shown in Table 44.2.

Table 44.2 Granger causality test results

Original hypothesis	Observed quantity	F-statistics	Significance level
Financial investment change of public library is not the reason for GDP variation	28	7.8565	0.0025
GDP change is not the reason for public library financial investment variation		6.4981	0.0058

The results show that the first original hypothesis F-statistics value, through significant inspection, is big enough to deny the hypothesis "financial investment change of public library is not the reason for GDP variation". The second hypothesis F-statistics value, through significant inspection, is also big enough to deny the hypothesis "GDP change is not the reason for public library financial investment variation". So, we get the conclusion that increase or decrease of public library financial investment will inevitably lead to the increase or decrease of GDP, and increase or decrease of GDP will inevitably cause increase or decrease of financial input in public library. There is a two-way causality between public library development and economic growth.

44.3 Simple Linear Regression Analysis of Public Library Development and Economic Growth

Regression analysis is a statistical analysis method to find out the influence of the change of a variable or a set of variables (the independent variable) to the other variable (the dependent variable). In order to eliminate the influence of variance and reflect the relationship between public library financial investment and economic growth better, we take logarithms to the public library financial investment and GDP and take differential analysis before the regression analysis. We use $\Delta \log(GDP)$ to represent GDP growth rate and $\Delta \log(TSG)$ to represent the growth rate of public library financial input [3].

The independent variable is public library financial investment growth rate and the dependent variable is GDP growth, the result of simple linear regression analysis according to the data of 1979–2008 is shown in Table 44.3. The coefficient of multiple correlations is just 0.1725 in simple linear regression model. The variances explain ability is 17.25 %. DW statistical value is 0.7871 and has a large gap with 2. It means there are more serious residual sequence related problems in regression model.

Figure 44.1 is a residual trend chart of public library financial investment growth rate and GDP growth under simple linear regression model. It shows simple linear regression model is difficult to implement the historical data fitting,

Table 44.3 Simple linear regression analysis of public library financial investment growth rate and GDP growth

Explained variable	Regression coefficient	Std error	T-statistics	Significance level
C	0.0869	0.0287	3.0258	0.0054
$\Delta\log(tsg)$	0.4026		2.3726	0.025
Evaluation index	*Number value*	*Evaluation index*		*Number value*
R-squared	0.1725	Mean dependent var		0.1501
Adjusted R-squared	0.1419	S.D. dependent var		0.0627
S.E. of regression	0.0581	Akaike info criterion		−2.7885
Sum squared resid	0.0910	Schwarz criterion		−2.6942
Log likelihood	42.4334	F-statistics		5.6292
Durbin-Watson stat	0.7871	Significance level		0.0250

and the residue of the estimate of the change is not frequently symbol, but, there appeared some of the negative after several positive. There is high positive autocorrelation of residual [4]. Therefore, inner dependent relationship exists between public library financial investment growth and GDP growth rate, and is not a simple linear regression relation, thus we cannot use simple linear regression model to explain inner dependent relationship between public library investment growth rate and GDP growth rate.

44.4 Generalized Differential Regression Analysis of Public Library Development and Economic Growth

In order to fully reveal the relationship between public library investment and economic growth, we must eliminate sequence autocorrelation. We use the general finite difference method to maintain the independence of the residual sequence , so there is no effect of correlation. The EView method is to add AR (1) to dispel the
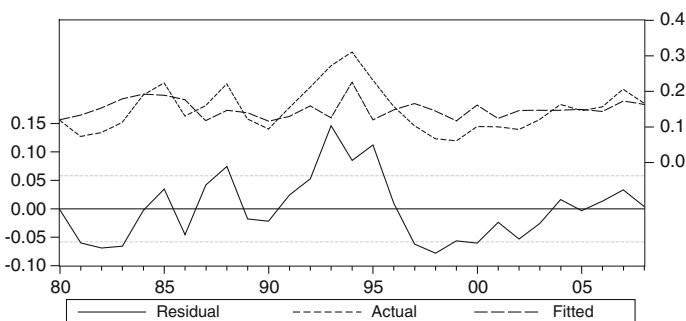
Fig. 44.1 Simple linear regression of residual trend of public library financial investment growth rate and GDP growth

Table 44.4 Regression analysis of generalized difference of public library financial investment growth rate and GDP growth

Explained variable	Regression coefficient	Std error	T-statistics	Significance level
C	0.1199	0.0326	3.6856	0.0011
$\Delta \log(tsg)$	0.2084	0.1127	1.8484	0.0764
AR(1)	0.6745	0.1478	4.5637	0.0001

Evaluation index	Number value	Evaluation index	Number value
R-squated	0.5247	Mean dependent var	0.1513
Adjusted R-squated	0.4866	S.D. dependent var	0.0635
S.E. of regression	0.0455	Akaike info criterion	−3.2411
Sum squared resid	0.0518	Schwarz criterion	−3.0983
Log likelihood	48.3747	F-statistics	13.7975
Durbin-Watson stat	1.4863	Significance level	0.0001

first-order autocorrelation in the initial equation, add AR (2) to dispel the first-order one, add AR (3) to the third-order one, by analogy [5].

To add AR (1) to the original regression model of China's public library financial investment growth rate and GDP growth, we get the result of generalized difference regression as shown in Table 44.4. DW value rises from 0.7871 to 1.4863, and eliminates the positive autocorrelation. The complex correlation coefficient increases from 0.1725 to 0.5247. F-statistics value has also improved of significant standard. The constant item, explain variables and AR (1) t-statistics value in the regression model are all consistent through the significant inspection, and their regression coefficients are not zero.

Figure 44.2 is the generalized residual trend chart of simple linear regression of public library financial investment growth and GDP growth Fig. 44.2 shows, though the generalized differential transform, the regression model not only effectively eliminate the related problems of the residual sequence, and fitting effect of the historical data is also very ideal.
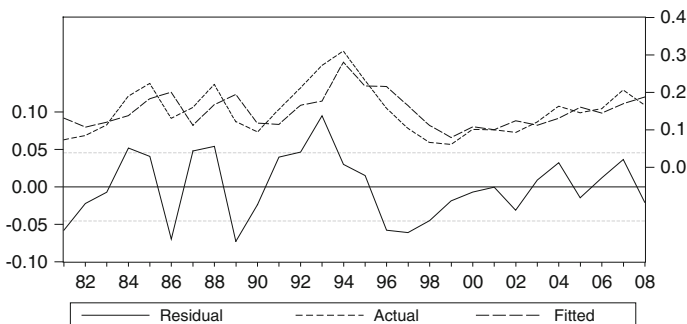
Fig. 44.2 Generalized difference regression of residual trend of public library financial investment growth rate and GDP growth

Thus, we can come to the generalized differential regression model of public library financial investment growth and GDP growth:

$$\Delta \log(GDP)(19792008)$$
$$= 0.1199 + 0.2084 \Delta \log(TSG) + [AR(1) = 0.6745] \tag{44.1}$$

The return coefficient of the independent variables in the model is 0.2084. It means every 1 % increase of $\Delta \log(TSG)$ will increase 0.2084 % of $\Delta \log(GDP)$. It shows the contribution rate of library development to economic growth is around 20.84 % in 1979–2008 in China.

44.5 Conclusion

Through the above analysis, we can see there is not a simple linear relationship between public library development and economic growth. There are very obvious two-way causality relationships. Every 1 % increase of $\Delta \log(TSG)$ will increase $\Delta \log(GDP)$ by 0.2084 %. Public library development promotes the economic growth to a certain extent, but its role in promoting and not very apparent. At present, government pays more attention to the development of public library, but financial investment shows deficiency with economic growth and national information demand. Therefore, the government should establish an institutionalized input mechanism which has legal protection [6]. The government should put the funds investment to budget and make funds project legal. Funding increase rate should adapt to the financial income increase. At the same time public library should seek social donation and find social forces to the public library cause. Public library should strengthen their ability to provide various services from providing information and traditional literature retrieval to consulting services and knowledge services. So, public library can make more contribution to the national economy and social development.

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Chapter 45
Research on Dynamic Pricing Based on Rationing for Two Deterministic Demand Classes

Yongsheng Cheng

Abstract It is discussed dynamic price discounts integrated with rationing policy for two demand classes in a deterministic environment. The two classes are partial backlogging of unfilled demand, which differ based on their sense to discounts and their willingness to incur delay in fulfilment of their demands. The firm either fills demand or offers a linear price discount to induce the demand to wait for fulfillment from the next reorder. Rationing strategy is carried out with offering discount for encouraging backlog. After analyzing the income and costs of the integrated-strategy, a serial equation for optimality is presented. Due to the cumbersome algorithm of the equation, several inherit rules are proposed to simplify calculation. Then the results are compared to EOQ policy, to a policy that only rations inventory without dynamic discounting and to a policy that only provides discounts. Finally numerical test proves the effectiveness of integration policy.

Keywords Discount · Rationing · Integration

45.1 Introduction

In the new economic era the consumer presents the character of diversify dynamics state and personality and modern information technologies and global competition have caused changes in business practices such as differentiate customer classes or dynamic pricing. For inventory systems with distinct customer classes, stock

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rationing is a well-known tool by maintaining threshold inventory, when on hand stock reaches threshold some demands are backordered. While delayed delivery may cause lost of sales, the firm should offer price discounts to demand that is not served immediately from stock. Unfilled demand may then wait for later fulfillment. The probability of this occurring is influenced by the discount. With these considerations, this paper study inventory system with two customer classes implementing rationing policy integrated with discount pricing from both view of supply and demand. On one hand, supply adopts inventory rationing strategy to satisfy two class customers with different character for accepting backorder by means of threshold stocks to ensure fulfillment rate for high priority customer class. On another hand, demand is interfered by offering discount price to encourage customers to accept delayed delivery avoiding lost of sales to improve service rate. This article presents a comprehensive model to integrate these two decisions for two determined demand class. We view the problem as fundamental to understanding how rationing and pricing can be used to address two class demand.

45.2 Literature Review

Our research is related to work in inventory rationing, incentives for customer retention, and dynamic pricing. At present, the research of inventory rationing and revenue management dynamic pricing is ample, while they have been carried out independently. Literature related to inventory rationing concern fixed price seen as environmental parameters while research about dynamic pricing seldom involved demand classification and stocks rationing. There are rare studies contribute to combination of inventory allocation and price differentiation.

The research in the area of rationing was initiated in the 1960s. In a periodic review setting, Veinott [1] introduces the use of critical levels for providing different service levels to different demand classes. Nahmias and Demmy [2] consider (s, S) policy under static rationing with two demand classes. They derive the expected number of backorders for both customer classes by assuming all demands occur at the end of the period. Teunter et al. [3] apply a time-continuous approach for dynamic rationing in a backordering inventory systems with two demand classes, deriving a set of formulae that determine the optimal rationing level for any possible value of the remaining time [4]. Moreover, they show that the cost parameters can be captured in a single relevant dimension, which allows us to present the optimal rationing levels in charts and lookup tables that are easy to implement. Mehmet Murat Fadiloglu [5] proposes two new bounds on the optimum dynamic rationing policy that enables us to tell how much of the potential gain they proposed dynamic policy realizes. Then discusses the conditions under which stock rationing–both dynamic and static is beneficial and assess the value of the dynamic policy.

Studies of pricing strategies in revenue management were at first motivated by research on production-pricing problems where finite periods were considered. Gallego and van Ryzin [6] formulated production-pricing problems into a comprehensive pricing model. They applied the dynamic pricing strategy to yield management problems and derived the optimal policy in closed-form when demand functions are exponential. For general demand functions, they analyzed a deterministic version of the model and obtained an upper bound for the optimal revenue. Feng and Gallego [7] studied a two-price, continuous-time revenue management model with general demand functions and developed an optimal pricing policy in closed form. Feng and Xiao [8] further proposed a continuous-time, dynamic pricing model which allows reversible price changes. They showed that the price reversal policy leads to an improvement of revenue and profit.

Different from these researches, the current paper commits to the literature by introducing the deterministic, two classes demand inventory system pricing and allocation problem with partial backlogging based on dynamic discounts. It provides income and cost functions to analysis rationing policy with consideration of discount incentive, and then draws optimal solution equations. Due to hard calculation and solving, several heuristic algorithms are brought forward to simplify the computing. It compares the results to EOQ policy, and a policy that only rations inventory without dynamic discounting and to a policy that only provides discounts, and then study numerical test to demonstrate effectiveness of the integrated model.

45.3 Model and Solution

45.3.1 Model Formulation

We consider an inventory system facing two class demand which is determined and price-dependent constant rate. Due to restricted stocks, the firm offers discount Z to persuade customer accept backordering. When stock out, only a portion demand reserves with the proportion dependent on the price, while others lost. The customer arrival rate for class i is (i = 1, 2, the same below). Two customer classes are distinguished by parameters i and that characterize the customers' willingness to wait for delayed delivery of their demand and sensitivity to price. For simplicity we presume backlogged rate is $\gamma_i = \alpha_i + \beta_i Z$ where initial rate $\alpha_1 \neq \alpha_2$, marginal efficiency $\beta_1 \neq \beta_2$ (and may be estimated either through econometric models using historical data on the likelihood that customers wait for service for alternate discounts, or if such data are not available, through questionnaire survey or interaction with current customers to understand how their behavior may change based on different discounts). We distinguish this work from previous partial backlogging (PBO) models by allowing the fraction of demand backlogged, to depend on discount rate, z, given to backlogged demand other than waiting time or backlogging. The discount rate is per unit per unit time the demand is backlogged, implying that the total discount received for a unit of demand that is

backlogged at time t and filled at time T is z. And other from reference, this paper presumes selling price and discount Z is same for two class demands which implies all customers could come from single channel in determined environment while reference presumes different selling price and discount serves to multi-demand class signifying different channel in order to implement price discrimination in stochastic environment. Besides, it is easier to operate based on linear discount model proportional to remaining time rather than fixed amount from managerial perspective.

Inventory is replenished according to EOQ-like policy that operates as follows. At the start of a given period, replenishment with quantity Q arrives. Backlog last period is fulfilled first. Then demands arrived from both classes are filled on a FCFS basis as long as the on-hand inventory level is greater than or equal to critical level. Once the on-hand inventory level falls below critical level, demand of low priority (say, class 1) is backlogged (i.e., no longer filled) while another class demand continues to be filled as long as inventory is available. The firm offers a discount to encourage the customer whose order is not filled immediately to agree to wait for fulfilment in the next period. For simplicity, we assume that each customer orders exactly one unit. Owing to received discount proportional to delay time, price is dynamic.

Notation:

T   Cycle time between orders,
Q   Reorders quantity every time,
H   Holding cost per unit per unit time,
K   Setup cost per order,
P   Selling price,
C   Production/acquisition cost per unit,
D   Lost demand cost per unit,
λ_i Demand arrival rate for class i,
Z   Discount rate per unit per unit time offered to demand unfulfilled immediately,
γ_i Fraction of demand from class i backordered, $\gamma_i = \alpha_i + \beta_i Z$, $\alpha_i \geq 0, \beta_i > 0$, $0 < \gamma_i \leq 1$, so $0 \leq Z \leq \min\left[\frac{1-\alpha_1}{\beta_1}, \frac{1-\alpha_2}{\beta_2}\right]$
ti: Run-out time for class i, when $t > t_i$, cease to fill demand from class i, $t_i \leq T$,
Si   Base stock level, remainder inventory after paying off backlog at the beginning of period,
Bi   Total quantity backorder in a replenishment cycle,
Li   Total quantity lost of sale in a replenishment cycle,
π Profit per time,
Π_T Profit in a replenishment cycle,
C_B Total effective backorder cost in a replenishment cycle,
C_L Total lost sales cost in a replenishment cycle,
C_h Total holding cost in a replenishment cycle

45.3.2 Revenue and Cost

The problem for the firm is to determine the cycle time between orders, T, the allocation of the inventory to the demand, ti, and the discounts to offer, Z to maximize the profit per unit time. Every time the order quantity is Q, and backlog last period is paid off firstly, with bases tock level remainder.

In a period, the base-stock level is $S = \sum_{i=1}^{2} \lambda_i t_i$. Backlog in a period is $B = \sum_{i=1}^{2} \lambda_i (T - t_i)\gamma_i = \sum_{i=1}^{2} \lambda_i (T - t_i)(\alpha_i + \beta_i Z)$. The total quantity lost of sale in a replenishment cycle is $L = \sum_{i=1}^{2} \lambda_i (T - t_i)(1 - \gamma_i) = \sum_{i=1}^{2} \lambda_i (T - t_i)(1 - \alpha_i - \beta_i Z)$.

The profit in a replenishment cycle is:

$$\Pi_T = (S + B)(P - c) \tag{45.1}$$

The total effective backorder cost due to discount is:

$$C_B = \sum_{i=1}^{2} \int_{ti}^{T} \lambda_i \gamma_i Z(T - t)dt = \sum_{i=1}^{2} \frac{1}{2}\lambda_i \gamma_i Z(T - t_i)^2$$
$$= \sum_{i=1}^{2} \frac{1}{2}\lambda_i Z(\alpha_i + \beta_i Z)(T - t_i)^2 \tag{45.2}$$

The total lost sales cost is:

$$C_L = \sum_{i=1}^{2} d\lambda_i (1 - \gamma_i)(T - t_i) = \sum_{i=1}^{2} d\lambda_i (1 - \alpha_i - \beta_i Z)(T - t_i) \tag{45.3}$$

The total holding cost is:

$$C_h = \sum_{i=1}^{2} \frac{1}{2}h\lambda_i t_i^2 \tag{45.4}$$

The profit per unit time is therefore:

$$\max_{T, ti, Z} \pi = \frac{1}{T}(\Pi_T - C_B - C_L - C_h - K) \tag{45.5}$$

45.3.3 Exact Solution

Taking the second derivative of π with respect to Z gives $\frac{\partial^2 \pi}{\partial Z^2} = -\lambda_i \beta_i \frac{(T-t_i)^2}{T} < 0$, there must exist unique Z maximizing π.

To solve the problem, taking the derivative of π with respect to Z, t_i, T and setting it equal to zero. This gives:

$$Z = \min \left[\frac{(d + P - c) \sum\limits_{i=1}^{2} \lambda_i \beta_i (T - t_i) - \sum\limits_{i=1}^{2} \frac{1}{2} \lambda_i \alpha_i (T - t_i)^2}{\sum\limits_{i=1}^{2} \lambda_i \beta_i (T - t_i)^2}, \frac{1 - \alpha_1}{\beta_1}, \frac{1 - \alpha_2}{\beta_2} \right]$$

(45.6)

$$t_i = \frac{Z(\alpha_i + \beta_i Z)T + (1 - \alpha_i - \beta_i Z)(d + P - c)}{Z(\alpha_i + \beta_i Z) + h}$$

(45.7)

$$T^2 \sum_{i=1}^{2} \frac{1}{2} \lambda_i Z(\alpha_i + \beta_i Z)$$

$$= K + \sum_{i=1}^{2} (\frac{1}{2} h \lambda_i t_i^2 - \lambda_i t_i (1 - \alpha_i - \beta_i Z)(d + P - c) \frac{1}{2} \lambda_i Z(\alpha_i + \beta_i Z) t_i^2)$$

(45.8)

Solve the nonlinear equation of 4 unknowns (45.6)–(45.8) can get the optimal exact solution.

45.3.4 Heuristic Rules

Solving the nonlinear equation of 4 unknowns is too hard to get analytic solutions and should seek help from calculation software. Heuristic rules can benefit calculation reduction.

Only when the two demand classes' initial rates α_1, α_2 are close to 1 it would result in $t_1, t_2 < T$. So in practice, there is one or more run-out time ti of demand classes equals to T, that means at lease one class demand shouldn't incurs stockout.

Then, when the inventory is not enough to meet all the demands, which demand class, should be satisfied preferentially? Or which class of customers is high ranked?

If the first-class customers are satisfied preferentially, it would increase profit per time with $\pi_1 = (1 + \gamma_2)(P - c) - (1 - \gamma_2)d$. But if the second class demand is met solely, the increased profit is $\pi_2 = (1 + \gamma_1)(P - c) - (1 - \gamma_1)d$.

If and only if $\gamma_2 > \gamma_1$, $\pi_1 - \pi_2 = (\gamma_2 - \gamma_1)(P - c + d) > 0$. So, when stock is not enough to fill all demand, the priority should be given to the demand class with lower initial backorder rate.

Therefore, we can get:

If $\alpha_2 < \alpha_1$, $\beta_2 < \beta_1$, the second-class customers should be the preferred customers. While $\alpha_2 < \alpha_1$, $\beta_2 < \beta_1$, and the offered discount $Z < \frac{\alpha_2 - \alpha_1}{\beta_1 - \beta_2}$, then the preferred customer is the second-class customer. While, when the discount $Z > \frac{\alpha_2 - \alpha_1}{\beta_1 - \beta_2}$, the first-class customers should be the preferred customer, and if $Z = \frac{\alpha_2 - \alpha_1}{\beta_1 - \beta_2}$, it has no necessary to distinguish demand classes, and fulfillmend should be operate under FCFS terms.

For the sake of convenience, just setting the second-class customers as the preferred customers, then $t_2 = T$.

Rule 1 when the stocks run out, just replenish it in time, namely the demand of priority customers class are fully satisfied and will not be out of stock. It assumes second-class customers to be preferential, then $t_2 = T$.

Therefore we can get the solution of the model:

$$Z = \min\left[\frac{d + P - c}{T - t_1} - \frac{\alpha_1}{2\beta_1}, \frac{1 - \alpha_1}{\beta_1}\right] \tag{45.9}$$

$$t_1 = \frac{Z(\alpha_1 + \beta_1 Z)T + (1 - \alpha_1 - \beta_1 Z)(d + P - c)}{Z_1(\alpha_1 + \beta_1 Z) + h} \tag{45.10}$$

$$T^2[\lambda_1 Z(\alpha_1 + \beta_1 Z) + h\lambda_2] = 2K + h\lambda_1 t_1^2 - 2\lambda_1 t_1(1 - \alpha_1 - \beta_1 Z)(d + P - c) + \lambda_1 Z(\alpha_1 + \beta_1 Z)t_1^2 \tag{45.11}$$

Solving the calculation through Eqs. (45.9)–(45.11) is still a huge project. We might as well set the order cycle as a certain value like EOQ environment. For the reason of that order cycle is harmonic to sales rhythm or subject to transportation scale or other factors, it is system exogenous variable.

Given the discount Z, backorder rate γ and failure rate $1 - \gamma$, we can get the shortage cost as $l = (1 - \gamma)(d + P - c)$. With the increase of Z, the failure rate and shortage cost will decline, while the T will increase. The shortage cost comprises the loss of sales failure $(P - c)$ and the later efforts cost d to strive to maintain market share. Adjusting the economic order cycle as $T^a = \sqrt{\frac{2K}{(\lambda_1 + \lambda_2)}}\sqrt{\frac{1}{h} + \frac{1}{l}}$, where l is the shortage cost.

Rule 2 setting the adjusted order cycle (which allows stockout in the like-EOQ environment) as lower limit to replenishment cycle: $T^a \geq \sqrt{\frac{2K}{(\lambda_1 + \lambda_2)}}\sqrt{\frac{1}{h} + \frac{1}{l_0}}$ where $l_0 = (1 - \alpha_1)(d + P - c)$.

Due to backorder, inventory could maintain longer time to fill demand. We can apply a simple iterative procedure, which solves the pricing problem and the cycle problems in a sequential manner. Therefore, we set the order cycle of the EOQ where stockout is allowed as the lower limit in order to find out the optimum cycle through iterative procedure.

Rule 3 the following algorithm applies:

Let $T = \sqrt{\frac{2K}{(\lambda_1+\lambda_2)}}\sqrt{\frac{1}{h}+\frac{1}{l_0}}$, solve Eqs. (45.9), (45.10), get the Profit per unit time $\pi^{(1)}$.

When T = T+1, solve Eqs. (45.9), (45.10), calculate $\pi^{(2)}$.

If $\pi^{(2)} \geq \pi^{(1)}$, let the $\pi^{(1)} = \pi^{(2)}$, and return step 2

Otherwise, stop the calculation. The calculated T is the optimum cycle, the solution of Z and t1 is the optimal solution, and $t_2 = T$.

45.4 Example

There are four basic strategies from the view of inventory allocation and pricing discount which contains no discount and no rationing policy, discount only (DO) policy, rationing only (RO) policy and discount integrated rationing (DIR) policy. Provided the customers are divided into two classes, $\alpha_1 = 0.6$, $\beta_1 = 0.1$, $\alpha_2 = 0.1$, arrival rate $\lambda_1 = 6$, $\lambda_2 = 4$. Given holding cost rate $h = 1$, $P = 1,000$, production cost $c = 920$, $d = 30$, setup cost K is 5,000 RMB per time. Through calculation we can get the results shown in Table 45.1.

Given arrival rate, only when the backorder rate is very high (for example, in this case, α need be higher than 70.9 %), backorder rather than fulfillment with inventory on hand can be profitable. Smaller α means severe customers lose and high shortage cost. Therefore, in this case the RO strategy is equivalent to *EOQ* strategy. The DIR strategy offers rebates to first-class customers, which will lead to 100 % backorder rate. And thus obtain better benefits than the policy DO. Contrast to classical *EOQ* strategy, the *DIR* strategy increases total profit by 4.14 %, in which 3.1 % is owing to discount incentive, and other 1.04 % is owing to rationing. Contrast to literature [10], this paper confirms that the increased profit is mainly owing to discount incentive but not rationing. In fact, rationing policy is suit to stochastic environment due to protective stock safeguarding fulfillment of high priority which enhanced profit. When demand is determined, offering discount incentive customers accepting backorder makes inventory allocating among different class demands attractiveness and profitable which expands the application of rationing strategy.

Table 45.1 The performance of the several policies

Strategy	Optimal solution			Performance				
	Z	t	T	Total profit	Delivery rate (%)		Service rate (%)	
EOQ	0	–	32	483	100	100	100	100
DO	4	$t_1 = t_2 = 30$	36	498	83.3	83.3	100	88.3
RO	α is not big enough such that the RO policy is equivalent to *EOQ model*							
DIR	4	$t_1 = 27, t_2 = T$	34	503	79.4	100	100	100

45.5 Conclusion

With the increasingly intense market competition, enterprises have to conduct effective differentiation among their customers in view of price and fulfillment. In our analysis we demonstrate the benefits provided by allocation and discounting. Both serve to lower the base stock level required, lowering the holding cost. By allowing discounts which substitutes discount cost for expensive holding cost, the firm retains its customers, and orders less frequently avoiding setup costs while greatly improving its service rate and profit. By allocating inventory, the firm differentiates between customer classes, and fills preferential customers' orders with high priority firstly for saving shortage cost and improving the profit. The integrated policy offers discount incentive based on protecting inventory for more valuable class and performs very well. Through the example, we show that if some customers (class 1 in the case) are distinguished by accepting reduced service, it is possible that the optimal policy results in improved service as compared with the DO policy for both customer classes.

Demand classification is widely used in many companies' marketing practice. According to demand characteristics' difference, enterprises should provide differentiated services, and implement rationing strategy, provide discount to encourage customers retaining of customer demand and accepting backorder in favour of customer loyalty, profit increasing, market expanding and capacity flexibility. This paper develops a discount and rationing integration policy model and shows economic benefits. It is of great research value and application prospect to integrate discount and rationing policy which coordinate both ends of supply and demand during stock insufficiency period.

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Chapter 46
Analysis of Principal-Agent Relationship in Rural Land Circulation Markets

Dongmei Shi, Shan Liang and Lei Tong

Abstract This paper based on different patterns and subjects of rural land transfer, used of principal-agent theory analysis the principal-agent relationship among land transfer, transferee and intermediary organizations, pointing out the main principal-agent relationship types and the main problems among of them, and established incentive and restraint mechanisms to promote reasonable transfer of rural land. The paper will enrich the study for the land transfer, it has a significant meaning to promote the normal operation of the land transfer.

Keywords Land transfer · Principal-agent · Incentive constraint

46.1 Introduction

With economic development of china, traditional agriculture gradually transfer to modern agriculture, and a large number of rural labor to tertiary industries, these phenomena have led to rural land circulation [1]. Land contracting right circulation question is a hot spot to the academic circles to study rural land as well as "three rural" issue. Reasonable standards of rural land circulation is conducive to the scale of land management and to improve the economic efficiency of land, but the unreasonable land transfer and after transfer of improper use not only damages

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the interests of farmers, destroyed the land of the chemical structure, will produce a series of economic and social problems. In the land transfer issue, different scholars have different point of view, but there is not so many research scholars from the theoretical level to research [2, 3]. This paper analyzes the principal-agent relationship of producing of land transfer process, benefit from the theoretical level to further study the issue of land transfer. To use of principal-agent theory to analyze the relationship of the subject act of land transfer, take out of the land transfer, into the land transfer side and intermediaries as brokers, this will help reveal the relationship of them, the theory will enrich the study for the land transfer, it has a significant meaning to promote the normal operation of the land transfer [4, 5].

46.2 The Content of Agricultural Land Transfer and Principal-Agent Relationship

46.2.1 The Content of Agriculture Land Transfer

For the meaning of rural land transfer different scholars have different interpretations, in this paper refers to the farmers who has land contract for the managerial right (the right to use) transfer his right to other farmers or economic organizations [6]. In the policy, the agricultural land in the land contract period can be transfer it contract right by the way of sub-contract, transfer, equity, cooperation, lease, exchange, etc. Encourage farmer's transfer contract for the managerial right to other large professional or cooperative farms, and development of large-scale agricultural operations [7]. The main point is: on the basis of not change the basic land household contract management system, introduce the joint-stock system to establishing the land system, establish the rural cooperative shares system, the main content is land, become the land contracted by farmers from the physical value, so that part of the farmers are entitled to share in the peace of mind after the second and third industries, another part of the farmers can expand the scale of land management, realized agricultural industrialization and modernization.

46.2.2 The Content of Principal-Agent Relationship

Principal-agent theory is based on the asymmetric information game theory. In the meantime, it is also one of the main content of contract theory of institutional economics. The central task of the principal-agent theory is to study how to design the optimal incentive mechanism to incentive agent in conflict with the interests and asymmetric information environment. Principal-agent theory in the economics refers to any kind related to the transactions under asymmetric information, it is a

form contractual relationship under the asymmetric information conditions. Information asymmetry can be division of two angles from the asymmetric occurrence time and contents. From occurred time to read non-symmetrical, asymmetry may occur in the parties ex ante the signing, also may occur ex post the contract, they are known as pre and post asymmetric asymmetric. Research asymmetric information game prior model known as adverse selection model, studies after the model of asymmetric information is called moral hazard models. From the asymmetric information content of view, asymmetric information may be referring to some involved in people's action, to explore such issues, we called the hidden behavior models (hidden action) [8], may be hiding that certain participants knowledge, to explore such issues in the model we call the hidden knowledge model. In the principal-agent relationship, as principal and agent utility functions is different, leading to the pursuit of maximizing interests inconsistent with the objectives, conflicts of interest. In the absence of effective institutional arrangements, the agent's behavior will likely eventually harm the client's interests. In everyday applications, whether in the economic field or in the social field are common to the principal-agent relationship, therefore, in the process of land transfer there are also the principal-agent relationship.

46.2.3 The Principal-Agent Relationship of Agricultural Land

Land transfer subject including the land transferred out, that is the party who has the right to use land, who is the supply of land, mainly with farmers who have the right to land contractual management. The land into side is the demand for land; primarily have abundant capital who is land scale operator. There is an intermediary who is banded supply and demand of land together. The third parties of provide services usually including the collective economic organizations, land transfer market and brokers. Transfer of land management agencies, market place, out of the land side, a common form of land into the side of the internal coupling mechanism for land transfer (Fig. 46.1).

According to the above analysis, from the contractual relationship of land transfer, by signing the relevant contracts of land transfer, the land outflow side,

Fig. 46.1 The inner affiliation mechanism of rural land conversion market
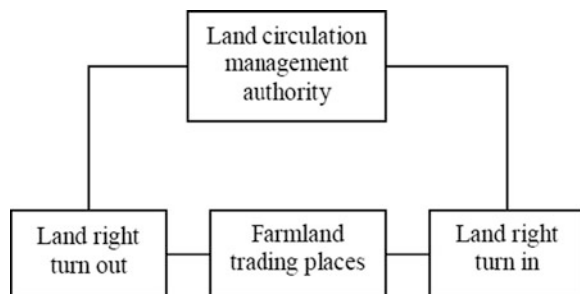
the inflow side and intermediary organizations established contractual relationship, from the benefit structure of land transfer, the three target interests are not the same, but the parties are all seeking to maximize the interests, through established an effective right mechanism to work out. The main pattern to promotion land transfer is: the principal farming, subcontract, and transfer, lease, managed operations, joint-stock cooperative system, the anti-rent Daobao and so on. According to principal-agent theory and contract theory, the basic conditions of constitute principal-agent relationship is a contractual relationship between the structure and the different interests and different interests of the target from, if both sides have signed a cooperation agreement they are intended to form the principal-agent relationship. Therefore, agricultural land exists in principal-agent relationship.

46.3 The Agricultural Land in the Principal-Agent Relationship Type

According to the different main body of land transfer, the transfer of agricultural land in the principal-agent relationship can be divided into three types: First, the farmers regard as the main body, such as delegated farming and leasing, Second, land trustee as the main flow, such as land share cooperation system, land trusts and other business, Third, the main flow of the collective economic organizations, such as leasing.

46.3.1 The Farmers Regard as the Main Body

This approach is farmers who have land use rights want voluntary transfer the land right will be directly entrusted to the farmers (usually their relatives and friends) who willing to operate, and sign contracts, to obtain rental income. The land transferor is called the principal, transferee were called the agent, thus forming a farmer's single-A-farmers B principal-agent relationship (Fig. 46.2). The main cause for this situation is rural labor force work out of the home or engages in non-agricultural industry, and they are not free time to farming land, in order to avoid abandonment of land cultivation they entrusted it to others. This pattern mostly verbal agreement is not conducive to the scale of land management. This pattern main apply to areas where have higher number of migrant workers, and farm relatively backward areas. It can be as explore for backward regions perfect

Fig. 46.2 The cycle relation of principal-agent
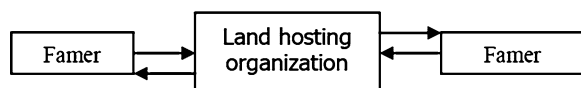
combination of two-tier management system, an innovative mechanism to explore agricultural operations.

46.3.2 Regard the Land Custodian for the Main Land Transfer

Under the premise of land ownership is collective, contract and management right is farmers, land custodian made the land management rights into share, through the form of shares put land use rights of farmers together, and the formation of "agricultural corporation". Farmers turn out the land use right; at the same time to become the company's shareholders, and become the employee, the company and farmers to establish a more direct and close economic interest's relationship, farmers also have a double identity: workers and shareholders. When the farmers as shareholders of the Company occurs, farmers will serve as the highest level of client, land trustee is playing a role of agent, while as a secondary principal, and eventually farmer who become the company's employees has become the final agency farmers, thereby forming a farmers-land trustee—the cycle of farmer agency relationship (Fig. 46.2). This approach is conducive to the scale of land management, and improves the economic efficiency of the land. However, due to information asymmetry and lack of supervision, farmers become vulnerable groups, usually occurred harm the interests of farmer incident.

46.3.3 Regard the Collective Economic Organizations as the Main Subject

Farmers send his land entrusted to the collective economic organizations to manage and sign the contract, and then adjusted by the collective economic organizations, made the land relative concentration, leased by the owner or economic organization contractor to unified development and management. At this time the households is highest level of client, collective economic organizations is agents and the second client, land owners or economic organizations is end user agent, to form a farmers-the collective economic organizations-the owners or economic organization dual agency relationship (Fig. 46.3). In real life, a dual agency relationship type is more common and more formal, so this paper to explore the principal-agent type.

Fig. 46.3 The double relation of principal-agent
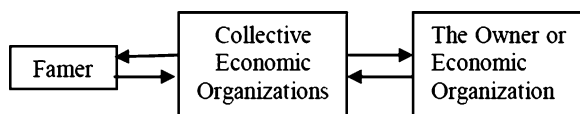
46.4 The Incentive-Restricted Mechanism Design

46.4.1 Establish Incentive and Restraint Mechanisms

It is an effective way to solve the problem of agricultural land in the principal-agent relationship by established between the principal and the agent motivate mechanism–provide policy support to the owners, reward outstanding contributions owners, publicize the outstanding owner [9]. Motivate Mechanism is the system arrangements for how principal and the agent share the economic benefits of land system. Both emphasize the role of principal and agent incentives; also emphasize the behavior of their rights and limits and constraints. An effective incentive and restraint mechanisms to make principal and agent should be consistent with the interests, so that land outside and land into the side can intermediary maximized that benefits.

46.4.2 Design Binding Mechanism

Firstly, providing the necessary mechanisms to ensure effective operation in the organization of the system by means of establish scientific and rational assessment indicators. These indicators should reflect the job performance and the problems of the organization of collective economy. While who to evaluate the performance is the first question to resolve. In a large part, the collective economy valuate themselves at present, this method cannot avoid the behavior of immorality. When commitment mechanisms finished, assess it both have reward and it punishment.

Secondly, strict punishments should be established to resolve the staff of the collective economy's immorality behaviors, until investigate and affix the responsibility for them. As a rational economic man, they can cut down illegal behaviors if they realize they will suffer losses. These systems can increase the risk of staff costs, reduce moral hazard.

Furthermore, establish dynamic screening mechanism for the staff of rural collective economic organizations. Established a set of normative and effective screening mechanism, weed out some staffs who scarce capacity and selfishness, lest they abuse of rights and violate farmers' interests. In the meantime, enhance agricultural land transfer of intermediary organization construction, lead in competition mechanism and take shape agent market.

46.5 Conclusion

Land transfer issue is a key to resolved scale agricultural operations and rural surplus labor force transfer, use of principal-agent relationship of information economics to analyze agricultural land, its legitimacy is that the farmers, owners

and collective economic organizations can be regarded as an economic one, essentially reveals the transfer relationship of agricultural land farmers, collective economic organizations and owners, it is contributing to establish rural land incentive and restraint mechanisms, thus it has great significance to protect the interests of farmers, and standard the rural collective economic organizations and owners behaviors, to promote the standardized operation of agricultural land.

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Chapter 47
Study of Chinese Basic Pension Based on the Leslie Model

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Abstract This paper is based on the Leslie model to predict the population age structure from 2008 to 2030, to get the population over the age of 60. Choosing two factors, the population over the age of 60 and the GDP, to precede simple linear regression of average basic annuities, the basic annuities scale from 2010 to 2030 will be forecasted. In consideration of the inevitable devaluation brings from inflation, calculated that the present value of the average basic annuities in different inflation rates are not the same, it explains the forecasted basic annuities scale is uncertain. As to the dynamic changes of basic annuities, combining the basic situation, we put forward feasible methods for the "Endowment difficult" problem.

Keywords Leslie model · Basic annuities · Linear regression · Inflation

47.1 Elderly Population Based on Leslie

First, choosing the Leslie age structure of the population model and using some related data announced in the National Bureau of Statistics, we proceed a simple prediction of the population in the future 20 years, to get the elderly population every year. It is based on the data in 2007 to forecast the elderly population over 60 in the next 20 years (to 2030) [1].

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According to the average number of females in child-bearing age and the average number of children born by each corresponding age females, we can get the fertility rate from 15 years old to 49 years old, namely, the overall fertility rate. According to the death toll statistics, we can concluded men and females' survival rate in each age level. Furthermore, the men and females of all ages have definite data. So we can get the Neonatal number (born of females from 15 to 49) in 2008 first:

$$\text{Neonatal number in 2008} = \text{Female number} \times \text{Fertility rate} \qquad (47.1)$$

The summation of neonatal number by all age females (15–49) is the number of all 0-aged children. And then, according to the computational formula of the number in each age:

$$\text{Number in this year} = \text{Male number last year} \times \text{Male survival rate} +$$
$$\text{female number last year} \times \text{female survival rate}$$
$$(47.2)$$

We can calculate the number at corresponding age in 2008. Since we do not know the proportion of the number of females in the demographic data obtained in 2008, it is not in accordance with Eq. (47.1) for the calculation of newborns in 2009. Assuming that the proportion of male and female ratio in 2007 as the base data, and remain the same each year. So for each age, we have computational formula:

$$\text{Newborns in 2009} = \text{Total number last year}$$
$$\times \frac{\text{Female number in 2007}}{\text{Female number in 2007} + \text{Male number in 2007}} \times \text{Fertility rate} \qquad (47.3)$$

The summation of neonatal number, born of females from 14 to 49 years old, is the neonatal number in 2009. While, except this, other neonatal number can follow the Eq. (47.2) directly to be calculated. Certainly, the neonatal number in the next each year can be in accordance with the Eq. (47.3), other ages can use the Eq. (47.2) to calculate.

Through crossover circulation applications of the formula above, we can obtain the population of all ages (0–89 years old) from the year 2008 to 2030 conveniently. Then get the population of the old in 60 and above in each year, and the result shown in Table 47.1(Unit: thousand):

As is shown in the graph below, the approximate trend of population of the old in 60 and above is like Fig. 47.1:

According to the graph, our population aging phenomenon is quite obvious. The number of the old increases significantly every year, and it will reach 348 million or so in 2030, that is, rise nearly 119.82 % in compared with 2008.

We have a huge population base, and population of the old is growing rapidly in recent years. Too much of the population of the old must be the main influencing factor in Retirement Pension Payment. So with the increasing population of the old, our work of paying the basic annuities will be more and more severe.

Table 47.1 The population of the old in 60 and above from the year 2008 to 2030

Years	Population	Years	Population
2008	158510.6473	2020	256877.4545
2009	166758.9298	2021	260710.285
2010	175157.7964	2022	269139.0799
2011	183302.9811	2023	283266.2498
2012	193754.833	2024	293437.3974
2013	203844.9159	2025	303860.6478
2014	214894.7584	2026	313605.6233
2015	225227.9891	2027	320484.8937
2016	234357.194	2028	330936.6494
2017	244451.0737	2029	339201.8439
2018	252181.9435	2030	348439.7853
2019	255744.9316		
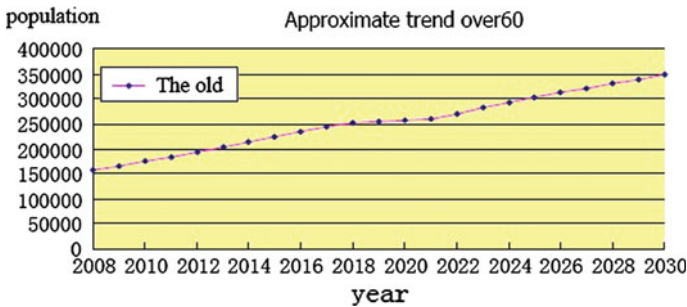
Fig. 47.1 Population tend graph of the old in 60 and above from 2008 to 2030

47.2 Forecast of the Basic Annuities

Firstly, let's analysis and forecast the average basic annuities every year. According to the relevant regulations of the state, the amount of basic annuities is 20 % of average wages in the last year. Get the statistical data from 1978 to 2009 in Statistical Yearbook and according to the formula (20 % of average wages), we calculate the average basic annuities every year. Choosing population of the old (above 60) and the GDP as two influencing factors, then do Simple linear regression of the average basic annuities with two factors in SPSS, we can obtain the specific expression:

$$\text{Average basic annuities} = -10.390 + 0.002 \times \text{population of the old} + 0.015 \times \text{GDP} \tag{47.4}$$

According to the Leslie model, we calculate the population of the old above 60. Combined with the predicted values of GDP from 2010 to 2030, and using the Eq. (47.4), we can predict the scale of basic annuities from 2010 to 2030 [2–4].

Table 47.2 Scale of basic annuities (2010 to 2030)

Years	Average basic annuities (yuan)	Population of the old above 60 (thousand)	Scale of basic annuities (hundred million)
2010	6309.670593	175157.7964	11051.87997
2011	6833.389287	183302.9811	12525.80627
2012	7404.852724	193754.833	14347.26003
2013	8022.3902	203844.9159	16353.23456
2014	8692.622566	214894.7584	18679.99027
2015	9416.512987	225227.9891	21208.62284
2016	10197.76939	234357.194	23899.2062
2017	11045.80998	244451.0737	27001.6011
2018	11959.49203	252181.9435	30159.67945
2019	12941.18705	255744.9316	33096.42997
2020	14000.85951	256877.4545	35965.05152
2021	15155.81221	260710.285	39512.76121
2022	16417.47624	269139.0799	44185.8445
2023	17796.34556	283266.2498	50411.04069
2024	19282.10512	293437.3974	56580.90742
2025	20892.92936	303860.6478	63485.3905
2026	22637.54515	313605.6233	70992.61456
2027	24523.06522	320484.8937	78592.71948
2028	26574.82998	330936.6494	87945.85192
2029	28794.84484	339201.8439	97672.64466
2030	31204.10137	348439.7853	108727.5038

Average basic annuities, multiply by population of the old (above 60), then we can get the scale of basic annuities. And its specific data is shown in Table 47.2:

As the same, we can also explain the changes in the scale of basic annuities by the approximate trend shown in the next Fig. 47.2:

From the graph, we can see the scale of basic annuities increases rapidly from 2020, and we have not seen the trend to slow down until 2030. In the future, population aging phenomenon will be serious; work of paying basic annuities will become more severe, so we are under a lot of pressure.
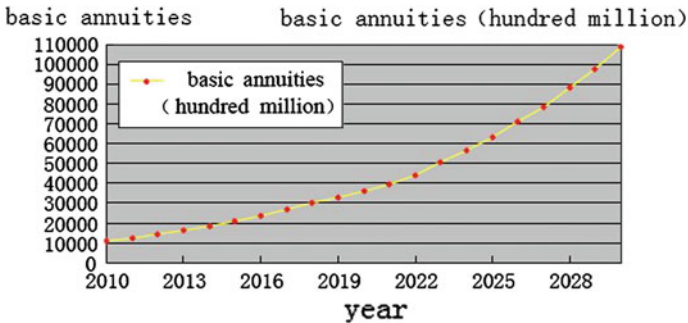
Fig. 47.2 Approximate trend of the summation of the annuities (2010–2030)

Fig. 47.3 Graph of the inflation rate(1979–2009)
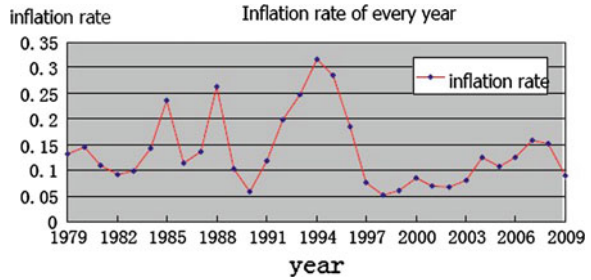
47.3 Present Value of Average Basic Annuities Under Inflation Rate

Seen from the dynamic development of the economy, forecasts of basic annuities are all not accurate for its various influencing factor, and one of this is the inflation. According to the data of various prices indices searching from Statistical year-book, and through the formula [5]:

$$\text{Inflation rate} = \text{Prices indices} - 1 \qquad (47.5)$$

We can calculate the inflation rate in every year, and its approximate trend shows in the next Fig. 47.3:

The inflation rate of the year 1990–1994 is larger, and it reaches more than 30 % in 1994. But in the next 3 years, it reduces to 7.63 % gradually. Although it decreases in some time of the year 1997–2007, the main trend is rising. Later, it falls down to less than 10 %. Choosing data: 0.04, 0.06, 0.09, and 0.1 as the inflation rate respectively, to calculate the present value of basic annuities under different inflation rates, and the result is shown in Table 47.3:

The inevitable inflation brings devaluation, the actual purchasing power of currency will be decreased. Seen from Table 47.3, the present value of average basic annuities under different inflation rates, the larger the inflation rate is, the more serious devaluation will be. While the inflation rate is 0.09 or 0.1, the present value of average basic annuities declines year by year, even it is less than 5,000 from the year 2026 to 2030 by the inflation rate of 0.1. The effect of inflation on the scale of basic annuities cannot be ignored. So we should do some adjustments to the scale of annuities depending on the actual purchasing power of currency in every year [6].

47.4 Feasible Methods for "Endowment Difficult"

Do real and strengthen individual account funds. Swedish NDC pension system actuarial system has an important reference on our reform of the pension system. In the phenomenon of population aging, increasing personal proportion in the

Table 47.3 Present value of basic annuities under different inflation rates

Years	Average basic annuities (yuan)	Present value of basic annuities under different inflation rates (yuan)			
		0.04	0.06	0.09	0.1
2010	6309.670593	6309.670593	6309.670593	6309.670593	6309.670593
2011	6833.389287	6570.566622	6446.593667	6269.164484	6212.172079
2012	7404.852724	6846.202592	6590.292563	6232.516391	6119.712995
2013	8022.3902	7131.875676	6735.753508	6194.757183	6027.340496
2014	8692.622566	7430.490201	6885.371252	6158.072976	5937.178175
2015	9416.512987	7739.687275	7036.56629	6120.08734	5846.913703
2016	10197.76939	8059.445282	7189.025023	6080.596696	5756.374967
2017	11045.80998	8393.907764	7346.094502	6042.436321	5668.247063
2018	11959.49203	8738.683686	7503.533257	6002.065774	5579.191298
2019	12941.18705	9092.306366	7659.868733	5958.482019	5488.326608
2020	14000.85951	9458.479018	7818.006823	5914.114363	5397.93743
2021	15155.81221	9844.926615	7983.89281	5873.375106	5312.019722
2022	16417.47624	10254.30722	8158.982718	5836.982902	5231.113879
2023	17796.34556	10688.02397	8343.621254	5804.787916	5154.9674
2024	19282.10512	11134.93525	8528.49369	5770.101795	5077.580927
2025	20892.92936	11601.10203	8717.889439	5735.903904	5001.601177
2026	22637.54515	12086.37043	8911.185519	5701.713124	4926.589387
2027	24523.06522	12589.48559	9106.993857	5666.622584	4851.757718
2028	26574.82998	13118.08339	9310.326683	5633.697601	4779.716762
2029	28794.84484	13667.25496	9517.070856	5600.299867	4708.187226
2030	31204.10137	14241.14453	9729.586304	5567.775572	4638.290836

pension responsibility structure is not achieved by accumulation fund of individual account system alone. Nominal account system can also be achieved by enhancing the contact between the payment of participants and the income of pension. In addition, the characteristic (PAYG) of Nominal account system makes itself have the feature of redistribution in designing.

Strengthen the construction of legal system, improving the administrative management system. We should improve the legal system of pension insurance, and regulate the levy, support and investment of the pension. Be strict in supervising and managing the local government, provincial government and its affiliated insurance agencies, and using legal methods to prevent the unnecessary loss of pension.

As the coexistence of unity and particularity in the pension system, we urgently need to narrow the gap gradually. With the two-track mechanism running in our country, we should be minimized to narrow the gap caused by the two systems, and by the employees of urban enterprises and government organizations and institutions and the civil servants pension payments gap, in order to avoid social unrest [7].

Using the capital markets effectively, expanding investment channels, avoiding investment risk, for the sake of increasing profitability. We can try to broaden the

investment to get into some low-risk areas. This not only reduces the credit risk of the currency, systemic risk of capital markets, so that pension funds can be achieved in low-risk investments to maximize revenue, maintain and increase value, improve the living standards of retired people, but also conducive to the development of capital market [8, 9].

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Chapter 48
Research on Indoor Landscape Layout Design Based on Mathematical Morphology

Gang Zhong

Abstract In order to create an ecological, green, comfortable, and digital indoor environment full of the artistic characteristics, we need to have a reasonable scientific layout of the interior landscape. In this paper, based on the concept of mathematical morphology, we use the method of expansion of structural elements, combined with the design concept of sustainable development, and have a digital design of the interior landscape. Through this, the practicality of the interior landscape and art are combined; humanity and digital are combined with the unity of integrity and personality to create newer and more beautiful indoor environment, thereby improving the living environment and the quality of life.

Keywords Interior landscape · Extension of mathematical morphology · Sustainable development · Design layout

48.1 Introduction

The interior landscape is not just a flower or plant in the room and indoor formation of a green garden landscape [1, 2]. Interior landscape is actually the perfect combination of modern architecture and garden design, which is an integral part of people's living space. It refers to the use of natural elements in nature, such as flowers and trees, waterfalls, rocks, etc., by using the knowledge of mathematical morphology, the combination of multi-structure elements, and the formation of the elements in the interior landscape scene, and the use of scientific and rational

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layout design [3]. It is developed by the requirements of the green indoor environment, environmentally friendly concept and low-carbon. As early as ancient Greece in the West, people have begun to grow plants bonsai for the protection of the common human environment. In the mid-15th century, in order to protect the natural plants from the harsh climate of the nature, the Italians build a variety of wooden huts [4, 5]. In the mid-nineteenth century in continental Europe and the United Kingdom Peninsula people have begun to grow a plant bonsai in daily life, transplanting flowers and trees, which was introduced into the interior space with plant bonsai plants and trees to improve their living environment and formed the prototype of the interior landscape [6, 7]. However, the history of China's interior landscape can be traced back to the Neolithic era. In the era of the Neolithic culture of the excavation, archaeologists accidentally discovered bonsai plants used for a stone carving decorative patterns. In other cultures, archaeological sites are found indoor carving of the landscape, which were all ingenious designs and applied to the Chinese classical gardens. This indicates that the indoor green, low carbon and environmental protection are the prerequisites and basis for the indoor landscape. Indoor landscape today is a fusion of artistic creation of artificial environment and natural environment [8]. Through a variety of artistic techniques, we create a pleasant indoor landscape, with the practicality of the interior landscape and art combined humanity and digital integrity unity and personality characteristics.

In this paper, by applying the concept of mathematical morphology, using the method of expansion of structural elements, and combining the design concept of sustainable development, digital design of the interior landscape, we combine the practicality of the interior landscape and art, humanity and digit, integrity and personality characteristics of unity, and create a newer and more beautiful indoor environment, thereby improving the living environment of life.

48.2 The Basic Principles of Mathematical Morphology

Mathematical morphology is a discipline built on a rigorous mathematical theory, and its basic ideas and methods have a significant impact on image processing theory and technology. In fact, mathematical morphology has already constituted a new image processing methods and theories, and become an important research field of computer digital image processing and sub-theory, and has been applied in the process of multi-discipline digital image analysis and processing. In computer word recognition, computer microscopic image analysis (such as quantitative analysis, particle analysis), medical image processing (such as cell detection, the heart movement process, automatical description of pine cancer images), image compression coding, industrial inspection (such as food inspection and printed circuit automatic detection), materials science, robotics, vision, automobile movement monitoring, this discipline has made a very successful application. In addition, mathematical morphology has a good prospect in the fields of fingerprint

Fig. 48.1 Structural elements diagram. **a** *Round*. **b** *Square*. **c** *Cross*

detection, economic geography, the synthesis of music and the fault of X-rays. The morphological approach has become an indispensable tool for image applications engineering and technical personnel. At present, the technology and application of mathematical morphology is under continuous research and development.

The main idea of mathematical morphology is to use the combination of multi-structure elements to collect and extract the corresponding features, in order to achieve analysis and identification. The combination of multi-structure elements is extended to a basic concept of mathematical morphology. Usually using the combination of multi-structure elements we need to consider two principles: first, all the structural elements must be displayed on the geometry as simple as possible and be bounded; second, the shape of each structure element should preferably have a unique convex, such as round, square, cross, etc., which is shown in Fig. 48.1.

48.3 Interior Landscape Design Essentials

The interior landscape as urban green space system is the most close to people, and most closely related to the composition of people's living link, which is getting more and more attention. The architectural form of diversification and changes in people's attitudes make the interior landscape increasingly rich and extend the coverage. Landscape elements and architectural integration become an organism in a variety of ways. Whether architecture or landscape is the main body, and regardless of the landscape in the construction or building was surrounded by the landscape, only the two perfectly coordinate can we create comfortable living spaces.

48.3.1 Unity and Variation

Unified interior landscape design composition changes are often embodied in four aspects: the contrast and harmony, rhythm, the primary focus of contact and separation.

1. Contrast and harmony. Contrast, which means reconciliation of the art of composition, is an important way; it is to use layout factors (such as volume,

color, etc.), two different degrees of difference and manifestations in different artistic effects, or the use of human illusion to set off each other's performance practices, differences in the degree of performance that contrast with each other to control, set off each other to more clearly highlight their own characteristics; little difference in performance is called to reconcile, and to make harmony with each other; once interrelated, result in full effect.

2. Rhythm. Rhythm is a factor regularly repeated and changed in the artistic expression, Repetition is a necessary condition of living rhythm. With only simple duplication and lack of regular changes, which is monotonous and boring, so rhythm is one of the important techniques for indoor and landscape art of composition and the layout unity in diversity. Interior landscape planting layout of rhythm has many ways: alternating rhythm, undulating twists and turns, and mimicry rhythm and so on.

3. Primary-secondary and focus. The main part of the interior landscape layout or theme and subordinate bodies are generally used by the functionality requirements of the decision. From a layout point of view, the main parts are frequently the main layout of the center of the indoor environment; the minor parts are the secondary center of the layout.

4. Contact and separated. Indoor green is used by a number of functional requirements of the different space or layout. All these have necessary contacts and separations between them.

48.3.2 Equilibrium and Stability

In interior landscape design, landscape is an entity composed of certain volume and different materials, so they often show a different sense of weight. We explore the principles of equilibrium and stability in order to obtain the integrity and security of the interior landscape layout. Stability is the overall relationship of the upper and lower severity of indoor landscape layout, while equilibrium is part of some relative interior landscape layout, just as the severity of relations between left and right, before and after.

Equilibrium is divided into a symmetric equilibrium and non-symmetric equilibrium. Symmetrical layout is the clear axis in the perfectly symmetrical axis. Symmetric balances the layout, and often gives a solemn feeling, which is more used in rule-based indoor green design layout. Asymmetric balanced layout should be a comprehensive measure of indoor green elements of the actual situation, color, texture, density, line, shape, etc. to the volume generated by people. We should know that we should only consider the-dimensional image layout.

Interior landscape layout stability refers to the interior rocks, bonsai plants and their sizes showing the sense of the severity. Indoor landscape layout is often used in size following large at the base and gradually reduced to small upward, in order

to obtain a stable solid sense; in handling the interior landscape rocks we often rough stone and dark surface, while the upper part of a more smooth or faded material gives a feeling of stability.

48.4 Interior Landscape Layout Design

48.4.1 Indoor Green Layout

Indoor green layout in different places, such as hotels the hall, lobby, atrium, lounges, meeting rooms, offices, restaurants and households living room, have different requirements, depending on the fact that different task, purpose and effect take a different layout, with spatial locations, roles and the status of the green are changing with it, and they can be divided into: (1) in an important position in the center, such as the center of the hall; (2) in a more major key parts such as entrances and exits; (3) in the corner areas, such as wall corners. It should base on different parts of selected plant products color. Indoor green almost always use the indoor space left, or do not affect traffic, wall, corner, and by the use of hanging, hanging niches, ledges, etc. to have full use of space, and use indoor area as little as possible. Therefore, the layout of the indoor green should be considered from the plane and vertical so that the three-dimensional green environment is formed, as is shown in Fig. 48.2.

Fig. 48.2 Indoor *green* layout
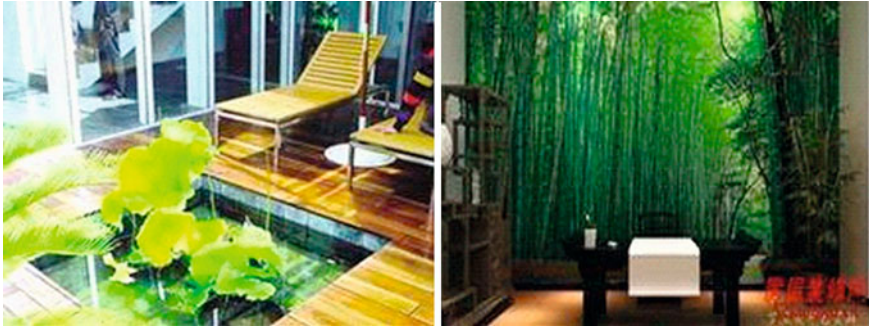
Fig. 48.3 Indoor scene layout

48.4.2 Indoor Layout of the Scene

During Indoor selection of plants, you should first consider how to better create a favorable environment for the growth of indoor plants, such as strengthening the contact of indoor and outdoor space, creating open and semi-open space as possible, providing more sunlight conditions, using a variety natural light way, as far as possible mining and opening up more green acreage of the ground or floor layout of the garden and additional terraces, planters, and selecting the appropriate wall mounts to create a green space characteristics of the building system. Depending on the size of the space, choose the scale of the plant. General indoor plants are divided into large, medium and small according to the following: small sized plants are of 0.3 m; medium-sized plants are of 0.3 to 1 m; large-scale plants are of l m or more. Good ratio between the size of the plant and interior spatial scales as well as furniture, small plants and casting composition of the groups have little effect on a large open space, while the lush trees generally make room smaller, but tall atrium can increase indoor majestic style; some trees can inhibit its growth rate or take a bonsai tree stump can make it suitable for indoor viewing, as is shown in Fig. 48.3.

48.4.3 Indoor Garden Design

The combination of location of the courtyard is often divided into the vestibule, courtyard, rear garden and side of the court. As the plants have the positive characteristics of exposing to the sun, the location of the garden is best arranged to the north, so that when you watch, you can see the plants oncoming, as if a beautiful mosaic of people waving and nodding and smiling. Within the garden scale is generally not large, therefore we should maintain the ecological environment of departure and plant-based layout. Content cylinder can be complicated and vary in size, and should be combined with the local conditions of the design.

Fig. 48.4 Indoor garden layout

The content of garden design, landscaping, group scene before the landscaping must first be based on conception, because the key to the creation of the garden landscape mood, as is shown in Fig. 48.4.

48.5 Mathematical Morphology after Processing

Through the refinement of the interior space, the interior landscape is divided into a variety of different structural elements. We have selected the structure of element sequences of in eight directions which is shown in Fig. 48.5.

In Fig. 48.5, B1, B2, B3, B4, B5, B6, B7, and B8 are used to represent the eight cardinal points. "o" point is the reference to the center; "1" indicates the location of the indoor landscape layout; "0" indicates the location of the simulated indoor landscape layout; "X" can mean that the location of the practice of landscape layout, and also the simulated position. We can get a rational layout of indoor landscape data, which is shown in Table 48.1.
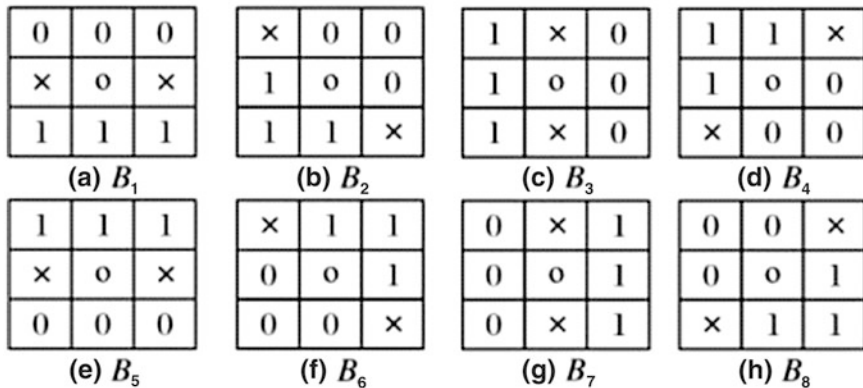
Fig. 48.5 Structure of element sequences

Table 48.1 Indoor landscape layout processing data

Processing method	Evaluate indicators	Indoor green layout	Indoor scene layout	Indoor garden layout
VMF	MSE	17.3405	21.4846	25.6836
FPG	MSE	12.5016	16.9492	21.7049
MRVF	MSE	10.6763	14.5926	18.9603

Fig. 48.6 Refined analysis of indoor landscape layout
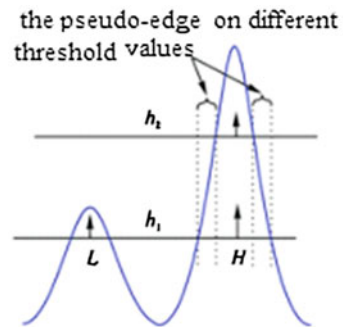
From the analysis available from Table 48.1 and Fig. 48.6, we design the interior landscape layout. When the threshold reaches h2, it will cause a loss within a certain space, which can not have a reasonable use, and the performance is shown as the loss of the L wave in Fig. 48.6; when the threshold is too small to achieve h1, it will result in the emergence of pseudo-edge, which is also not conducive to the design layout.

48.6 Conclusion

The interior landscape is very important part of urban environmental protection, low-carbon, and greening stem, providing people with leisure, entertainment and living environment, which is closely linked to one of the most important part of our living. The interior landscape is the integration of artificial environment and natural environment, and it is an artistic creation. Through a variety of artistic techniques we can create a pleasant indoor landscape, with combinations of practicality of the interior landscape and art, humanity and digit, integrity and individuality.

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Chapter 49
Research on Management Evaluation System of University Sports Teams Based on Fuzzy Evaluation Method

Bogang Huang and Yong Wang

Abstract With the strategic readjustment of China's education system reform and social needs of talent, to promote higher education to meet university students, moral, intellectual, physical and other aspects of the comprehensive development of a comprehensive talent. In this paper, the literature survey and content analysis method, a preliminary analysis to establish a management evaluation system to determine a management evaluation of the university sports teams, the two index system and the corresponding evaluation criteria. In the comprehensive evaluation of the use of fuzzy comprehensive evaluation method to assess the mode of management of the university sports teams, and provide a scientific basis for managers to develop system decision-making.

Keywords Sports teams · Management evaluation system · Literature survey · Content analysis · Fuzzy evaluation method

49.1 Introduction

Sports reform and social development of the twenty first century, the new requirements [1, 2]. At present, China's national conditions, the development of competitive sports out of a single system to achieve diversified development pattern; ordinary institutions of higher learning how to play an educational and scientific and technological advantages to develop national outstanding university athletes; extensive training system into intensive cost-effective training system, to ensure that the sports sustainable development, and so these problems have a significant impact on the

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overall development of sports in the state of the twenty first century, made from practical and theoretical scientific answer is very important.

With the strategic readjustment of China's education system reform and social needs of talent, to promote higher education to meet university students, moral, intellectual, physical and other aspects of the comprehensive development of a comprehensive talent [3–5]. Sport as a competitive sport, university sports is also a measure of the strength of a university standard, various universities and universities have set up their own sports teams, recruitment of physical good as an athlete in university students [6]. Universities and Universities Should efforts to run the excellent team of sports teams, we must first establish and improve the management evaluation system, and only through this can the development of university sports teams.

Contemporary university athletes as national reserve athletes must be in strict accordance with the management standards for training, to ensure the booming of China's sports undertakings [7]. The survival and development of competitive sports, the relationship to competitive sports, life and death, but also an important guarantee of the development of higher education, which is the core content of the sustainable development of competitive sports. University of the development of sports not leave the quality of education, especially the gradual growth of the students in the physiological and psychological process, basic education is particularly important. Universities and universities should not only pursue the ranking of sports scores to the neglect of the cultural quality of the university athletes, university athletes' sports performance at the expense of their cultural qualities of the cost of universities and universities should actively explore the one obtained on the basis of quality assurance University Sports the proper management of the career development model to jointly promote the improvement of the quality of university students' cultural and athletic capabilities. Therefore, throughout the country should actively promote "people-oriented" concept of lifelong education, at the same time, universities should actively explore the establishment of a sound sports team management evaluation system.

In this paper, through literature survey and questionnaires and other methods, a preliminary analysis to establish a management evaluation system to determine a management evaluation of the university sports teams, the two index system and the corresponding evaluation criteria [8]. In the comprehensive evaluation of the use of fuzzy comprehensive evaluation method to assess the mode of management of the university sports teams, and provide a scientific basis for managers to develop system decision-making.

49.2 The University Sports Teams

The former IOC President Juan Antonio Samaranch had said: twenty first Century world of competitive sports will be relying on in universities and universities under the under the premise that improve the level of sports competition, while improving the cultural quality of the athletes from various countries, which will is the

Table 49.1 The competitive sports strength and athletes quality rankings

Country	Strength ranking	Elite athletes ratio (%)	Athletes quality rankings
United States	1	36.66	1
China	2	24.91	4
Britain	3	18.68	2
Russia	4	15.03	3
Italy	5	14.47	5
Other	6	7.93	6

inevitable trend of the future development of competitive sports. This shows that the development of university sports teams in the future, mainly to develop comprehensive talent for the international sports competition. Walk in the forefront to take the lead in the development of university sports teams, set up all kinds of sports in university sports teams, forming a close contact sports talent from the full range of primary and secondary schools to university to develop management models. This management is not only achieve with a solid high-level sports talent, many universities train the athletes of these strengths, but also athletes and cultural qualities. It can be said that such competitive sports lies in the universities and universities nurture talent management model road to go, not only to grow the U.S. athletes Athletic Strength, but also improves the nation's athletes and cultural qualities and reputation in the international arena.

With the rapid increase of China's international status at the same time, the International Athletic Strength of the Chinese athletes is not so excellent, competitive sports as athletes in an activity of the exchange between countries, compared to sports in the United States, the overall strength of China's Athletics Strength still appears slow growth, poor management model, athletes comprehensive cultural quality of the overall trend in competitive sports, the progress made in reform and innovation of the athletes training is not enough, as shown in Table 49.1 and shown in Fig. 49.1. At present, the combination of Sports and education to athletes personnel training mode, the management evaluation system is to absorb the international advanced level of management of sports teams, increasing the use of the sports teams of the management evaluation system, in terms of ideology on university sports teams further profound understanding and knowledge of the management evaluation system, so that ideas and theories to solve these problems, and provide an effective management of sports teams, and effectively improve our existing management model, to increase the strength of the competitive sports of our athletes and athletes team and cultural qualities.

49.2.1 The Governing Bodies University Sports Teams

School leaders for planning the development of high-level sports teams to set up a special Campaign Committee, such as shown in Fig. 49.2, several times the annual school party and government joint meeting of the development and construction of
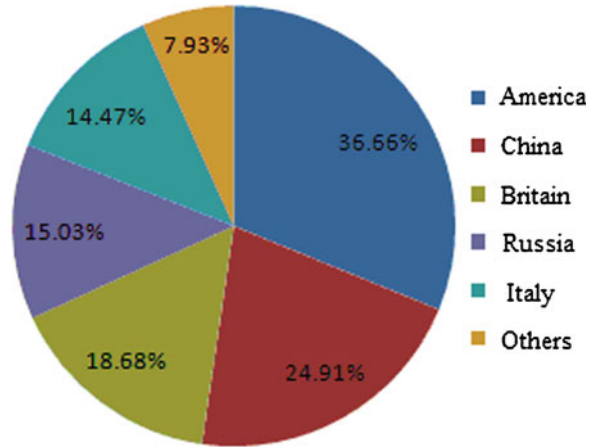
high-level sports teams as an important issue to be discussed a timely manner to
make the planning of the development of high-level sports teams. Every go out to
participate in the competition, school leaders are personally mobilize even led
campaign

It can be seen from Fig. 49.2: the direct leadership of the principal in charge of
teaching principals in charge of the Ministry of sports and art teaching in the
school sports teams in the technical aspects of specific management: identify
coaches candidates to develop the management rules and regulations, and with the
Office of Academic Affairs, students the teaching of the universities of high level
athletes training program, the development of sports competition incentives in
consultation with the work department. Meanwhile, the students where the Insti-
tute is mainly responsible for students' learning and daily life management of
high-level athletes, and equipped with the class teacher and counselor responsible
for the students. These organizations in charge of school leaders under the
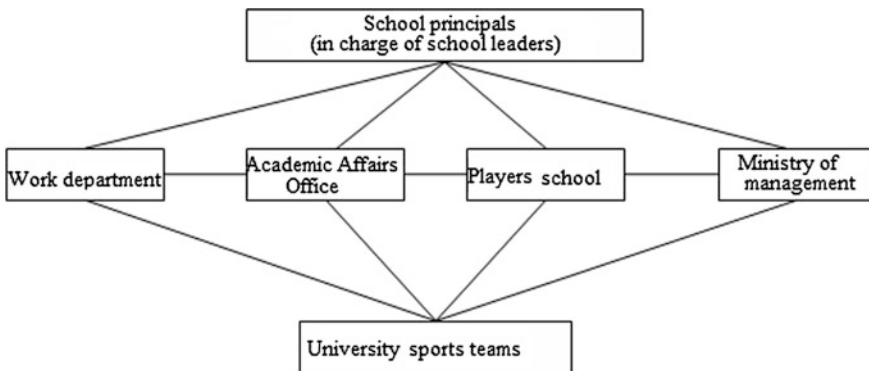
Fig. 49.2 The schematic of sports team organization and management

guidance of division of labor, duties, and provide the necessary protection for the sustainable development of high-level sports teams.

49.2.2 The Management of the University Sports Teams

Universities should attach great importance to the enrollment of high-level athletes, there are rigorous systems and procedures, as the group leader each year by the principal in charge of the Enrollment, Admissions Office, sports and art teaching, and school discipline inspection committee jointly composition of the leadership team, strict implementation of the enrollment system and procedures. First school to the community through the campus network to provide high-level athletes enrollment information, rigorous testing of the candidates, and invite outside of sports celebrities expert group supervision and guidance for each specific test, strict control of the special group of each candidate the test results in accordance with the special assessment criteria score and then ranked by the scores of the candidates and the public through the campus network to ensure the enrollment work under the principle of openness, impartiality, fairness, and put an end to the unhealthy tendencies in the enrollment, to ensure the quality of the selection.

University sports teams, athletes, first of all university athletes must ensure the comprehensive development of their moral, intellectual, physical and other aspects of culture as a special talent, high level athletes. School Office of Academic Affairs Student Management Division in accordance with strict enrollment management school enrollment regulations on the high level of student athletes, and specifically with high-level athletes enrollment management file, and specifically invest in the athletes file network. Calendar year to recruit high-level athlete roster and handled Collegiate Athletic Association Registration, and other supporting materials, all high-level athletes stay in school, learning and training, to accept a unified management.

49.3 Management Evaluation System of University Sports Teams

Content analysis based on different research areas, the corresponding model of the corresponding system analysis model, and a more complete model of the current development model of linguistic analysis, index analysis model and feature analysis model and so on. The model is mainly used in this paper system analysis model. Tors and two indicators of frequency distribution of the number and proportion of the table as follows shown in Table 49.2. We can clearly see the percentage of each level indicators.

Table 49.2 The distribution table of the number and proportion level indicators and two indicators of the frequency

Level indicators	Frequency	Proportion (%)	Two indicators	Frequency	Proportion (%)
Athletes quality	90	30.0	Sportsman ship	170	56.7
			Physical and mental health	280	93.3
			Personal capacity	299	99.7
Management process	60	20.0	Goal Setting	267	89.0
			Plan	260	86.7
			Organization and implementation	245	81.7
			Control	210	70.0
Management team	120	40.0	Experience in complementary	290	96.7
			Cooperation and collaboration	300	100
Management practices and organizational structure	30	10.0	Management system	180	60.0
			Management structure	140	46.7
			Management practices	160	53.3

Determine the management level, and general management knowledge and mastery of the governing body of university sports teams, divided into three levels: low, medium and high. Can use the collection expressed as: V = (V1, V2, V3). According to the data in Table 49.2, it is possible to determine the weights of individual indicators. An index weights $A_i = i$ index the frequency divided by the number of samples, (i = 1, 2, 3, 4); two index weights $a_{ij} = a_{ij}$ appear frequency divided by the number (ai1 + ai2 + ai3 +··· ain frequency) ain is a subsidiary of i-level indicators index of the nth two indicators.

Anonymous questionnaire form, corresponding to the index weights of the set A = {a1, a2, a3, an}, where the weights ai (i = 1, 2, 3… m), said indicators in the index system degree of importance, are generally given by experts. Grading above a two indicators. Suppose there are N experts, indicators ain m personal recognition, you can get the evaluation matrix.

$$R = \begin{bmatrix} r11 & r12 & r1n \\ \dots & \dots & \dots \\ rm1 & rm2 & rmn \end{bmatrix} \quad (49.1)$$

$$B = A \cdot R = (a1, a2, a3, a4) \cdot R = (b1, b2, b3, b4)$$

$$= (a1, a2, a3, a4) \begin{bmatrix} b_{11} & b_{12} & b_{14} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \\ b_{41} & b_{42} & b_{43} \end{bmatrix} = (b1, b2, b3) \tag{49.2}$$

Among them, (a1, a2, a3, a4) is the first-class index weight.

49.4 The Lesson from the Research

Sports reform, and social development of the twenty first century, the new requirements. At present, China's national conditions, the development of competitive sports out of a single system to achieve diversified development pattern; ordinary institutions of higher learning how to play an educational and scientific and technological advantages to develop national outstanding university athletes; extensive training system into intensive cost-effective training system, to ensure that the sports sustainable development, and so these problems have a significant impact on the overall development of sports in the state of the twenty first century, made from practical and theoretical scientific answer is very important. The construction and management of the sports team coaches, track and field team by Associate Professor Wang then served as head coach of the remaining coaches are responsible for their own projects to work together in the training game. In addition, the Ministry of sports and art teaching coaches specially formulated assessment criteria, business files, coaches workload methodology for calculating and spiritual, material incentives, and win the school agreed to develop the special provisions of the coaches staff rank. Coaches are a political quality, reliable, upright style, with a strong sense of professionalism and responsibility of the team. Coaches are the unit carefully selecting the right trainer competition results, and implementation of assessment, not the professional quality of the coaches to develop evaluation criteria and methods.

49.5 Conclusion

In recent years, the building of the university sports teams has been the strong support of the government and universities, the collaboration of other relevant departments of the school, through the efforts of all coaches of the sport and art of teaching Ministry, the construction of a diligent study, and always willing to dedication, the courage to fight coaches. Has made remarkable achievements in athletes moral, intellectual, physical culture, but also has made outstanding achievements, gradually exploring the one to adapt to the social development of

sports reform, the development of competitive sports out of a single system to achieve diversified development pattern, common institutions of higher learning to train national outstanding university athletes, the role of education and scientific and technological advantages ensure the new ways of sustainable development in athletics.

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Chapter 50
Research on Evaluation Method of Ability of Enterprise Technology Competition Based on Patent Analysis

Liu Song, Yu-shui Geng and Xin-gang Wang

Abstract In this article, we present the evaluation method of the ability of enterprise technology competition based on patent analysis, which establishes the comprehensive evaluation index system of the ability of technology competition including four sets of evaluation indicators: patent applying number and authorizing number, economic value, technology value, ability of research and development. Then the evaluation method and steps based on the above index system is designed. At last, an empirical study about enterprises in optical communication technology in China is shown.

Keywords Ability of enterprise technology competition · Evaluation method · Evaluation index system · Patent analysis

50.1 Introduction

The evaluation of the ability of enterprise technology competition is undoubtedly of great significance for enterprises to formulate right policies and improve the technological level. Traditional evaluation indexes of technology competition have mainly focused on expert analysis and market investigation. These indexes place emphasis on theoretical model. The corresponding data of these indexes is acquired and measured difficultly, or the standard measurement is not unified. For example, "competitive senior managers", "technical management ability", "technical strategy" often appear in these indexes [1].

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In this article, using the description items of patent document as basis of measurement and calculation, we present the evaluation method of the ability of enterprise technology competition based on patent analysis from the competitor aspect. Enterprises are taken as research subject and its research and competition ability in a certain technology domain is evaluated [2]. We establish the method which takes into consideration the constituent factors of the ability of enterprise technology competition, we also builds the systematic, objective, accurate evaluation index system based on measurement and calculation of the patent documents and their description items from different dimensions. The purpose of the evaluation in our method is first to investigate the overall technology competition ability of the enterprise, fully monitor and evaluate the competitors of the enterprise, therefore the advantages and shortages of the enterprise itself and its competitors could be found [3].

50.2 Building Evaluation Index System of the Ability of Enterprise Technology Competition

The evaluation method of the ability of enterprise technology competition based on patent analysis is presented in this article. We try to build a evaluation index system that is objective, acquired easily, complete, and able to represent the enterprise's technology competition ability, so that we can evaluate and compare the enterprise's technology competition ability totally and objectively [4].

According to the analysis of the factors of the technology competition ability, referring to the research of enterprise's technology evaluation and technology innovation capacity evaluation by several domestic and international scholars, on the basis of research of patent analysis indexes by concerned scholars, We make the evaluation of the ability of enterprise technology competition mainly from the aspect of technology analysis [5]. The evaluation index system in this article puts aside the indexes of market, input and implementation. We make the evaluation of the ability of enterprise technology competition mainly from the aspects of the enterprise's technology ability, technology efficiency level, technology economic efficiency, research and development ability of technology, etc. In this article, four main categories of evaluation indexes of ability of enterprise technology competition is synthesized: patent application and authorization number, economic value index, technology value index, research and development ability index [6].

Patent application and authorization number index measures the technology share that the enterprise has in technology domain; Economic value index measures the technical and economic value of enterprise's patents from an economic point of view; Technology value index measures the technology importance of enterprise's patents from the views of quality and novelty of patent applications [7]. These four categories of indexes reflect the technology competition ability of enterprise form the different perspective. When these four categories of indexes

are calculated to evaluate the technology competition ability of enterprises (company, university, research institutions are all named as enterprise in this paper), we always use the data of valid granted patents, so as to ensure the validity and objectivity of the data.

Specific Identification of the evaluation indexes of ability of enterprise technology competition is given below:

(1) Patent application and authorization number index N

Authorized patent/invention patent number: Enterprise's authorized patent/invention patent number in technology domain F;

Authorized patent/invention patent ratio: The ratio of the enterprise's authorized patent/invention patent number in technology domain to the number of total authorized patent/invention patent in technology domain.

(2) Economic value index E

Patent/invention patent survival amount: From the date of patent authorization, patent royalty must be charged regularly so as to keep the patent alive, and the patent royalty is increasing with time, so only the patent that can bring benefit can be maintained. This index refers to the number of patent/invention patent which is valid in the Nth year from the date of patent application;

Patent/invention patent survival ratio:

$$\frac{\text{Patent/invention patent survival amount}}{\text{Number of granted patent/invention patent}};$$

Patent/invention patent average life:

$$\frac{\sum_{n=1}^{20} \text{Amount of granted patent/invention patents that have survived for n years}}{\text{Number of granted patent/invention patent}}$$

(3) Technology value index T

Average novelty of patent/invention patent: Average technology novelty of patent/invention patent the enterprise owned in technology domain F. It reflects the overall level of the technology value of patents. It's a good complementary method of absence of patent citations in Chinese patents data. At the same time, it's also fit for patents data with citations such as American patents. In fact, there are no conflict between technology novelty and citations. The concepts and definitions of technology novelty are quoted from [8];

Patent/invention patent good quality number: the number of granted patent/invention patents which novelty is larger than threshold value λ. It reflects the technology advantage the enterprise has in technology domain F;

Patent/invention patent good quality ratio:

$$\frac{\text{Patent/invention patentgood quality number}}{\text{Number of granted patent/invention patent}};$$

Overseas patent application number: Overseas patent application number that the enterprise owns in technology domain F;

Overseas patent application ratio:

$$(\text{Overseas patent application number})/(\text{Number of granted patents});$$

Granted patent/Invention patent average claims number: A patent often has several claims, so as to expand the scope of claims. Granted patent/Invention patent average claims number embodies the innovation subject's exclusive capacity in technology domain F. So it could be a valuable reference to patent technology value.

(4) Research and development ability index *D*

Cooperation density: The ratio of joint application number by the enterprise and its cooperators in technology F to its total patent application number. It reflects the ability of the enterprise to share outer knowledge;

Technology scope: The IPC categories number of the patents that the enterprise has applied in technology domain F. It reflects the enterprise's ability of knowledge coverage;

Technology circle: The ratio of the number of the patents that the enterprise has applied in technology domain F to its time-span, that is, the patent application number per unit time. It reflects the innovation speed of the enterprise;

Technology relative growth potential: The ratio of the enterprise's patent application number in the first half to patent application number in the second half in technology domain F, using the Tm year as a time cut-off, we split the period into the first half and the second half. It reflects the attention to the technology that the enterprise pays recently;

Patent average growth rate: The average of the patent number per unit time to the time unit before. It reflects the enterprise's development change state in the domain.

50.3 The Evaluation Method and Steps of the Ability of Enterprise Technology Competition

The detailed steps of the method and steps of the ability of enterprise technology competition are given below:

The first step: Confirming the coefficient of indexes appropriately. In this article, we use the combination method of equal weight method, expert evaluating method and AHP;

The second step: Standardizing the index values. The formula of Standardization adopted is:

$$I_i' = \frac{I_i - E(I_i)}{\sqrt{S_{I_i}}} \tag{50.1}$$

$E(I_i)$ is the average of I_i, S_{I_i} is its variance;

The third step: Computing the value of the ability of enterprise technology competition. Then the coefficient of indexes and the standardized index values are substituted in the formula, the value of the ability of enterprise technology competition is determined. The formula adopted is:

$$V = W_1 N + W_2 E + W_3 T + W_4 D \tag{50.2}$$

W_1, W_2, W_3, W_4 is the weight of patent application and authorization number N, economic value index E, technology value index T, research and development ability D respectively;

Table 50.1 Evaluation results of the ability of enterprise technology competition

The name of the enterprise	Rank	Number index	Economic value	Technology value	Composite value
Huawei technologies	1	0.7965	0.2377	0.0912	0.3794
Shanghai Jiao Tong university	2	0.3971	0.2541	−0.0041	0.1805
Tsinghua university	3	0.1181	0.0668	0.1576	0.1194
Beijing university of posts and telecommunications	4	0.0408	−0.0156	0.0665	0.1036
Huazhong university of science and technology	5	0.1375	0.0773	0.2123	0.0727
Shanghai Lianneng technology	6	−0.1610	−0.0225	0.0611	0.0123
FiberHome telecom technology	7	0.0421	0.0009	−0.1072	−0.0040
ZTE corporation	8	−0.0773	−0.0994	−0.0066	−0.0116
Shanghai institute of optics and fine mechanics, CAS	9	0.0022	0.0546	0.0144	−0.0192
Peking university	10	−0.0847	0.0070	−0.0731	−0.0208
Shanghai optical networking technology	11	−0.1397	0.0478	−0.0185	−0.0364
Yangtze optical fibre and cable company	12	−0.0853	0.0383	−0.0429	−0.0373
Wuhan Accelink technologies	13	−0.0905	0.1043	−0.0106	−0.0399
HUST	14	−0.0910	−0.2047	0.3026	−0.0493
Fudan university	15	−0.1510	−0.0360	0.0614	−0.0541
Jiangsu Huashan optoelectronics	16	−0.0270	−0.1724	−0.2714	−0.0841
Nankai university	17	−0.1468	−0.0555	−0.0504	−0.1056
Liao Xiankui	18	−0.1821	−0.0629	−0.0896	−0.1056
AlcatelLucent Shanghai bell	19	−0.1157	0.0221	−0.1552	−0.1343
Jiangsu Tongguang electronic wire and cable corp	20	−0.1821	−0.2420	−0.1374	−0.1658

The fourth step: The analysis and comparison among the results. Analyzing the scores of the enterprises on every category of indexes and the enterprises' composite scores, we can analyze their respective advantages and disadvantages.

50.4 Practical Studies

We use the 210 patents in Chinese patent data of optical communications technology in the empirical study. We use the companies which number of patent rank top 20 as analysis objects to evaluate and compare their ability of enterprise technology competition.

The final results from the computation of the ability of enterprise technology competition of the 20 enterprises are shown in the following Table 50.1.

The analysis and comparison among the results: The scores of the enterprises on every category of index and the enterprises' composite scores in the technology domain of optical communications are shown on the following bar charts, from Figs. 50.1, 50.2, 50.3, 50.4 and 50.5:

From Figs. 50.1–50.5, we can conclude that:

(1) The enterprises that rank among Top 5 in the composite scores are: Huawei Technologies Co., Ltd., Shanghai Jiao Tong University, Tsinghua University, Huazhong University of Science and Technology, Beijing University of Posts
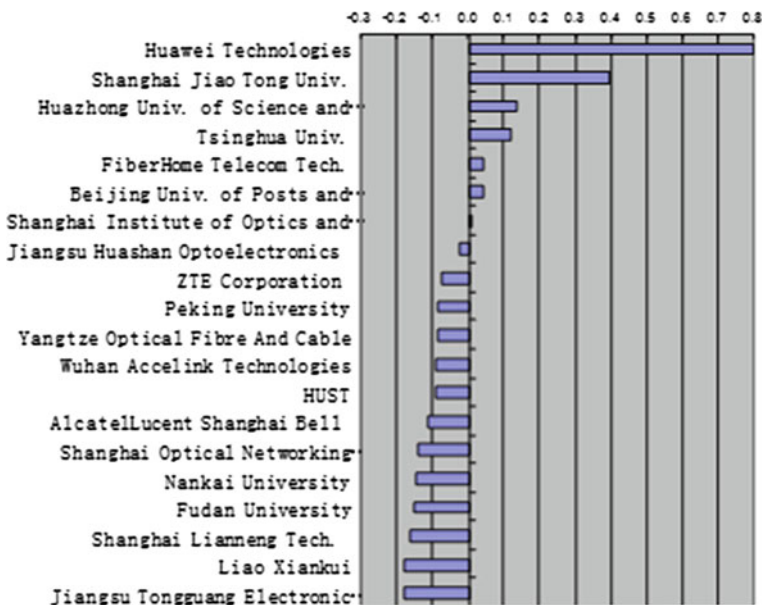
Fig. 50.1 Comparison of the scores of the patent application and authorization number index
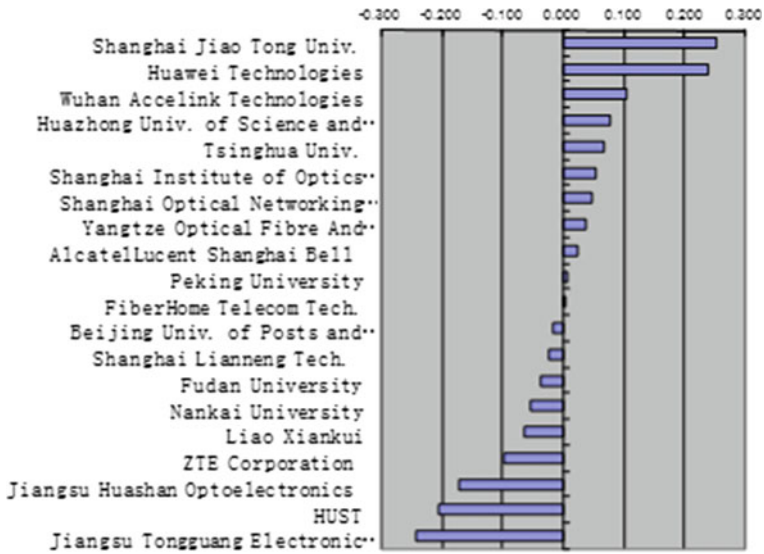
Fig. 50.2 Comparison of the scores of the economic value index

and Telecommunications, the competition capability of the five enterprises in the technology domain of optical communications overall is relatively good. Huawei Technologies Co., Ltd ranks the first with the predominant advantage;

(2) Huawei Technologies Co., Ltd gets higher scores in every category of indexes, which is absolute superiority in the enterprises;

(3) Shanghai Jiao Tong University ranks first in the economic value index of patent; Huazhong University of Science and Technology and Tsinghua
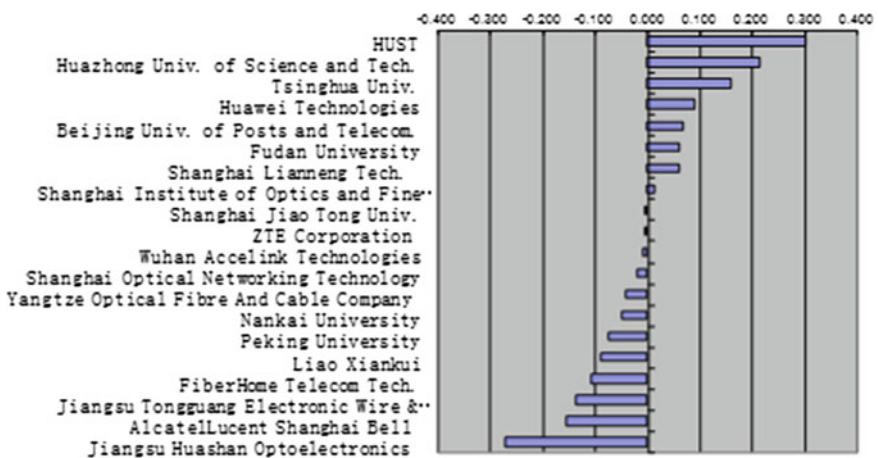
Fig. 50.3 Comparison of the scores of the technology value index
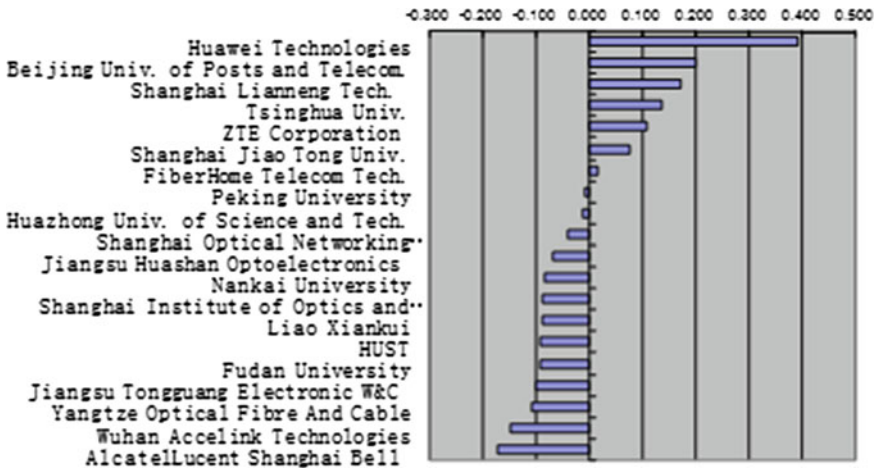
Fig. 50.4 Comparison of the scores the research and development ability index
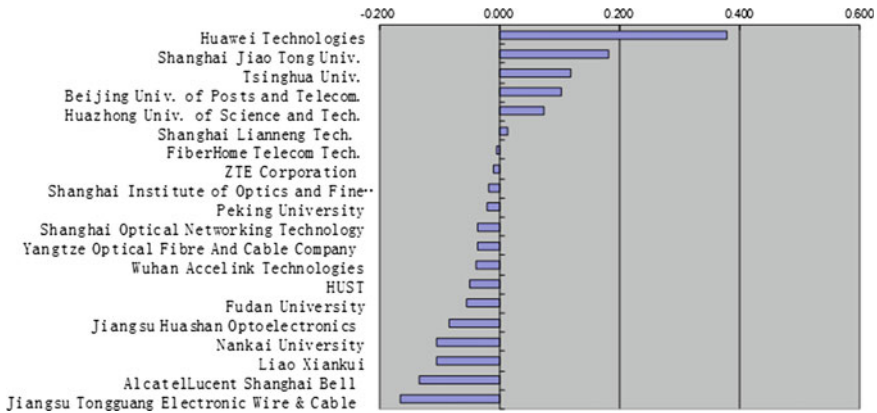
Fig. 50.5 Comparison of the composite scores of the ability of enterprise technology competition

University are in lead in China in Economic value index of patent. The universities and institutes mostly rank higher than companies in the scores of each category of indexes except Huawei.

50.5 Summary

From the evaluation method described above and the empirical study taken, we can know that the method we present overcomes the restrictions of traditional method in which indexes were acquired and measured difficultly. Our method

selects the objective and quantitative information in patent data, with the advantages of being objective, complete and acquired easily, etc. In future, more indexes about economic, market and management may be considered to be added to the evaluation index system.

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Chapter 51
Empirical Research on Factors Affecting Performance Appraisal of State-Owned Agricultural Enterprise

Wei Wang and Chang Wang

Abstract In this article, by taking Beidahuang Group as an empirical case, time series analysis was carried out by using Eviews6.0 software, VAR model for performance appraisal of state-owned agricultural enterprise in China was established, the main factor affecting performance was found out to be institution variables, and the important role of system influence factors in performance appraisal of state-owned agricultural enterprise was analyzed, and then the opinion in which index system of performance appraisal of state-owned agricultural enterprise should include financial benefit, capital operation, debt paying ability, development ability, organization structure and management system was put forward.

Keywords Performance appraisal · Time series analysis · VAR model

51.1 Introduction

In the past, in analysis of the evaluation system of performance appraisal of state-owned agricultural enterprise in China, although the method of finance, resource, management, etc., had a certain influence, it was not able to find out the essence solving problems all along [1, 2]. From Coase Theorem we can see that transaction

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cost is certainly generated in business operation, and different rights definition and allocation will bring about resource allocation with different benefit, only by fundamentally changing the property allocation system of the enterprise can organization structure, management level, etc., of the enterprise be adjusted accordingly, and then operational efficiency of the enterprise be promoted. And agriculture is different from other industries, there are some rigidities existing in the demand of its consumers, and there is a relative less influence of external environment like economy, politics, culture, etc., on operating performance of agricultural enterprise, therefore, it appears extremely important to establish reasonable organization structure, management system, etc.

51.2 Pre-processing of Index System and Original Data

As a typical state-owned enterprise in agricultural industry in China, there is certain reference function to taking investigation on Beidahuang Group. Incorporating the conditions of Beidahuang Group, its performance appraisal system can be divided into four quantitative indexes: financial benefit, capital operation, debt paying ability and development ability, and two kinds of qualitative indexes: organization structure and management system are added at the same time, and then methods of experts marking and questionnaire survey are adopted to assign values to them [3–5]. In this article, 7 year data of Beidahuang Group from 2004 to 2010 were selected and standardized, see the Table 51.1 for details.

51.2.1 Stability Test of Time Series

Stability test of time series usually refers to unit root test. ADF test was mainly adopted in this article, and was completed through the following three models.

Model 1 (with constant term and trend term):

$$\Delta X_t = \alpha + \beta t + \delta X_{t-1} + \sum_{i=1}^{m} \beta_t \Delta X_{t-i} + \varepsilon_t \tag{51.1}$$

Table 51.1 Relevant data processing of beidahuang group from 2004 to 2010

Years	2004	2005	2006	2007	2008	2009	2010
Financial benefit	0.099	−0.049	0.203	−0.324	−0.207	−1.153	−1.443
Capital operation	−0.339	0.291	0.696	0.582	−0.309	0.984	1.292
Debt paying ability	−0.142	−0.406	−0.308	0.106	−0.538	−0.356	0.202
Development ability	0.879	0.010	−0.392	−0.314	−0.656	−0.491	0.904
Organization structure	0.420	0.420	0.420	0.500	0.500	0.620	0.700
Management system	0.620	0.620	0.620	0.620	0.700	0.700	0.820

Model 2 (with constant term and without trend term):

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{i=1}^{m}{}^{i=1}\beta_t \Delta X_{t-i} + \varepsilon_t \qquad (51.2)$$

Model 3 (without constant term and trend term):

$$\Delta X_t = \delta X_{t-1} + \sum_{i=1}^{m}\beta_t \Delta X_{t-i} + \varepsilon_t \qquad (51.3)$$

Examine the above three models in sequence to see whether they were smooth, if they could not pass the test till model 3, it was considered that the time series was not smooth, and difference should be taken for original series, then repeat the above mentioned test sequence till steady state was reached. See Table 51.2 for test results.

From the test results we can see that variable Y, X_2 and their first order differences are smooth under the significance level of 10 %, when the first order differences of variable X_1, X_3, X_4, X_5, X_6 are also smooth, so series I (1) is selected.

Table 51.2 Stability test results of time series

Variable	T test value	1 % critical value	5 % critical value	10 % critical value	Value P	Conclusion
LNY	−10.55993	−10.55993	−3.3350	−2.6242	0.000000	Smooth
DLNY	−7.393572	−4.8875	−3.4239	−2.8640	0.000000	Smooth
LNX_1	−1.544130	−4.6405	−3.3350	−2.8169	0.113361	Not smooth
$DLNX_1$	−5.279411	−4.8875	−3.4239	−2.8640	0.015739	Smooth
LNX_2	−0.422685	−4.6405	−3.3350	−2.8169	0.906176	Not smooth
$DLNX_2$	−3.661641	−4.8875	−3.4239	−2.8640	0.033347	Smooth
LNX_3	−3.717779	−4.6405	−3.3350	−2.8169	0.036178	Smooth
$DLNX_3$	−1.544726	−5.2459	−3.5507	−2.9312	0.230804	Smooth
LNX_4	−1.296652	−4.6405	−3.3350	−2.8169	0.145015	Not smooth
$DLNX_4$	−3.298657	−4.8875	−3.4239	−2.8640	0.018453	Smooth
LNX_5	2.688250	−4.6405	−3.3350	−2.8169	0.104545	Not smooth
$DLNX_5$	−3.171087	−5.2459	−3.5507	−2.9312	0.032082	Smooth
LNX_6	−0.706164	−4.6405	−3.3350	−2.8169	0.712648	Not smooth
$DLNX_6$	−2.939823	−5.2459	−3.5507	−2.9312	0.016783	Smooth

51.2.2 Granger Causality Test

Granger causality test is used for examining if series X is the reasons for series Y. For VAR model with multi-variable, coupled Granger causality tests were carried out by Eviews [6]. See Table 51.3 for test results:

From Table 51.3 we can see that variable X_1, X_5, X_6 generated Granger causality to variable Y, and X_2, X_3, X_4 did not pass Granger causality test. We should know that the conclusion of Granger causality test is only the causality with statistical significance, and not necessarily the real causality, and can't be taken as the final evidence to affirm or negate the causality, but it can be taken as a kind of support to real causality, and has certain reference value.

Parameter estimation of VAR model. According to above mentioned analysis, VAR model was established for variable X_1, X_5, X_6 in this case to carry out parameter estimation for them, and the results are as follows:

- X1 = −1.373121144*X1(−1) + 0.748140139*X1(−2) − 5.976730854*X5 (−1) − 3.286720766*X5(−2) + 2.518806921*X6(−1) + 2.509748498*X6 (−2) + 6.440820302
- X5 = 0.3791459775*X1(−1) − 0.2050020121*X1(−2) + 2.152768013*X5 (−1) + 1.753078673*X5(-2) − 1.067180463*X6(−1) − 0.7298320227*X6 (−2) − 1.226415342
- X6 = −0.03833064037*X1(−1) − 0.1021433273*X1(−2) + 1.425174075*X5 (−1) + 0.6395089513*X5(−2)−0.9002860577*X6(−1) − 0.4332088185*X6 (−2) + 1.338473015

Table 51.3 Results of Granger causality test

Null hypothesis: no Granger causality exists	Value P	Conclusion
$LNX_1 \rightarrow LNY$	0.03197[*]	Null hypothesis is refused
$LNY \rightarrow LNX_1$	0.13919	Null hypothesis is accepted
$LNX_2 \rightarrow LNY$	0.14050	Null hypothesis is accepted
$LNY \rightarrow LNX_2$	0.10483	Null hypothesis is accepted
$LNX_3 \rightarrow LNY$	0.48936	Null hypothesis is accepted
$LNY \rightarrow LNX_3$	0.41713	Null hypothesis is accepted
$LNX_4 \rightarrow LNY$	0.29801	Null hypothesis is accepted
$LNY \rightarrow LNX_4$	0.18752	Null hypothesis is accepted
$LNX_5 \rightarrow LNY$	0.0157[*]	Null hypothesis is refused
$LNY \rightarrow LNX_5$	0.29177	Null hypothesis is accepted
$LNX_6 \rightarrow LNY$	0.02537[*]	Null hypothesis is refused
$LNY \rightarrow LNX_6$	0.22009	Null hypothesis is accepted

Note [*] Indicates that null hypothesis is refused above the level of 10 %

Table 51.4 Test results of each equation of VAR model

R-squared	0.997365	0.996255	0.998152
Adj. r-squared	0.981554	0.973784	0.987063
Sum sq. resids	0.003008	0.001019	0.000423
S.E. equation	0.054848	0.031916	0.020567
F-statistic	63.08124	44.33523	90.01388
Log likelihood	20.19174	24.52353	28.03882
Akaike AIC	−3.297936	−4.380881	−5.259706
Schwarz SC	−3.228425	−4.311370	−5.190194
Mean dependent	0.839582	1.646167	1.922805
S.D. dependent	0.403843	0.197115	0.180823
Determinant residual covariance		0.000000	

51.2.3 Test of VAR Model

Goodness of fit for each equation of VAR model was tested by using Eviews6.0, and lags was determined by using AIC and SC information content. The Test results are as shown in Table 51.4:

From the above table we can see that all results of determination coefficient and correction coefficient of each equation of VAR model approach 1.0, all residual sums of squares are less than 0.01, and standard deviation of regression is small, which indicates that establishment of its equation is good.

51.3 Conclusion

Following conclusion is got by the writer through positive analysis to the index system and model of performance appraisal of Beidahuang Group:

As Granger causality test being performed to the data, value P of organization structure and management system is 0.0157 and 0.02537 respectively, both of which have obvious Granger causality on the result of performance appraisal. Therefore, when VAR model of performance appraisal is established, organization structure and management system are absolutely necessary critical factors.

When VAR model is established by utilizing three indexes of financial benefit, organization structure and management system, the test result of each equation is good, in which determination coefficient and correction coefficient of management system are the largest among the three, and residual sum of squares of it is the smallest, which equation has the highest goodness of fit. In addition, as a minimum value is taken for AIC and SC, lags of equation is 2 which is selected as the optimum lag time. And AIC and SC of management system are less than those of financial benefit and organization structure, in prediction of time series system of these three variables, change of management system variable has certain influence on not only the change of itself, but also the other variables, and finally result in

different performance appraisal results, which shows that management system is an important variable in VAR model.

When VAR model is established, though capital operation, debt paying ability and development ability haven't passed Granger causality test yet, these three indexes should be taken into test scope of performance appraisal according to Detailed Operating Procedure for Enterprise Performance Appraisal. Therefore, index system of performance appraisal of state-owned agricultural enterprise should include financial benefit, capital operation, debt paying ability, development ability, organization structure and management system. And system variable plays a decisive role in performance appraisal, only by improving the system variable of enterprise management can we have its capital structure, organization structure be fundamentally changed, to improve financial benefit, effectively utilize enterprise resources and strengthen continuous improvement ability. Management system is the quintessence of enterprise management, if the enterprise want to become stronger, it should fundamentally reform the management system incorporating its own conditions and conforming to the changes in economic environment, social environment, etc., and finally improvement of operating performance, smooth and healthy development of the enterprise can be achieved.

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Chapter 52
Study of Air Quality in Naturally Ventilated Rooms and Air-Conditioned Rooms

Tianquan Pan and Jinshun Wu

Abstract With today's social progress and economic development, the number of hotel is increasing. While consumer demand has also undergone a qualitative change in the pursuit of comfortable accommodations, they pay more attention to the health and living quality, so high-quality travel and accommodation have become the modern pursuit. The air conditioning makes the hotel year-round warm and cool and natural ventilation also makes the hotel a comfortable and pleasant environment. This article analyzes air quality of air conditioned rooms and naturally ventilated rooms Xingjia Hotel in Wuxing City guest houses and through the combination of the two advantages gives the trend of the design of future hotel rooms.

Keywords Hotel · Air-conditioned rooms · Natural ventilation rooms · Air quality

52.1 Introduction

Since the reform and the opening up, with the national economy's rapid development, people's living standards improve and people are more concerned about happiness and health, and requirements for living environment is also improving. Thus, the air quality problem has aroused widespread concern. Studies show that in both the large building, and the air-conditioned dance hall, restaurant, and the cell floor, the quality of indoor air quality and ventilation and the supporting air-conditioning systems design and use are closely related [1].

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Hotel as temporary living place for modern travel, the pros and cons of their living environment directly affect the customer's physical and mental health and would have a significant impact on the development of the hotels. Hotels mainly have the following effect: (1) to be the base of tourism activities; (2) to promote the development of social consumption patterns and consumption structure and change; (3) to ease the employment pressure to create employment opportunities for the community; (4) to create income from tourism and to promote economic development; (5) to drive the development of other industries. There are different specifications of hotel rooms, and air quality classifications are divided into air-conditioned rooms and naturally-ventilated rooms, and the advantages of the two rooms are different. From the perspective of architectural design, emphasis on natural ventilation, 30 m^3 of fresh air per hour is a basic requirement, but the air conditioning, however, affects the natural ventilation, especially whether the hotel rooms are with air conditioning becomes one of the prerequisites of customer needs [2]. In terms of simple comfort, air-conditioned rooms are welcomed by customers, but for the air quality, many of its customers confirm it's more reassuring for the naturally ventilated rooms, so the study of air quality in the natural ventilation rooms and air-conditioned rooms in the hotel and rational planning of hotel rooms are very necessary [3].

We studies guest rooms in Xingjia Hotel in Wuxing City. By means of detection and analysis of its air quality, according to the results we adjust the type of hotel room, which is of great significance to the development of the hotel [4].

52.2 Indoor Air Quality Overview and Object Selection

For every one of us, about 70–90 % of the time is spent indoors, so indoor air quality is good or bad has impact on human health. In China, per capita living space has not yet been satisfactorily resolved, so it is difficult to improve indoor air quality and take effective measures [5, 6]. Today, as the people's living standards and living conditions continue to improve, we begin to pay more attention to how to have a healthy lifestyle, and improve their health and indoor air quality become a sure thing. Sick Building Syndrome, referred to as SBS and Building Related Illness, referred to as BRI are two types of indoor environment on the health effects. Whether it is Sick Building Syndrome or Building Related Illness, we can improve indoor air quality by improving the living environment, thereby reducing the incidence of these symptoms.

Only take reasonable measures to develop science-based prevention programs and countermeasures on the basis of the sources of pollutants can we ensure good indoor air quality. Enhancing interior ventilation to ensure the ventilation and fresh air in a certain period of time is the most important measures [7]. Of course indoor air quality assessment must have the appropriate standards, and the implementation of our "indoor air quality standards" have been since March 1, 2003, which is the basis of the indoor air quality evaluation. With the development of science and

technology and the emergence of new research, we must revise the existing standards and supplement in order to meet the current requirements. Biological pollution is one of the main types of indoor air pollution, mainly referring to the pollution caused by bacteria, viruses, mold, dust mites, pollen, spores, and cockroaches. The quality of biological pollution levels for indoor air quality is more important evaluation index, and the attention in this regard is not enough.

This article selects the number of bacteria and composition of the important indicators of indoor pollution as the object of comparative study of air quality of naturally ventilated rooms and air-conditioned rooms in hotels.

52.3 Research Methods and Findings

52.3.1 The Objects of Study

Select Xingjia Hotel in Wuxing as the study sites, 5 air-conditioning rooms and 5 tural ventilation rooms, and their areas are 25 m^2 (5 * 5 m), volume is 72.5 m^3; their internal facilities are basically the same.

52.3.2 Research Methods

In each room, select the appropriate test points, and the detection point is set based on room construction area in the middle between 0.9 and 1.3 m. Total number of bacteria is determined in accordance with the commonly used methods of bacterial detection, by the use of ordinary plate storm drain sedimentation method and the prepared ordinary agar medium was placed in the detection point, storm drain 4–5 min, then in accordance with the requirements, finish the research and bring it back to calculate the total number of bacteria in the laboratory, and cultured for 48 h at 37 °C.

In per cubic meter, the total number of bacteria is $\frac{N}{3.14r^2} * 100 * \frac{5}{t} * \frac{100}{3}$; N is Petri dish of bacteria landing number; 3.14 r^2 is plate area, t is the exposure time (minutes). In two detections, one is detection when cleaning, and another is detection after cleaning.

52.3.3 The Detection Time

Noted the time of the hotel guests to get up, to ensure that does not affect the guests to rest and to get true test data, which is scheduled in the time between 8:00 and 10:00 am.

Table 52.1 Total number of bacteria in naturally ventilated and air-conditioned rooms after cleaning

Time	Amount	Air-conditioned rooms			Naturally ventilated rooms		
		Average	Amount exceeding standards	Percentage	Average	Amount exceeding standards	Percentage
8:30	10	16,298	3.08	100.00	15,635	2.92	100.00
9:00	10	54,576	12.61	334.10	35,348	7.82	224.78
9:30	10	36,567	8.09	223.52	11,465	1.86	72.98
10:30	10	8,289	1.07	51.07	5,765	0.44	36.52

Table 52.2 Total number of bacteria in naturally ventilated and air-conditioned rooms before cleaning

Time	Amount	Air-conditioned rooms			Naturally ventilated rooms		
		Average	Amount exceeding standards	Percentage	Average	Amount exceeding standards	Percentage
8:30	10	15,012	2.75	100.00	12,102	2.02	100.00
9:00	10	13,232	2.30	88.17	7,236	0.57	52.15
9:30	10	11,470	1.88	76.29	6,315	0.58	52.16
10:30	10	6,735	0.67	44.96	4,978	0.24	41.13

52.3.4 The Test Results

Detect when the temperature and humidity inside the hotel room was measured according to the detection and calculation the total number of bacteria of natural ventilation and air conditioning room at different times, which are shown in Tables 52.1 and 52.2.

52.4 Results Analysis

52.4.1 Preliminary Analysis

According to test results it is clear that bacteria of the air-conditioned room number are higher than naturally ventilated rooms. Figures 52.1 and 52.2 are excessive bacteria control curves in air-conditioned and natural ventilation rooms before and after cleaning.

After analysis, the bacteria number in the room will change as time changes, whether it is air-conditioned room or naturally ventilated rooms, and the excessive bacteria in the room before the cleaning gradually reduced over time; then it has the highest number of bacteria after getting up; then as no one cleaning, the
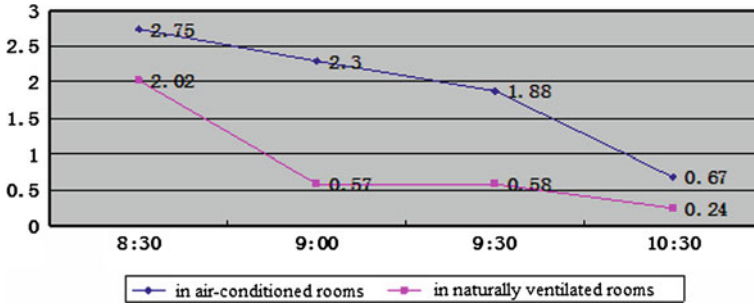
Fig. 52.1 Excessive bacteria control curve in air-conditioned and natural ventilation rooms before cleaning
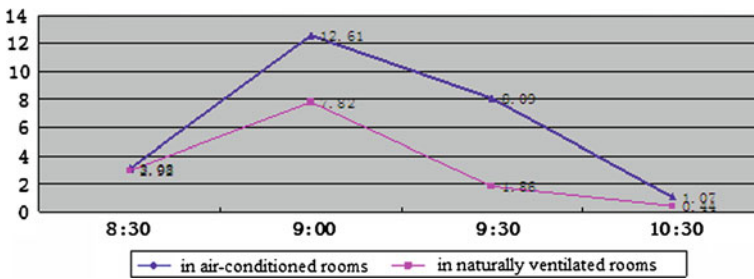
Fig. 52.2 Excessive bacteria control curve in air-conditioned and natural ventilation rooms after cleaning

number of bacteria in two different rooms will be reduced; bacteria begin to rise after cleaning to the second detection of bacteria exceeded a multiple of the maximum and then decreased. I believe that is because the cleaning makes the increase in the number of airborne bacteria, bacterial super-multiples of the room will be a sharp decline until the time of the cleaned up after some time.

By comparison, the air-conditioned rooms' bacteria number is always higher than naturally ventilated rooms, so to enhance natural ventilation is to reduce the total number of indoor bacteria, and cleaning is the main cause of secondary pollution, but this cannot conclude the air-conditioned room air quality is poorer than naturally ventilated rooms. There is the need for further analysis.

52.4.2 Deep Inspection

Although the number of bacteria obtained from the macroscopic response be processed there and air quality, but to draw the exact results, but also on the bacterial composition further research and identification, analysis of bacterial components.

Table 52.3 Fungal ingredients in air-conditioned and naturally ventilated rooms after cleaning

Type	Naturally ventilated rooms		Air-conditioned rooms	
	Average percentage (%)	Range (%)	Average percentage (%)	Range (%)
Penicillium	24.6	11.2–40.8	15.8	8.1–30.4
Spore	43.8	21.7–57.9	54.7	34.3–63.2
Aspergillus	13.7	6.4–18.1	12.9	6.0–25.7
Yeast	8.1	3.5–15.2	7.8	4.7–18.1
Others	9.8	4.4–16.1	8.8	5.1–17.5

Fig. 52.3 Fungal ingredients in air-conditioned and naturally ventilated rooms after cleaning
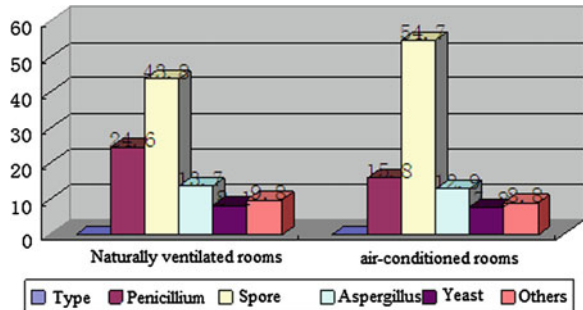
Analysis through the study of bacteria, Gram-positive bacteria accounted for most (about 78 %); composition of the fungi is shown in Table 52.3.

Fungal ingredients are mainly spores, and the percentage of the various components are drawn in curves and shown in Fig. 52.3.

From Table 52.3 and Fig. 52.3, we can analyze whether it is air-conditioned rooms or natural ventilation rooms, various types of fungi in the proportion remained at a relatively balanced level, and spores percentage is relatively higher in the air-conditioned rooms; other types of fungi is relatively higher in the natural ventilation conditions.

52.5 Conclusion

Based on the above findings and through comparative study of air quality of the natural ventilation rooms and air-conditioned rooms in the hotel, we know that the bacterial number of air-conditioned room is more than the naturally ventilated rooms, and the bacterial composition in terms of overall similarity, proportion of various types of fungi is stable, but the proportion of spore is higher in the natural ventilation room, but the air quality under the two conditions are able to meet the normal hotel use. Through comparative analysis of the data, we can clearly see that the air quality in the hotel room is good or bad is not just related to air conditioning and natural ventilation, but also to human factors, and the impact on air quality

factors are very complex, which must be considered in order to make hotel rooms have the best living environment. Hotel rooms are designed to comprehensively consider the local climatic conditions, surrounding environment, and among other factors, to achieve the organic combination of natural ventilation and air conditioning systems. It is necessary to consider the space ventilation advantages and the good effects of natural ventilation so as to create a comfortable environment for both customers and the staff.

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Chapter 53
A Customized Services Model Based on Web Applications in Cloud Computing Environment

Kunqiong Li, Yuan Fang, Huali Tang, Xiao Liu and Jishen Liang

Abstract With the rapid development of Internet and mobile networks, there have been more and more Web applications. But most of them use closed services model so that users can not customize or change the applications. Against the Web2.0 background, this paper proposes a customized services model in the cloud computing environment. The mode has Web applications packaged into functional components which can be customized by users and make users to be creators and callers of Web applications, not limited to ordinary users. This service model breaks the tradition that users passively use Web applications, what's the most important; it's a new customized services model of Web applications which has extensive using value in Web2.0 environment.

Keywords Cloud computing environment · Customized · Web applications · Services model

53.1 Introduction

With the rise and development of Web2.0 user's identity has been changed, not only consumers of Internet, but also creators of Internet's content. Therefore the fields of Internet applications is changing the traditional service concept and pay

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more attention to service model's innovation to improve user's participation and experience and allow users to conveniently access a variety of resources, creating individual and customized applications.

Mashup which originates from the traditional Internet is a kind of technology that obtained datas from different sources on the Internet to form integrated web site or applications [1]. As a representative service model for the Web2.0 applications, Mashup has caught the attention of many researchers and developers. Literatures [2, 3] all introduce typical Mashup applications about map [4]. In addition, there are many other Mashup applications such as search and shopping Mashup, news Mashup, Microblog Mashup. Of course, the Mashup concept based on mobile Internet has also become the development trend and the literature [5] introduced the architecture, challenges about Mobile Mashup applications. However, both for Internet and mobile Internet Mashup applications [6], users can not modify or customize them, not to mention that ordinary users or developers could quickly and easily integrate these Mashup applications into their own Web applications or Web sites in the form of functional components. In this process, the user is not only simple users of Internet applications, but also creator and caller of Internet applications; what's more, it's not the API-level calls, but the functional component-level calls. In order to allow ordinary users who do not have Web development experience or technical background also to customize and create Internet Web applications, this paper presents a kind of customization services model for Internet Web applications. This model makes the user who does not understand how to call Web applications' APIs or how to develop Web applications can create, customize and invoke Web applications at functional components level according to their needs, greatly enhancing users' experience and participation.

53.2 Customized Services' Structure for the Internet Applications in the Cloud Computing Environment

Mashup is an aggregation of contents, which combines information from multiple sources into a new application [7]. Mashup is one of the representative technologies of Web2.0 which has characteristics such as simplification, users' involvement, personalization, resource reuse [8]. The Mashup technology will become the bridge of mobile telecommunications network and Internet's integration at the business level in the future [9]. This paper presents a kind of customized services' structure for the Internet applications in the cloud computing environment based on Mashup as shown in Fig. 53.1.

In the architecture, the services' creation and execution environment for Internet applications based on Internet infrastructure can be divided into the
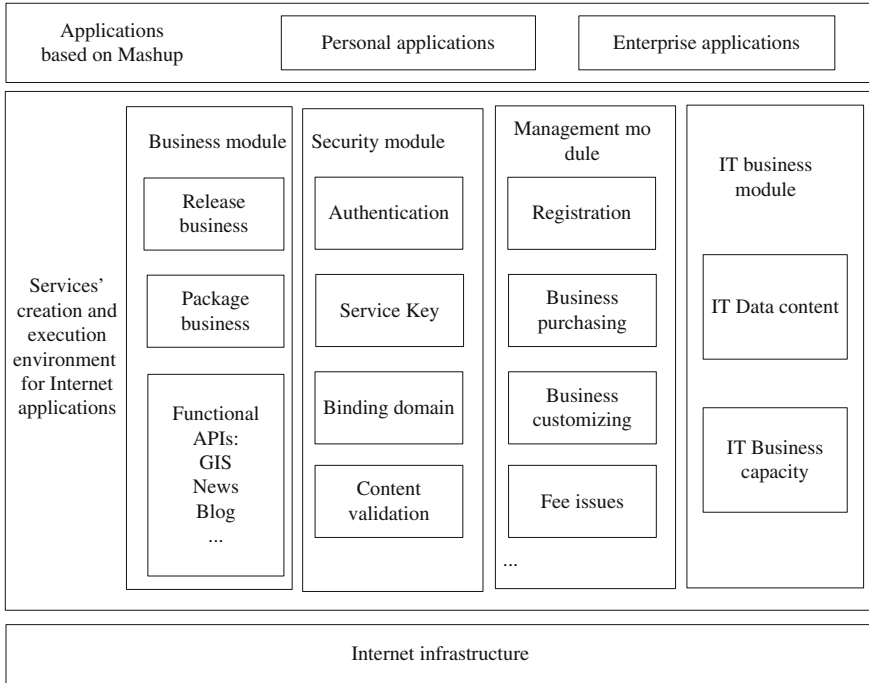
Fig. 53.1 Customized services' structure for the internet applications

business module, the security module, the management module, the IT business module. For the business module, Internet applications' APIs are packaged and open to developers; The security module is mainly responsible for users' information and application-related security issues, such as authentication both for users and applications; The management module is mainly in charge of registration information of users, purchase management for services capacity and release management of applications; The part related with Internet data and business is included in the IT business module. The customized services' structure for the Internet applications in the cloud computing environment makes developers to create a variety of Mashup applications rapidly and conveniently including personal applications and enterprise applications deployed at Internet business level.

Based on the business architecture above, the customized Web application designed in this article makes users create functional components of their own. The most important thing is no longer just using the services provided by applications, but users can customize and call these functional components. What's more, users can add these functional components to their own Web applications or web sites.

53.3 Customized Service Model of Internet Applications Based on Mashup

The customized maps application designed and implemented in this article is the concrete manifestation of the customized services model. Its main function is to provide inquiry and mark functions of accurate location information. The maps application is shown as web pages where users could enter a location name to get a map component and on the map canvas location information inputted before as well as surrounding geographic information are marked. The component's final code is shown as HTML code which users can add to their Web applications or sites so that to add the customized maps application.

53.3.1 Architecture Design of Customized Maps Application

As the Fig. 53.2, the customized page on the client collects users' customized information and sends them to the server-side which makes integration of these information and Web resources including maps function API, JS function scripts. The server will generate codes of the customized maps application and return them to the client's pages. In this way, users can get generation code of the customized application through a browser and directly call the maps application in the form of functional components. The generation code mainly includes addresses of many Web resources such as JS files' addresses, pictures' addresses, dynamic scripts' addresses, Web APIs' addresses. The code is packaged into HTML elements such as <iframe> or <div> so that users could easily add the customized maps application through HTML elements.

53.3.2 Business Processes of Customized Maps Application

On the customization page of the maps application, users firstly should input accurate location information which they want to search. This is very important because the server will mark the address on the final maps application. What's more, users could select the final maps application's styles such as the size. All of users' customization information above will be integrated into the final maps application.

After users' customization to the map application completed, the customization information is submitted to the server-side and to be integrated with other Web resources, and then you will see the preview of the map application through a browser on the client-side. In the map, we can see the location information which the user inputted during the customization process and also we can drag the tag in
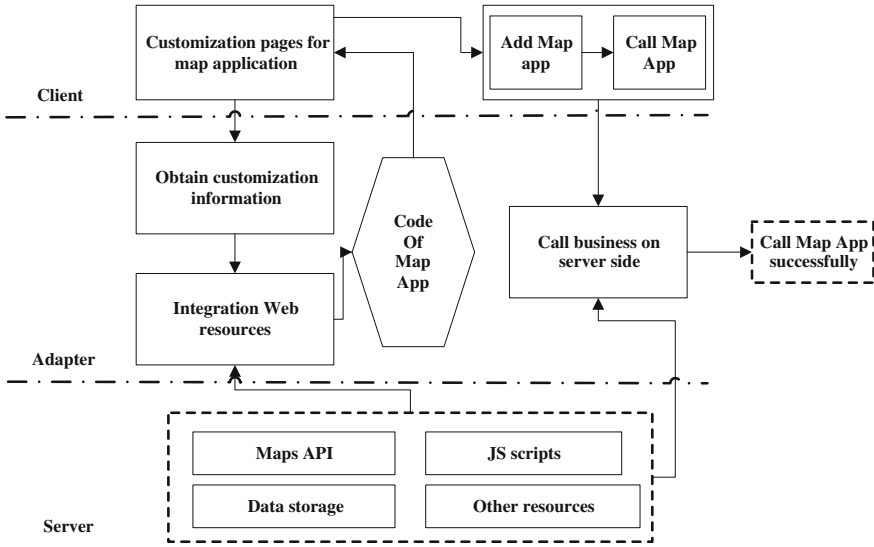
Fig. 53.2 Architecture design of customized maps application

the map to have a look at surrounding location information. At the same time, users could get the maps application's generation code through browsers and copy them into their own Web applications or sites to add the map.

53.4 Summary

With rapid development and diversification of Internet applications, users' participation becomes more and more important and they will play an important role in construction of the Internet [10]. Some Web service providers have opened their function APIs which are the foundation of Internet applications and innovative services model [11]. The customized services model based on Web applications in cloud computing environment makes users could create and customize Web applications according to their own needs. What's the most important, this kind of services model makes Web applications' calling more flexible and users' participation more greatly increased. This new services model for Web applications will further promote the development of Internet applications.

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Chapter 54
Study on Revolving Reserve Optimization Model Considering Demand Response

Na Yu and Guoqing Li

Abstract Traditional dispatching model could not suit the requirement in power market, optimal dispatching model considering demand response has been established by using optimal theories of bi-level programming. The optimal dispatching results could be obtained with objective of minimizing the operating cost and constraint-set of post-contingency, definite the responsibility of members in the power market. At last, we took an IEEE-30 test system as calculation case demonstrates the validity and rationality of this proposed model. This work is supported by NEDU Doctoral Scientific Research Foundation (BSJXM-201012).

54.1 Introduction

In the power market environment, there are different uncertain factors in power system operation. And these factors may destroy the balance of power supply and consumption, in [1–3]. To assure the power supply reliably and stably operation at certain risk level, the reserve is need to defend the emergency cases. With the development of the demand side action, the reserve can not only be obtained from the generation side but from the demand side. The customers in the DSM are taken as a kind of substitutable resource in the power system dispatching, in [4]. Thus the mode of tradition reserve is changed. As one of the important content in the demand

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response the interruptible load is close related with the safety and economic operation. The interrupted load can be dispatched as reserve resource when the system supply is tense or the system is short of reserve capacity to release the pressure from the system reserve shortage during the peak load, in [5, 6].

With the maturity of the power market the traditional optimal dispatch is difficult to balance the economic and safety when considering the expected contingency. And the probability method is a good way to coordinate the severity in expected contingency set and the possibility of occurrence. This way is according to the real active power dispatch in the power market, in [7]. Thus when the demand side is active in the power market, how to coordinate the system's safety and economic is hot issue. The scholars did lot of work in study of demand side in economic dispatch. In [8] the minimum of purchased generation side reserve capacity and interrupted load cost is the goal and probability character of the unit operation is considered and on this basis the economic optimal reserve capacity is obtained. In [9] the bidding mode of demand side attending the reserve market is studied. In [10] the interruptible load is taken as reserve recourse. The principle of interruptible load is presented and the reserve theory is used to erect the quantity model of reserve capacity. In [11] the power purchasing cost and the customer black out loss minimization is the object, based on the insurance theory a new reserve capacity acquirement and dispatching mechanism is presented. In [12] the customer attending the reserve capacity is introduced in the competition, the customer benefit maximization is the object function, a power flow based energy and reserve capacity market united optimization model is presented. In [13] the risk factor in system operation is considered, the interruptible load is introduced as the reserve recourse and the optimal model of reserve capacity decision is built.

Based on the analysis above in this paper the bi-level optimal theory is introduced in the power system dispatching model and an optimal dispatching model considering interruptible load is presented. And this model is in the condition of the customers' attending the reserve market dispatching, and the system operation environment in the initial power market is also included. In this model based on considering the system operation cost minimization the interruptible load re-dispatching cost led by the uncertain factor is also considered. The system's safety and economic are correlated by bi-level. Thus the safely economic equilibrium dispatching is perfected. In the end an IEEE 30 bus test system is used to test the exactness and feasibility.

54.2 Mathematical Express of the Model

54.2.1 Express of Expense Function

In the model of this paper, in the condition of given unit commitment the active power balance and relative constraints in some state are considered. The unit cost function represents cost of the generator, and the interrupted load cost such as

compensation function represents the demand side cost. The compensation function representing the demand side cost is expressed as simple equation.

The operation cost characteristic function of the ith unit is expressed as following:

$$c_i(p_i) = a_i p_i^2 + b_i p_i \tag{54.1}$$

In which, p_i is the output power of the ith unit; a_i and b_i are the constants of the operation cost; $c_i(p_i)$ is the operation of the ith unit when the output of it is p_i.

The demand response model takes the customer low price discount model in [13]. And the implement method is also taken the method in [13]. The electricity price is supposed to be ρ_0, the electricity discount function is as following:

$$d_j(\Delta p_{Ij}) = u_j + v_j \Delta p_{Ij} \tag{54.2}$$

The amount less than normal from the interrupted load customer in the jth node is as following:

$$c_{Ij} = \rho_0 d_i(\Delta p_{Ij}) \tag{54.3}$$

In which, Δp_{Ij} is the interrupted load in the jth node; u_i and v_i are the intercept and slop of the customer's discount rate function, and they are given; c_{Ij} is the interruptible load cost in the jth node when there is Δp_{Ij} curtailed.

54.2.2 Dispatching Model

In this paper the system's operation state is considered during dispatching process. The influence of the uncertain factor on the system's operation state is quantified. The customer's duty allocation in the market when he attends the dispatching is cleared. And the bi-level optimal model is used to build the optimal dispatching model as the customer's attending in the market is considered. The expression of the model is as following:

The object function is

$$\min \sum_{i=1}^{NG} c_i(p_i) \tag{54.3}$$

In which, NG is the amount of the generators.

The constraints is s.t.

$$A_G P_G - A_f P_f = P_L - \Delta p_{I0} \tag{54.4}$$

$$A_C X P_f = 0 \tag{54.5}$$

$$p_i^{\min} \leq p_i \leq p_i^{\max} \tag{54.6}$$

$$p_f^{\min} \le p_f \le p_f^{\max} \tag{54.7}$$

$$\min \sum_{j=1}^{N} c_{Ij} \tag{54.8}$$

$$\text{s.t} \sum_{i=1}^{NG} s_i + \sum_{j=1}^{N} \Delta p_{Ij} \ge p_i \tag{54.9}$$

$$0 \le \Delta p_{Ij} \le P_{Lj} \tag{54.10}$$

In which, A_G is the association matrix between generators and nodes; P_G is the vector of system generators output; A_f is the association matrix between nodes and branches; P_f is the vector of transmission power in system branches; P_L is the vector of load active power in each system node; Δp_{I0} is the vector of initial allocated interruptible load in each system node; A_C is the association matrix between independent loop and branches of power system; X is the diagonal matrix of the branches reactance; $p_i^{\max}$ and $p_i^{\min}$ are the up and low limits of generate units separately; $p_f^{\max}$ and $p_f^{\min}$ are the up and low limits of branches active power outputs separately; N is the number of system nodes; s_i is the reserve capacity served by the ith unit; Δp_{Ij} is the interruptible load changing of the jth node; P_{Lj} is the load in jth node.

Equation (54.4) is the active power balance equation; Eq. (54.5) is Kirchoff current law equation, namely the power in one node is balance; Eq. (54.6) is the unit's power output constraint; Eq. (54.7) is the branch power flow constraint; Eq. (54.8) is the customer interruptible load cost; Eq. (54.9) is the customer load constraint; Eq. (54.10) is the amount of customer's interruptible load constraint.

54.2.3 Model Analysis

The model consists of Eqs. (54.3–54.10) is the bi-level optimal dispatching model considering interruptible load. Equations (54.3–54.7) consist the up level model of the bi-level optimal model, we call it M1. Equations (54.8–54.10) consist the low level of the bi-level optimal model, we call it M2. Model in this paper takes some time section as study object and coordinate safety and possibility of expected contingency occurrence. Thus the optimal balance dispatching mode between economic and reliability is given. The goal of optimal model M1 is system operation cost and the active outputs of the units is the optimal variants; the network flow as the constraints condition considered the system power flow balance constraint which reflect the interruptible load attending the system reserve dispatching mechanism.

The goal of optimal model M2 is the interruptible load dispatched cost minimization. By the optimal variants Δp_{Ij}, p_i M2 and M1 form a bi-level optimal

model. The implement process of this bi-level model as following: After the optimization of M1 it transmits information to M2 by variants. And with these information M2 makes reasonable decision according to its own object and constraint conditions. Model M1 makes integer optimal model decision by these results, namely global optimal solution. Through the solution of bi-level program model, the bi-level program model optimal solution of each own model optimization can be reached. The reliability and economic of the system operation can be coordinated. The economic optimization can be realized based on the reliability of system is satisfied.

54.3 Model Solution

By the analysis of the model, we know this model is a optimal model which has two levels recursive structure. The up level and down level problem have their object functions and constraint conditions. During the resolving process an optimal variable is given in the up level, and then this optimal variable is taken as participant in the low model. The low level model makes reasonable reaction based on its own object and constraints and feeds this reaction back to up model. The up level optimal model reaches global optimal solution on the condition of whole constraints based on this feedback. We can see that the low level optimal model feeds the optimal solution back to up level optimal model. Thus this dispatching model is changed to standard bi-level optimal model as following:

$$\min_{x \in X} F(x, y) \tag{54.11}$$

$$\text{s.t.} \quad Q(x, y) \leq 0 \tag{54.12}$$

$$\min_{y \in Y} f(x, y) \tag{54.13}$$

$$\text{s.t.} \quad q(x, y) \leq 0 \tag{54.14}$$

In which, F, Q, f and q are the object function, constraints condition of M1 and M2 separately; x and y are optimal variables of model M1 and M2 separately. For the bi-level program model above there are normal solutions such as Kuhn-Tucker algorithm, steepest decent, penalty function algorithm and branch and bound algorithm. With the character of the model in this paper the Kuhn-Tucker algorithm is taken to solve this model. The K-T condition is used to substitute the optimal solution of the low level model, and when the up level model solves own problem should consider the optimal solution of the low level model. Thus Eqs. (54.11–54.14) can be changed to single level optimal model. The expression is as following,

Table 54.1 Generator unit characteristic data

Unit number and the node number	$P_G^{\max}$	$P_G^{\min}$	a	b
G1(1)	2.0000	0.5000	37.5000	200.000
G2(2)	0.8000	0.2000	175.000	175.000
G3(5)	0.5000	0.1500	625.000	100.000
G4(8)	0.3500	0.1000	83.4000	325.000
G5(11)	0.3000	0.1000	250.000	300.000
G6(13)	0.4000	0.1200	250.000	300.000

$$\min_x F(x, y) \tag{54.15}$$

$$\text{s.t.} \quad Q(x, y) \leq 0 \tag{54.16}$$

$$\nabla_y f(x, y) - \lambda^T \nabla_y q(x, y) = 0 \tag{54.17}$$

$$\lambda^T q(x, y) = 0 \tag{54.18}$$

$$\lambda \geq 0 \tag{54.19}$$

$$q(x, y) \leq 0 \tag{54.20}$$

In which, λ is Lagrange multiplier of Eq. (54.18); ∇_y is the differential coefficient of the low level model's optimal variable. Thus Eqs. (54.15–54.20) form a quadric program model. The prime-dual initial point algorithm is used to solve this model. The solution process of the model is as following,

1. Give the initial operation state of the system and the load mode;
2. Build standard mode of bi-level program model;
3. Change the bi-level program mode with Kuhn-Tucker algorithm;
4. Build a bi-level program model as Eqs. (54.15–54.20);
5. The prime-dual initial point algorithm is used to solve the model in step 4.

54.4 Case Study

In this paper the IEEE-30 node system is used to analyze. With the load model given the system's $N - 1$ single generator out fault is considered as expected contingency. Thus the optimal dispatching model is discussed in detail. The nodal load data and branches' active power limitation of the IEEE-30 node system is from [13]. The num.1 generator is the balance generator. The units' parameters are in Table 54.1. The initial output power is in Table 54.2, the unit takes p.u.

With the data in Tables 54.1 and 54.2 the model in this paper in which the operation reserve is considered is analyzed. To analyze the compensation coefficient

Table 54.2 Initial power outputs of generator units

	G1	G2	G3	G4	G5	G6
Initial data	0.4080	0.3532	0.2381	0.3500	0.1024	0.1550

Table 54.3 Dispatching results and analysis

Dispatching result	Case1	Case2
OC	853.9539	884.1402
PG1	1.9787	1.5315
PG2	0.4954	0.3000
PG3	0.1987	0.3500
PG4	0.1000	0.2000
PG5	0.1000	0.1000
PG6	0.1200	0.1200

of the load shedding is 100. The dispatching operation analysis result is showed in Table 54.3.

The optimal dispatching result of the model is showed in Table 54.3. The goal of which is system operation cost minimization. In which, OC is system operation total cost; p_{Gi} is the active power optimal dispatching output of the ith unit; Case1 expresses the dispatching result which the expected contingency cased are considered, and the demand side load attending the reserve dispatching is also considered; Case2 shows the traditional dispatching result which the interruptible load attending the reserve dispatching, namely the model M1 and model M2 are weighted simply. From the analysis of dispatching result in Table 54.3, we can see the cost in Case1 is 853.9539 which is the least. The total interruptible load in the system is 0.1787. The reserve capacity decided by the model in this paper is 1.9787 which just satisfies the single unit maximum capacity. And the re-dispatch capability after the expected contingency may occur can be assured. For Case2, the operation cost is larger; the interruptible load capacity is 0.4315. The supply shortage in expected contingency will not occur, but in this way the interruptible load percentage is larger. The power supply reliability is lowered. Thus it will direct power supply accident in part area and the supply and demand balance of the system is on the premise of system's reliability sacrifice. So this dispatching mode is conservative and the advantage of interruptible load could not be embodied.

54.5 Conclusion

In this paper a new optimal dispatching model based on DC power flow is presented. In the power market environment, the interrupted load in DSM is considered in power system operation dispatching which extends the traditional reserve dispatching operation mode. The bi-level optimal theory is used to realize

different objects' monetary measurement. The different participants' duties, rights, benefits are coordinated. The clarity of the power market is also embodied and the optimal resource allocation is realized.

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Chapter 55
Research on Vegetables Industrialization Demonstration Project Evaluation

Jian-guang Wu, Bang-hong Zhao and Dong-mei Shi

Abstract It is one of effective methods for the assessment of project implementation that is comprehensive Evaluation of the project. This paper searched vegetable industry project of Gaocheng of Hebei Province. It used of some method that is questionnaires, interviews, focus group discussion, case files, files study, and so on. The paper conducted comprehensive evaluation system of enterprise project implementation. Through effective evaluate management of project implementation, the use of funds to the comprehensive evaluation and the output effects, we establishment of the evaluation index system of the vegetable industry projects.

Keywords Vegetables · Industrialization · Evaluation

55.1 Introduction

Hebei province is the national vegetable production in and out, it is one of the eight agricultural products wholesale market in Beijing. In 2009, the province's vegetable output was 67.42 million tons, ranking second place in the country, the sown area reached 1,651 mu, ranking sixth of the country [1]. About 27 % of the province's rural labor force engaged in the vegetable industry, 22.5 % of the farmers' per capita income from vegetables [2]. The vegetable industry has become one of the three leading industries of Hebei agriculture, it plays an

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important role of protected agricultural products reliable and adequate supply and quality of Beijing and Tianjin markets. In recent years, the Hebei Provincial Party Committee and the provincial government attaches great importance to the vegetable industry, constantly increasing financial investment, pay close attention to the construction of production bases, efforts to promote advanced technology, efforts to develop domestic and international markets, the province's vegetable industry has seen rapid development, it has became one of the three leading industries of agriculture [3].

But compared with the developed provinces and increasing demands of rural living standards, Hebei vegetable production layout is scattered and the scale is low degree, product structure is irrational, perfect vegetables is lack, domestic high market and foreign market shared low; market system incomplete, modern logistics development slow; organization and industrialization, level low, the overall efficiency is not high. So the Hebei provincial government made file of "about strengthening the construction of demonstration counties to promote the vegetable industry views on good and fast development", and 15 vegetable production in the province are chosen as the vegetable industry in demonstration counties, the counties (cities, districts) provincial, municipal and county levels of financial funds to support the project counties. By 2015, the province's vegetable planting area will reach 25 million mu, which accounted for more than 60 %, Vegetable output reached 100 million tons, output value reached 200 billion yuan, vegetables income reached more than 25 % of farmers per capita net income [4, 5].

55.2 Construct of Project Evaluation Index System

55.2.1 Design Principles of Evaluation Index

The principle of relevance. Directly linked to performance goals should be able to properly reflect the degree of goal.

The importance of the principle. Should give priority to the most evaluation of object representation, best reflects the core indicators of the evaluation requirements.

The principle of comparability. Similar evaluation of the object you want to set common performance evaluation in order to facilitate the evaluation results can be compared.

Systematic principle. Quantitative indicators and qualitative indicators should be the combination of the system reflects the agricultural financial expenditure arising from social, economic, environmental benefits and sustainable impact.

The principle of economy. Should be readily accessible, user-friendly data access should take into account the actual conditions and operability, cost-effective.

55.2.2 The Construction of the Index System

The evaluation framework of the project is to carry out the core of the project evaluation. According to the evaluation of the guiding ideology, objectives and basic principles, combined with the characteristics of modern agricultural development projects, the design of the project evaluation focused primarily on project management, management indicators (such as project location, budget preparation and reporting, process management, etc.), project output indicators (quantity, quality, timeliness, cost savings, etc.) and implementation of the project impact indicators (economic, social, eco-efficiency, sustainable impact, etc.). Based on the actual situation of the construction project of the vegetable demonstration counties in Hebei Province, the project team designed a framework for evaluation, designed the three-level indicators, 10 two indicators, 21 three evaluation indicators in Table 55.1

55.3 Comprehensive Evaluation Method

Integrated for various values of the indicators to the appropriate choice of methods commonly used are the weighted arithmetic mean, weighted geometric mean of the distance method. In this paper, using the weighted arithmetic mean as the final result of the comprehensive evaluation. Evaluation of the basic steps is as follows:

Selected evaluation indicators. This is the premise of an objective assessment of the situation of agricultural industrialization, the choice of different evaluation indicators, reflecting the different goals. A comprehensive evaluation of the industrialization of agriculture related to many of the indicators, we chose in front of the indicators proposed system as an evaluation index.

Determine the index weights. We subjective chain weighting method and the combination of objective correlation coefficient weighting method to determine the weights, the composition of each weight set.

Create a comprehensive evaluation model. Draw a composite index of the region, reflecting the implementation effect of the vegetable industry projects in the region as a whole, the composite index of the overall implementation of the project of the size of the vegetable industry effects were positively correlated, that is, the greater the index, the vegetable industry in the overall project implementation effects as possible.

Table 55.1 Vegetable demonstration county building project performance evaluation framework

Level indicator	Two indicators	Three indicators	Evaluation criteria and indicators explained	Reference weights
A Management indicators 30 point	A1 Project decision making 6 point	A11 Goal setting	Project objectives are clear, detailed, quantified	2
		A12 Basis for decision making	The project conforms to the economic and social development planning and the department's annual work plan, in line with actual local conditions	4
	A2 Fund management 11 point	A21 The implementation of funding	Project funding actually in place and plans in place consistent	2
		A22 The use of funds	Funded entirely according to plan, there is no violation spending and misappropriation, interception of	4
		A23 Financial management	Sound system of management of funds, expenses, and strictly enforced; accounting norms	5
	A3 Project management 13 point	A31 Organization	Sound project management, a clear division of labor	4
		A32 Management system	Sound project management system	4
		A33 Project monitoring	Monitoring the progress of the project	5
B Output indicators 40 point	B1 Quantitative indicators 18 point	B11 Production capacity	Vegetable acreage	18
			Intensive nursery area	
			Annual increase vegetable production	
		B12 Disaster prevention capabilities	Pest control area	
	B2 Quality indicators 14 point	B21 Cultivated land use efficiency	Multiple crop index raise rates	6
		B22 The vegetables high quality rate	New pollution-free vegetables of quality rate	8
			New green vegetables of quality rate	
			New organic vegetables of quality rate	
	B3 Cost index 8 point	B31.Cost savings	Water per cost saving rate	4
			Fertilizer cost saving rate per hectare	2
			Drug cost saving rate per hectare	2

(continued)

Table 55.1 (continued)

Level indicator	Two indicators	Three indicators	Evaluation criteria and indicators explained	Reference weights
C Performance metrics 30 point	C1 Economic effects 12 point	C11 Vegetable output value	Vegetable production value	4
		C12 Net income of vegetables	Vegetable growing income	4
		C13 New farmers'net income of vegetable cultivation	The per capita net income of vegetables planting	4
	C2 Social effects 9 point	C21 Benefit farmers scale	Benefit farmers number	5
		C22 The proportion of adjustment of industrial structure	Vegetable industry in the proportion of rate	4
	C3 Ecological effects 3 point	C31 Groundwater levels drop deep	Groundwater depth situation	3
Total score				100

55.4 An Empirical Analysis of the Vegetable Industry in Hebei Province Project Evaluation

55.4.1 Evidence Collection and Analysis Methods

Requirements for evaluation purposes, the evaluation team used a variety of methods to collect the evaluation of the necessary evidence, which mainly include:

Of case. In-depth study of relevant policy documents and project files, comparison and analysis, including: the relevant documents of the country provinces and cities on the support and management of modern agricultural projects; specific projects, project feasibility study report, project implementation plan, project reports, project inspection reports, project implementation and completion of the report.

Internet retrieval: to retrieve the newly introduced policies and regulations, and policies and regulations associated with modern agricultural development projects on the Internet.

Interviews: all levels of project-related person in charge of in-depth interviews, interviews to understand the overall project implementation.

Forum: for the use of funds, through the implementation of the project the social and ecological effectiveness of the convening of provincial forum; the same time, the relevant staff forum held in the research area.

Questionnaire: The questionnaire is one of the primary means of data collection in social surveys. The evaluation team based on the evidence collection requirements design the questionnaire for farmers.

Field research: in the project area to conduct field research to understand the real situation, and have first-hand information.

55.4.2 An Overview of the Project Area

Gaocheng located southwest of Hebei Province, Shijiazhuang City East. Gaocheng integration program in 2010 involving 721 Xiao Xiang, the main content of the new excellent greenhouse, greenhouses, net shed and small and medium-sized greenhouse; pollution technology; vegetable cooperatives, public facilities construction and agricultural high-tech parks and processing zones. New development of the greenhouse through the implementation of the project have been completed 2,406 acres, 3,594 acres of greenhouses, total new facilities in an area of 6,000 acres, and promote the construction of a contiguous high-grade greenhouse has been built above contiguous acres of the fifth generation of greenhouse and the new greenhouse and high standards of nursery center, not only vegetable production facilities rapid development, while increasing the edible fungus, large-scale planting of virus-free potato varieties.

55.4.3 Evaluation of Vegetable Industrialization Project Implementation

According to the evaluation of design requirements, evaluation of the Gaocheng vegetables industrialization projects including the evaluation of the project management indicators, output indicators for the evaluation and the evaluation of the efficiency indicators.

Management indicators: two indicators in the management indicators include indicators of the project's decision-making, money management and organizational management.

Management indicators: two indicators in the management indicators include indicators of the project's decision-making, money management and organizational management.

The project's decision-making major changes included the set project goals and annual goals, including the construction of the project location, coverage area, the construction content, use of funds, organization and management, implementation effect and other aspects of setting goals and annual goals and specific quantification. Assessment of the decision-making is mainly based on the project site selection in the potential for increasing production efficiency in agriculture, a significant demonstration effect, sufficient preliminary work, and complete construction planning areas, and can focus on contiguous building.

The fund management of the project: financial management assessment content for the availability of funds, usage and management.

Project Management: The assessment of project management including project organization, management systems and project monitoring.

Project output indicators: the vegetable project output indicators include the number of indicators, quality indicators and indicators of the cost of the vegetable output after the implementation of the project.

Quantitative indicators: assessment of the number of indicators including vegetable cultivation area of new facilities, new intensive nursery area, annual vegetable production, new pest and disease control area, improve the rate of new cooperatives and leading enterprises, as well as multiple cropping index.
The implementation of the evaluation results are shown in Table 55.2.

Implementation of the project's effect: the effect of project implementation including the ecological effects, economic and social effects.

Ecological effects: evaluation of the ecological effects of mitigation for groundwater annual reduction rate.

Social effects: the evaluation of the social effects, including the addition of the number of beneficiary farmers, the vegetable industry in the proportion of the rate. As well as farmers and village collective satisfaction.

Project area additional vegetable output value of 201 million yuan, actually add the vegetables and net income of 1.6 billion yuan to farmers new vegetable growing net income of 2,680 yuan, the actual 8,600 new income farmers, the vegetable industry in the proportion increased to 47.99 %, greatly improving

Table 55.2 Index
evaluations of project outputs

Level indicator	Two indicators	Three indicators	Grade
B.Output indicators 40 point	B_1	B_{11}	2
		B_{12}	4
		B_{13}	4
	B_2	B_{21}	6
		B_{22}	3
		B_{23}	3
	B_3	B_{31}	2
		B_{32}	2
		B_{33}	1.5

Table 55.3 The effect of the
project evaluation

Level indicator	Two indicators	Three indicators	Grade
C Performance metrics 30 point	C_1	C_{11}	4
		C_{12}	4
		C_{13}	4
	C_2	C_{21}	5
		C_{22}	3
	C_3	C_{31}	2

vegetable industry level, the implementation of the project village collective satisfaction 100 %, the farmers were satisfied with 96 %, the implementation of the project has received the praise of the farmers. The effect of the project evaluation in Table 55.3.

The overall effect: According to model calculations, Gaocheng vegetables industrialization projects Total value of 90.4 points, the effect of implementation of the project for excellent.

55.5 Conclusion

This paper regard Gaocheng as example, to evaluate the effects of the implementation of the vegetable industry projects, and on the basis of field visits, the evaluation index system of the vegetable industry projects, provides a good implementation of the project evaluation of the vegetable industry in Hebei Province methods, but also for the standardized operation of the project a reference to improve the efficiency of capital use, speed up the development of vegetable industry, promote the development of agricultural efficiency and farmers' income and rural economic and social coordination, and enhance the agricultural industry service functions and provide the ability of the public service.

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Chapter 56
Research on Cosmetology of Traditional Chinese Medicine

Min Ling

Abstract Along with the rapid acceleration of social development pace, the stress in the life of people living in urban areas gets increasingly greater with each passing day, and especially the environment in which company employee work has become more difficult. In the busy life and work, people begin to be in pursuit of spiritual enjoyment out of materials, and this has created a very favorable condition for the rising of the beauty industry. Cosmetology of traditional Chinese medicine is one of the health protection measures which are very popular at market, and has greatly helped ease the pressures of people in all aspects. Under the situation, the specific characteristics of the cosmetology of traditional Chinese medicine are analyzed, and also the methods of applying it are introduced emphatically in this paper.

Keywords Traditional Chinese medicine · Cosmetology · Characteristics · Methods

56.1 Introduction

In recent years, the economic income level of people has attained a continuous improvement in China, and the stress in the life of people living in urban areas gets increasingly greater with each passing day, and also the pressure caused by the accelerated social development steps will be greater on people later. If people live in such an overload of life for a long term, not only the stable emotion of people

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will be spiritually destructed, and also a great harm will be created to physical health. Cosmetology is a kind of beautification and reconstruction activities, which integrate health and conditioning [1]. Now, the promotion of the cosmetology of traditional Chinese medicine is reform and innovation on medical beauty technology.

56.2 Overview of the Cosmetology of Traditional Chinese Medicine

The increase of the consumption behaviors of people has been promoted greatly by the improvement of the economic income, and the cosmetology of traditional Chinese medicine is an emerging form of consumption in the modern cities, bringing about increasingly more fun for the urban life of modern people [2]. The cosmetology of traditional Chinese medicine is a specialized discipline, which is oriented at researching the prevention of destructive skin diseases and the covering and correction of destructive physiological defects under the guidance of Chinese medicine theory and human body aesthetic theory with Chinese characteristics, mainly achieving the prevention of disease, building up fitness, making people live longer and retain youthful looks, and maintaining and creating the beauty of both mind and body.

The definition of the cosmetology of traditional Chinese medicine in a broad sense is used commonly. The cosmetology of traditional Chinese medicine is a beauty science based on health [3]. In the cosmetology of traditional Chinese medicine, a comprehensive evaluation is made on human's external appearances and internal spiritual outlook as well as temperament, manners, etc. Cosmetology is defined by people in both narrow and broad senses. The cosmetology in a narrow sense refers only to the beautifications and making-up of the five sense organs or the part above neck. The cosmetology in a broad sense comprises of the beautifications of the whole mind and body such as facial appearance, beard and hair, body, limbs, and soul. High importance is attached by the cosmetology of traditional Chinese medicine to the close connection of facial appearance with internal organs, channels and collaterals and blood, and also the oral administration and external application of Chinese herbs, acupuncture, massage, qigong, diet therapy and other methods have given expression to the view of showing beauty through dynamic state, for the purpose of allowing blood of human to be unblocked totally [4]. In the mean time, all these methods are easy-to-use, safe and reliable, and also can play their roles extensively for a long time. The cosmetology of traditional Chinese medicine is with unique characteristics in health and beauty, the treatment of destructive skin diseases, etc. [5, 6].

Fig. 56.1 Characteristics of the cosmetology of traditional Chinese medicine
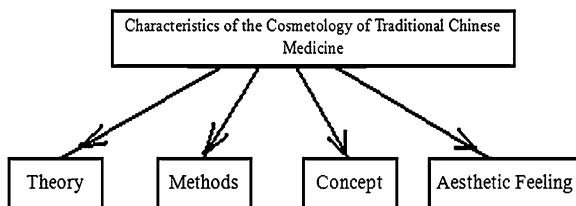
56.3 Characteristics of the Cosmetology of Traditional Chinese Medicine

The core idea of the cosmetology of traditional Chinese medicine is making two great theories (traditional Chinese medical science and cosmetology) integrated together, and finally creating a cosmetic method in an all-round way. From the actual promotion of the cosmetology of traditional Chinese medicine, it can be known that its characteristics can be mainly reflected from four aspects as shown in Fig. 56.1.

56.3.1 Theoretical Characteristics

Professional theory of the cosmetology of traditional Chinese medicine is rich in intension, but not a simple combination of theoretical knowledge. In fact it makes traditional Chinese aesthetic culture and the theory of traditional Chinese medicine integrated together. It is a cosmetic system produced after long-term practice and improvement, and such a theory features long-term and science and is a new method originating from the theory of traditional Chinese medicine, thus providing a new service for a wide arrange of beauty enthusiasts, and promoting the development of the beauty industry of traditional Chinese medicine at the same time.

56.3.2 Method Characteristics

Cosmetic method was single in the early times, in which the surface of human skin was beautified very simply and also the used cosmetic technology was relatively backward. In the beautification process, techniques of traditional Chinese medicine science are applied by the cosmetology of traditional Chinese medicine, which is very significant in the diversity of cosmetic methods. The cosmetic methods, which are used the most commonly in the cosmetology of traditional Chinese medicine, mainly include traditional Chinese herbs, diet therapy, acupuncture, massage, and qigong and so on. These methods can be reasonably selected according to the actual conditions of human body.

56.3.3 Concept Characteristics

As a new cosmetic way, researchers in the cosmetology of traditional Chinese medicine always hold a dialectical attitude in concept, but do not see a cosmetic way partially and simply. For example, importance is attached to the harmony of human tissue in the cosmetology of traditional Chinese medicine. Therefore, it is necessary to give consideration to the cooperation of internal and external organizations of human when using this cosmetic way, not only maintaining the balance between yin and yang, stable internal organs, smooth channels and meridians, and also paying attention to the effect of the new cosmetic way.

56.3.4 Aesthetic Feeling Characteristics

Beautification is not only for improving the health condition of human skin, but ultimately creating different external aesthetic feelings, and providing a more aesthetic external appearance for served objects. The aesthetic feelings the cosmetology of traditional Chinese medicine expresses are an aesthetic art from inside to outside or from external to internal. For example, in the process of ensuring the integrity and flexibility of skin tissue, it is also necessary to lay a stress on the healthy beauty of human internal blood, channels and meridians, internal organs and so on.

56.4 Methods of Applying the Cosmetology of Traditional Chinese Medicine

The cosmetology of traditional Chinese medicine has been promoted in China for a long time, and also has replaced the traditional cosmetology with a gradual step, becoming a new choice of modern people living in urban areas. Considering from cosmetic effects, health effects, and aesthetic effects, it is necessary for the cosmetology of traditional Chinese medicine to combine with the actual conditions of served objects in the selection of cosmetic methods, but not to blindly choose a certain cosmetic method, and otherwise the result will go oppositely to wishes. At present, the main techniques and methods used in the cosmetology of traditional Chinese medicine include taking Chinese medicines, smooth channels and meridians, Qigong, and medicated food therapy, and their detailed applications are shown as follows.

56.4.1 Taking Chinese Herbs

Traditional Chinese medicines are made of different kinds of herbaceous plants, and also are green, healthy, and originally ecological medical herbs. In the

application of the cosmetology of traditional Chinese medicine, it is necessary to combine the theory of traditional Chinese medicine, and also give comprehensive consideration to the proportion of ingredients of herbs as well as preparation forms, ensuring the best cosmetic results achieved. For example, it is necessary to manage the amount of ingredients of herbs, and also strictly control the traditional Chinese medicine forms such as powder, paste, liquid, paste, etc.

56.4.2 Smooth Channels and Meridians

Beautification through smooth channels and meridians needs to rely on external medical equipment, which is usually used for implementing stimulated cosmetic activities on skin tissue, for the purpose of promoting the smooth flowing state of human blood, channels and meridians, and other organizations. The common methods used for the beautification through smooth channels and meridians include acupuncture and massage as shown in Fig. 56.2, and stringent requirements have been made on them. The beautification through acupuncture can be taken for an example: the accuracy in acupuncture points is extremely demanded, and otherwise the acupuncture effect will be affected.

56.4.3 Qigong

In recent years, exercises of Qigong are more commonly applied in the cosmetology of traditional Chinese medicine. Such a cosmetic method can be operated easily and is not limited by space, and therefore is applicable for the beauty operations of company employees. Under normal circumstances, through breath, emotional and mental adjustments, the organizational functions of human body will be significantly improved, and the state of the whole structural organization of human will become more active, achieving a role of beautification and fitness.

Fig. 56.2 Acupuncture points for pain in back and loin
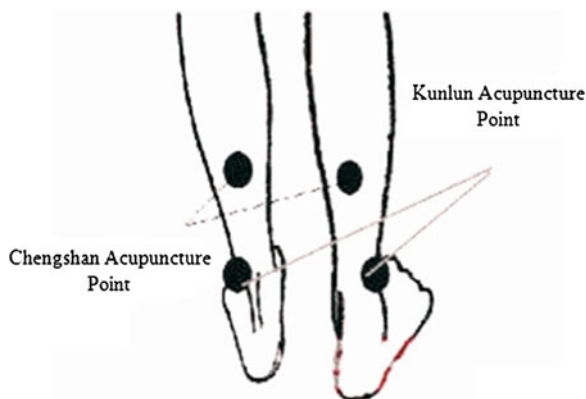
56.4.4 Medicated Food Therapy

Beautification through medicated food therapy develops based on the cosmetology of traditional Chinese medicine. In the method, dietary is added into the original Chinese herbal prescriptions, and medicines and food are prepared as beauty food according to scientific rules. The cosmetic method integrating herbs and food makes up the nutrients necessary for human body. The promotion of medicated food therapy makes the forms of the cosmetology of traditional Chinese medicine more diversified, and also provides more choices for beauty enthusiasts.

56.5 Conclusion

From the above analysis, cosmetology has undergone different development stages in China, transforming from the single cosmetic way in the earliest time to the cosmetology of traditional Chinese medicine in the modern times. It is not only a positive change of industrial thought, but also optimization and innovation in the medical beauty technology.

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Chapter 57
Study on Government-to-University Relationship and Public Responsibility

Zhitong Ma

Abstract The public nature of higher education is the logical starting point for the relationship between government and universities. Under market economy conditions, the relationship and responsibilities of the government and universities should be to build the legal protection of higher education with the value target of public nature. Optimize the allocation of resources for higher education, establish and perfect the system of government and university accountability, and actively explore the governance theory Government and a new relationship.

Keywords Publicity · Relationship · Responsibility

57.1 Introduction

The relationship between the Government and the University has been the focus of China's higher education management theory and practice, both divisions of powers issues discussed in the core. Many scholars start from the perspective of different relationships that are learnt from foreign governments and universities. They focus on the mode of study of the relations between government, market and universities [1]. This article is intended from a publicity perspective and makes relevant discussion on the relationship between our government and the university.

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57.2 The Publicity of Higher Education: The Logical Starting Point for the Relationship Between Government and Universities

57.2.1 The Publicity of Higher Education

The publicity of higher education refers to that higher education, involving the public, public funding and the use of social resources, members of society share the necessary interests, their common consumption and the possibility of use is open to all members of the results for all members of society can be shared nature. In Article 8 of Education Law of the People's Republic of China [2], Educational activities shall conform to the State and public interests. The State separates education from religion. No organization or individual may make use of religion to conduct activities that interfere with the educational system of the State. In Article 24 of Higher Education Law of the People's Republic of China, Establishment of an institution of higher learning should conform to the state higher education development planning, accord with state interests and public interest of society and must not take profit making as the object.

57.2.2 Government Maintain Publicity Responsibility

Higher education has far-reaching and lasting impact on the country's political, economic, cultural, mechanisms and spokesperson on behalf of the national interests of the public, the Government is bound to provide higher education in universities to intervene to ensure that its better to serve the public [3].

The course of development of our University, the Government has been committed to the management and control of the university. Throughout history, our universities are set up under the government-led national crisis the West "skills" of media organizations, is run by the Qing government for the training of personnel in the external stress [4]. From the source is inextricably linked with the government. Universities and Government from the modern view, had become fully dependent, seeking independence, strengthen the control, program management, institutional reform, the five stages of development. After the founding of new China, followed by the University of Fully Public Transformation, universities, the Government implemented a highly centralized administration paradigm; the government is both the University of the Organizers, administrators, but also the fact the school. After the reform and opening up, with the gradual development of the socialist market economy, organized by the University of Managers, school slowly began to role differentiation, governments, universities, the market formed a new relationship.

57.2.3 University Publicity

President Jackson, President of the United States in the establishment of the University of Virginia in 1819, told the university's public responsibility to lead a national function to establish the institutions must meet public demand to locate and confirm. Tsinghua University, Xie believes that the university has many features and value, but… the most important functions and values should be public. The public university is a complex system simple and can be divided into the public nature of the endogenous and exogenous public nature. The endogeneity public refers to University Education and scientific institutions with public Exogenous public nature of the country in view of the importance of the university, giving the university a certain degree of social responsibility, and it bears a more public nature, such as national security, economic prosperity, justice, equality, democracy, democratic country to give the public university.

57.3 Challenges Faced by the Higher Education Publicity in Our Country

57.3.1 The Weakening of University Publicity

Under market economy conditions, the interests of the university continue to be strengthened gradually from the Government of the subsidiary to become an independent legal entity. Once the national interests and the interests of university conflict, universities sometimes may ignore the requirements of society, making the public digestion of the University or cannot be fully realized. Prestigious universities such as some high-level, regardless of the requirements of the equal opportunities in education, discrimination policy to implement the regional differences of enrollment indicators put; some improper use of public funding for education in order to expand the size of school, while ignoring the quality of education and teaching.

57.3.2 The Lack of Higher Education Public Finances

The core of the public finances is publicity. China Education Reform and Development Program, has proposed that in the late twentieth century, the state education budget spending accounts for a proportion of GNP to 4 %. 2006, the 16th CPC Sixth Plenum resolution clear once again that "all levels of government to provide public services of education responsibilities to ensure that the education budget in the growth rate was significantly higher than the regular financial revenue growth, and gradually make the education budget in the gross domestic

product (GDP) reached 4 %." But in actual implementation, the indicators of long-term hovering around 3 %, government at all levels of higher education investment are a serious shortage of financial funds has decreased significantly.

57.3.3 Differences in Development of Higher Education Increases

From the early 1990s to the beginning of this century, colleges and universities transfer to the original part of the central sector of higher education as the main content management system is basically completed the one hand, the formation of the central and local government levels to the local government with the new higher education management system, on the other hand, the resulting uneven development between higher education area and the province. The main manifestations are: First, central to the case of universities and local colleges and universities, the financial capital structure difference is significant; is the imbalance of the conditions for the development of higher education at the provincial level.

57.4 Enhance the Public Nature of Higher Education

57.4.1 Construct the Legal Guarantee of Higher Education with the Publicity as the Value Target and Regulate the Relationship Between Universities and Government

National laws and policies is the most powerful mechanism to safeguard the public nature of higher education to be realized. In many developed countries, higher education issues related to the fundamental interests of the country, they are, without exception, to resort to the law, the law intended to ensure, to consolidate the promotion and development of higher education as an essential measure. Therefore, in the process of the socialist legal system, a legal form to enhance the public nature of higher education is their first choice. This is the case for public education legislation, especially the goal of the value of higher education legislation. Secondly, we must clear the legal form of government and universities in the realization of the rights and obligations in the public process of higher education and education of public comprehensive concrete into the code of conduct to regulate the legal relationship between the principal rights and obligations.

57.4.2 Optimize the Allocation of Resources of Higher Education and Keep Improving the Publicity

On the one hand, from the government point of view, optimize allocation of resources of higher education.

In the first place, necessarily improve the Government's fiscal investment and financing policies to promote equal opportunities for tertiary education.

In the second place, we must follow the principles of performance and competitive configuration so as to locate the external public resources of university effectively. Government investment, particularly the disbursement of funds for scientific research should be guided by the principles of performance and competition, through open competition between universities to enhance the University's public service level.

On the other hand, optimize allocation of resources of higher education from the University point of view.

In the first place, optimize the university's internal public resource allocation mechanism, the strength of the school to personnel training and scientific research work up, which is a necessary condition for promotion by the public schools.

In the second place, use public information resources, improve the transparency of the university to promote the public informed on the development of the university, participation and supervision, and attention to strengthening links with the social, active alumni, business people, celebrities and other public stock of human resources effectively and give full play an active role in the promotion of university development and public upgrading.

57.4.3 Establish and Perfect the System of Accountability of Government and University

Accountability has become one of the words of the education reform in many developed countries. Such as the United States, many states and gradually formed the public institutions of the state accountability system. Accountability activities, account party must provide the relevant information on the activities, and its correctness to make a note. At present, the Government's public responsibility of higher education management system is not yet clear, especially as the provincial local government through education reform, substantial co-ordinate the management of higher education in the right place, but the provincial government in the reform commitment to higher education management functions, higher education co-ordinate the management of meaning and use of key issues such as the lack of deep understanding of, the result is the provincial government in the process of administration of higher education not only there is no accountability and often the absence of regulation and other issues.

57.4.4 Under the Governance Theory, Establish a New Relationship Between the Government and the University

The proposed governance theory seeks to highlight the privileges and responsibilities of the management of public affairs from the traditional single government monopoly in the way, the formation of new multiple main rule of the situation. Governance theory suggests that in contemporary society and other social organizations play an important function, but the government cannot become all-powerful government, but to reform and become "effective government", "The government should strengthen accountability and improve the ability to adapt and transparency of the construction." At the same time, the government should maintain a low profile in society. In fact, the government and universities, two public higher education has the goal of the organization of a high degree of consistency in the social system of governance are interdependent, the Management of the Government and University of the establishment of a new relationship by the signing of the administrative contract with nurture intermediaries, such a concept of governance, not only the achievement of higher education public a useful and beneficial.

First, the governance body of the Yuan makes higher education public policy choices tend to the public interest, rather than tend to the government or university "private interest" is conducive to the realization of the School of Public.

Second, it is the supervision of the government and universities.

Third, relatively independent of third-party education intermediary organizations exist, can university and government relations to a large degree of buffering.

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Chapter 58
Practical Exploration and Thoughts on Model of Clinical Legal Education–Legal Aid

Zuwei Qin and Jiyu Tang

Abstract It is the common target for Clinical Legal Education and legal aid to provide legal service for the society and maintain the fairness and justice of the society governed by law. The implementation of legal aid works can be promoted through Clinical Legal Education and the Clinical Legal Education can be carried out through legal aid. In this way, the complementary advantages of both can be realized in a relatively good manner and mutual development can be promoted. In recent years, our school has implemented the courses of Clinical Legal Education, and made active explorations and practices on the interaction with public welfare legal aid organizations. It has made arranged the existing problems in the interaction model of "Clinical Legal Education–legal aid" and put forward corresponding countermeasures.

Keywords Clinical legal education · Professional skills · Legal aid

58.1 Introduction

Clinical Legal Education is a kind of legal science education model originated from the law schools in the United States since the 1960s. The "legal clinic" was established, meaning any private, nonprofit law practice serving the public interest. In the academic context, these law school clinics provide hands-on experience to law school students and services to various clients. Academic Clinics are usually

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directed by clinical professors. Many legal clinics offer pro bono work in one or more particular areas, providing free legal services to clients. The remainder of this article will discuss clinical legal education. Students typically provide assistance with research, drafting legal arguments, and meeting with clients. In many cases, one of the clinic's professors will show up for oral argument before the Court. However, many jurisdictions have student practice rules that allow law-clinic students to appear and argue in court. There have been 118 legal departments in universities in our country becoming the members of the Clinical Legal Education professional committee in China from September 2009 to 6th September 2011. The Clinical Legal Education is implemented [1]. Legal aid is the provision of assistance to people otherwise unable to afford legal representation and access to the court system. Legal aid is regarded as central in providing access to justice by ensuring equality before the law, the right to counsel and the right to a fair trial. A number of delivery models for legal aid have emerged, including duty lawyers, community legal clinics and the payment of lawyers to deal with cases for individuals who are entitled to legal aid. It was generated in Britain in the 15th century. Legal aid has a close relationship with the welfare state and the provision of legal aid by a state is influenced by attitudes towards welfare. Legal aid is a welfare provision by the state to people who could otherwise not afford access to the legal system. Legal aid also helps to ensure that welfare provisions are enforced by providing people entitled to welfare provisions, such as social housing, with access to legal advice and the courts. Historically legal aid has played a strong role in ensuring respect for economic, social and cultural rights which are engaged in relation to social security, housing, social care, health and education service provision, which may be provided publicly or privately, as well as employment law and anti-discrimination legislation. According to estimates, our country needs to provide more than 740 thousand cases of legal aid. However, the actual cases that have been handled are merely 170 thousand [2]. As for the students majoring the legal profession in universities and colleges, they do not have strong abilities to connect theories with practices. It terms of the clinical legal education, there are usually too few university teachers, who are qualified to practice, and very few of these had actually worked as lawyers for any period of time. The students must be individually supervised, making the clinical education much more expensive compared to the traditional classes of large groups. Extra resources must therefore be allocated to the teaching and running of the clinic. On the other hand, clinics are usually very popular among students, therefore the issue arises, how to choose those who can attend them. In May, 2008, School of Politics and Law in Chongqing Three Gorges University have carried out the "legal clinic" coordinately with the Chongqing Layers' Association. Their objective is to explore the model of "Clinical Legal Education–legal aid" through the connection between universities and public welfare legal aid associations. It has organically connected the legal aid and the law education, trying to enlarge the legal aid teams as well as providing the opportunity for the students to improve their abilities of relating theories to practice. Our school has implemented the courses of Clinical Legal Education, and made active explorations and practices on the interaction

with public welfare legal aid organizations. It has made arranged the existing problems in the interaction model of "Clinical Legal Education–legal aid" and put forward corresponding countermeasures.

58.2 Our Practices on Model of "Clinical Legal Education—Legal Aid"

Our school has implemented the courses of Clinical Legal Education, and made active explorations and practices on the interaction with public welfare legal aid organizations. The implementation process has included such content as the theoretical knowledge learning and actual cases implementation as well as the implementation of other legal aid volunteer services and so on.

58.2.1 Implement Theoretical Courses for "Clinical Legal Education—Legal Aid" and Improve Students' Theoretical Levels of Legal Aid

The theoretical courses of "Clinical Legal Education–legal aid" have included the prerequisite courses and the legal aid courses. Prerequisite courses have included the substantive law. Substantive law is the statutory or written law that defines rights and duties, such as crimes and punishments, civil rights and responsibilities in civil law. It is codified in legislated statutes or can be enacted through the initiative process. The prerequisite have also included the procedure law. Procedural law or adjective law comprises the rules by which a court hears and determines what happens in civil lawsuit, criminal or administrative proceedings. The rules are designed to ensure a fair and consistent application of due process or fundamental justice to all cases that come before a court. The substantive law, which refers to the actual claims and defenses whose validity is tested through the procedures of procedural law, is different than procedural law. Through the theoretical education, the students are able to learn systematically the basic theoretical knowledge of legal science, the language expression, and debate and communication abilities. The relevant courses of legal aid have included the systematical learning of the relevant laws and regulations of the legal aid in our country. They should have relevant professional morality and rules on legal aid cases treatment.

58.2.2 Divide Students Into Case Handling Group and Deal with Actual Legal Aid Cases

After systematic learning on the clinical education theoretical course, 4–5 students are divided into a group and 1 or 2 instructors are assigned to help each group. Mechanisms emerged through which citizens could legally enforce their economic, social and cultural rights and welfare lawyers used legal aid to advice those on low income when dealing with state officials. Legal aid was extended from family law to a wide range of economic, social and cultural rights. From May 2008 to 2011, School of Politics and Law in Chongqing Three Gorges University have carried out the "legal clinic" coordinately with the Chongqing Layers' Association. Their objective is to explore the model of "Clinical Legal Education–legal aid" through the connection between universities and public welfare legal aid associations. During this period, 12 cases have been undertaken and they have achieved good social effects.

58.2.3 Guide Students in Legal Consults and Propaganda

Where it was not possible to provide such a choice citizens were given the right to voice their dissatisfaction through administrative complaints processes. This resulted in tension, as legal aid was not designed to offer advice to those seeking redress through administrative complaints processes. Tensions also began to emerge as states which emphasized individual enforcement of economic, social and cultural rights, rather than collective enforcement through polices, reduced funding for legal aid as a welfare state provision. There have been 70 consultant cases. At the same time, from May 2008 to the present, the student volunteers have been organized to directly communicate with the local residents in the rural areas such as Wanzhou District, countries and districts that near Chengkou and Fengdu, making use of the 3.15 International Day for Consumers' Rights and Interests and 12.4 Law Publicity Day as well as the opportunity of "Three into the Country". They offer free services like legal consultants and drafting of legal instruments and so on.

58.3 Existing Problems and Countermeasures in "Clinical Legal Education–Legal Aid" Model Practice Process

School of Politics and Law in Chongqing Three Gorges University have carried out the "legal clinic" coordinately with the Chongqing Layers' Association for four times. Their objective is to explore the model of "Clinical Legal Education—legal aid" through the connection between universities and public welfare legal aid

associations. The clinical legal education contains important value to assist students in achieving judicatory by uplifting their operational ability, training the legal devoted spirit and strengthening the innovation consciousness. There are still many obstacles on the path of Humanization of clinical legal education, such as the backward teaching evaluation system, the qualities of the teachers and templar and the lack of the resource of finance, cases and regulations, etc. The clinical legal education is life in our country if we clean off these obstacles, adjust our legal education orientation and explore and make full use of our local resource. During this period, 219 students have been cultivated. Students have acquired cases treatment experiences and the techniques of treating cases have been improved. Their social responsibility has been strengthened and some of the students have already got the ability to handle cases independently. However, we have found some problems as well. In addition, solutions and countermeasures have been put forward.

58.3.1 Problems in Teaching Content

Legal assistance is a system of legal remedy adopted by many countries in the world. Under this system, the state, throughout the legal process and at all levels, provides legal assistance, through reduction or exemption of fees, to the under-privileged of society who have difficulty safeguarding their own rights through the normal legal means, because of economic problems or otherwise. Legal-aid centers have also been established in provinces to supervise and coordinate legal-aid work in their respective jurisdiction. Our school has implemented the courses of Clinical Legal Education, and made active explorations and practices on the interaction with public welfare legal aid organizations. It has made arranged the existing problems in the interaction model of "Clinical Legal Education—legal aid" and put forward corresponding countermeasures. Therefore, the teaching content stresses on the knowledge education of labor law.

58.3.2 Problems in Cases' Connection for Students

In the "Clinical Legal Education—legal aid" held by our department, the students participating the activity are mainly from sophomore year or third year. Legal assistance is rendered by three groups of people; lawyers, public notaries and grassroots legal professionals. Lawyers provide procedural aid and non-procedural aid; public notaries provide notarization assistance; grassroots legal professionals provide legal counseling, document drafting and general non-procedural aid. In our country, legal aid is funded by three sources: government, social donations and volunteering. Though still in an embryonic stage, the legal-aid system as a major legal institution will surely play an important role in realizing the rule of law in

China, safeguarding fundamental human rights and promoting social stability. Different semesters are suggested. If it is the one-class teaching, the teaching semester can be prolonged to one year, which is beneficial for the students from different grades to deal well with the cases' connection work.

58.3.3 Identity Problems of Students' Legal Aid Volunteers

Citizens who need legal assistance but cannot afford to pay for lawyers' fees, may, in accordance with state regulations, seek legal assistance in matters such as supporting the elderly, workplace injuries, criminal lawsuits, state compensation, and the granting of pensions for the disabled or survivors of an accident. Lawyers should assume the responsibility of legal assistance and dutifully help those in need in accordance with State regulations. Specific rules for legal assistance will be worked out by the State Council judicial administration and submitted to the State Council for approval." These provisions define the scope of legal assistance and require lawyers to provide legal assistance. In addition, they lay the foundation for future legislation on legal aid [3].

58.3.4 Problems of Activity Fees

Legal aid needs necessary fees for successful running. The legal aid activities carried out by the students in our school depends on the fees offered by the migrant workers safeguarding rights centre in Three Gorges area. Supervising students in the clinic is subject to pressures that pull in opposite directions. Arriving at the right balance can be difficult. The student learns best if left with as much control over a case as possible so that there is room to make mistakes, appreciate how things may be done differently and change practice or behavior accordingly. If learning by doing is to be the leitmotif, it is no good looking over the student's shoulder all the time to correct what is being done. On the other hand, the obvious danger is that too much freedom will be given to the student and that this could result in a poor or even negligent service being provided to a client. The public could be used as guinea pigs for the inexperienced. It is therefore essential for a system of supervision to include checks on the quality of work being done e.g. the approval of all letters sent out, certain interviews recorded, file entries checked and diaries examined. It is also crucial that the supervisor be given sufficient knowledge of what the student has done in order to provide effective feedback and ensure that the clinical work forms part of the skills learning experience. In the end, also assessment of the work has to be done in some way; otherwise the student may treat the clinical work as less important [4]. At the same time, fees can be acquired by active strives from the department and relevant legal aid institutions, making the fee resources diversified.

58.3.5 Influence of Social Adverse Atmosphere and Frustrations

The study of ethics and the professional responsibility and conduct of lawyers has been markedly absent from law schools in contrast to medical schools. However, there has been a growth of interest in this area in recent years, and it is a subject that, arguably, is better dealt with in a clinical context where the often abstract notions can be given a practical context. The crucible of the clinic allows moral issues to be debated more openly than within the confines of the traditional curriculum. Although the idea of providing free legal advice is attractive to those who wish to see the university become more closely involved with the wider community where it is based, problems can develop if the public service aim takes precedence over that of providing a sound and well rounded legal education. Students who work in a legal clinic are enthusiastic about their experience. They are self-motivated and often highly committed to the work. They are more responsible for what they do and how they do it. In theory, the teacher's role becomes more facilitative—helping students discover solutions for themselves. According to Lewis many students share disenchantment with the classical law school. To an extent involvement in clinical work can help reduce such feelings, and can invigorate future study. It can cause students to think again about what law school offers and what direction their future career could take.

58.3.6 Students' Security Problem

The students must be individually supervised, making the clinical education much more expensive compared to the traditional classes of large groups. Extra resources must therefore be allocated to the teaching and running of the clinic. On the other hand, clinics are usually very popular among students, therefore the issue arises, how to choose those who can attend them. This is because it stimulates resort to the law, and the need for advice is increased out of proportion to the clinic's ability to deal with it. A security system to local firms for certain types of advice or assistance is essential, and the number of people thus sent to lawyers far outweighs the work taken on by the clinic. Far from being a source, the clinic helps to foster a closer relationship with the local legal profession. Currently, the social security system and the legal aid system are progressing respectively. To further the study of the relationship between the two systems is becoming obviously urgent. Although legal aid is different from social security in the usual sense, it has the same function as social security in the process of building a harmonious society. To include the legal protection of vulnerable groups into legal aid programs is the inevitable requirement for developing a comprehensive social security system. In this case, the legal aid work can be carried out successfully.

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Chapter 59
Demands Analysis of Express Delivery Services in Beijing

Jie Ma

Abstract There has been fierce competition in the express delivery market in China with its fast development. This competition is mostly focused on lower service price which results in poor customer service in the industry, especially for private companies. Thus, express companies should carefully observe the demands of consumers and take service quality into strong consideration. This paper aims to provide features of consumers' demand based on a survey of 147 corporations in Beijing. From this survey, various concerns about service quality emerged including delayed delivery, high damage rate to packages, and poor service attitude. The paper focuses on the micro level rather than the macro level of the express delivery market. The questionnaire was designed to measure not only the satisfaction degree of current services but also the features of service demand required. The results in this paper can be useful for express companies when they design service products or place marketing strategies.

Keywords Demand for service quality · Express delivery · Beijing

59.1 Introduction

With the fast development of the Chinese economy and the open service market policy after 2006 in China, there has been fierce competition among express delivery companies. This competition has focused more on lower service prices than on a higher service level [1], which has tended to decrease the profit margin

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and has been harmful to the whole industry. According to a study of private express delivery companies, Shen [2] claims that these companies have entered an era of tiny profit margins due to the strong competition. Therefore, these companies are beginning to pay more attention to service quality which can be evaluated by measuring several factors. For example, Zhao [3] developed a system of evaluation factors measuring punctuality, accuracy, liability, and convenience each with specific, measurable sub-factors. Based on these factors, some individual express companies have surveyed their consumers to measure their satisfaction with current express delivery services, but the results are proprietary and not published.

To date, little research has directly provided the features of demand which effect the decision making of consumers about express delivery and what they expect as the appropriate service level. Furthermore, much published research has emphasized the development of the express delivery industry only from a macro perspective rather than from a detailed or micro perspective.

This paper is based on a survey of corporate consumers of express delivery services in Beijing. Since Beijing is one of the most developed areas in China, it is more representative than smaller markets. The aim of this paper is to determine which features best meet the demand in the express delivery market including strong concerns about flexibility, lower damage rates, and on-time delivery. In the following section, the survey and methods are described. Then features of the demand from consumers are provided in specific detail. Finally, the conclusion and discussion are presented with possible suggestions for future studies on the express delivery market. Findings in this paper can be a reference point for express delivery companies who want to better position themselves in the market and meet the needs of their consumers.

59.2 The Survey and Methods

The survey was conducted with corporate consumers in the express delivery market through a questionnaire designed according to the evaluation system developed by Zhao [3] to reflect consumers' requirements for service quality. Questions about the delivery time, the response time to orders or to claims were used to measure punctuality. A series of questions to grade multiple factors that are effective for choosing a delivery company highlighted consumers' concerns about accuracy, liability, and convenience. Several questions about the most unsatisfactory aspects leading to claims, the factors leading to suspension of services, and the services most requested for improvement also featured concerns about punctuality, accuracy, liability, and convenience.

Well-trained students majoring in logistics management delivered the questionnaires to corporate consumers and instructed them to fill them out. To ensure a wide sample, the consumers were selected from various business districts, industries, ownership categories, and business scales. A total of 147 questionnaires

were collected, with the percentage of private companies at 78 %, state-owned companies at 12 %, and foreign-invested companies at 6 %. Of the total sample, 78 % of respondents worked in companies with less than 100 employees. The sample well reflects the distribution of companies in Beijing, with the majority of small, private companies having relatively small numbers of employees.

The analysis of results started with a re-examination on collected questionnaires to guarantee validity. Then answers of each question were input into an Excel file in a stipulated form. Data and charts were formed through functions in Excel, which facilitated the analysis. The results of calculations were analyzed and compared according to numerous factors. Qualitative analysis also contributed to the findings.

59.3 Findings

Delayed delivery and high damage rates to packages ranked the first two reasons (out of 6) leading to suspension of cooperation with their current express delivery company (27 and 24 %, respectively), which were more significant than an increase in the price (10 %) for consumers in the sample, as seen in Fig. 59.1. Data in Fig. 59.2 about the services most requested for improvement also showed this trend with 41 % of respondents choosing quicker delivery, 31 % of them choosing higher liability, and only 18 % of them choosing lower price.
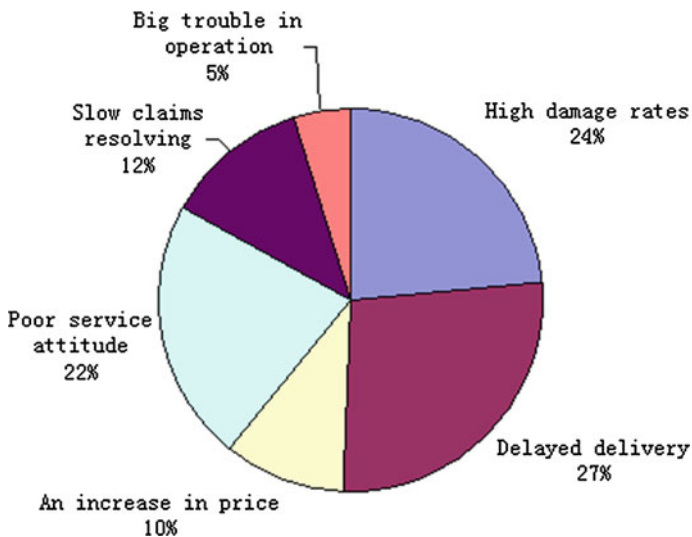
Fig. 59.1 Reasons leading to suspension of cooperation with the current express delivery company
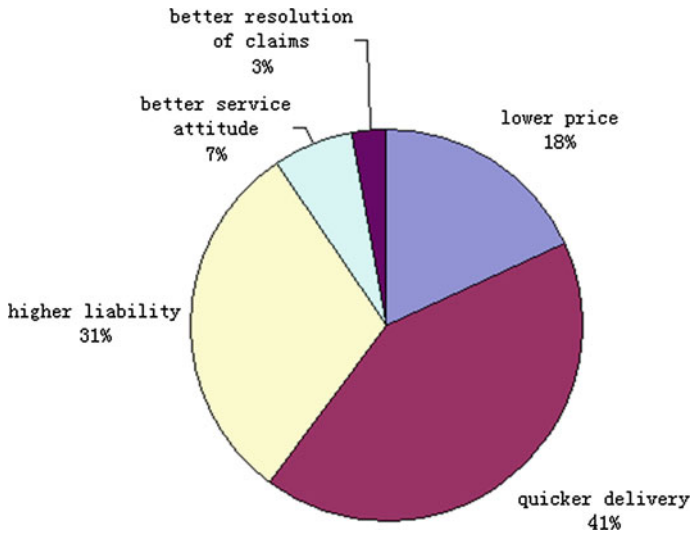
Fig. 59.2 The services most requested for improvement

As shown in Fig. 59.3, the majority of consumers in the sample had relatively high expectations of delivery time of nationwide packages with 35 % of them choosing delivery in the next day, 30 % of them choosing delivery in 2 days. As for response time of an order, a large proportion of the corporate consumers in the sample preferred an even shorter period of 1 h (44 %), and 2 h (33 %) (see Fig. 59.4). Another factor, response time to claims, also reflected the consumers' strong concern about punctuality, since 58 % of the respondents expected their
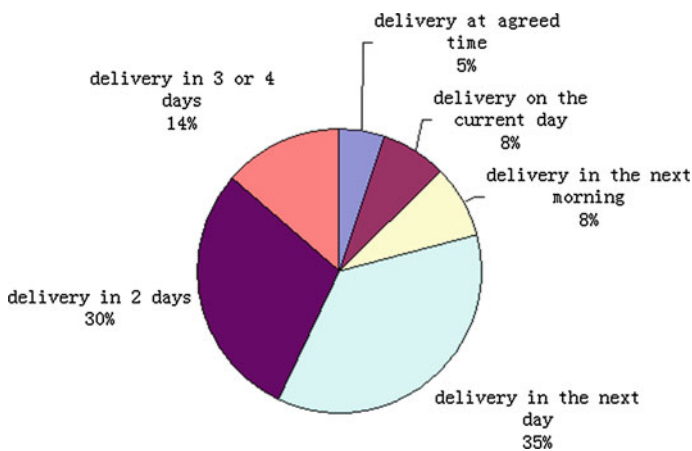
Fig. 59.3 Expectation of delivery time of nationwide packages

Fig. 59.4 Expectation of
response time of an order
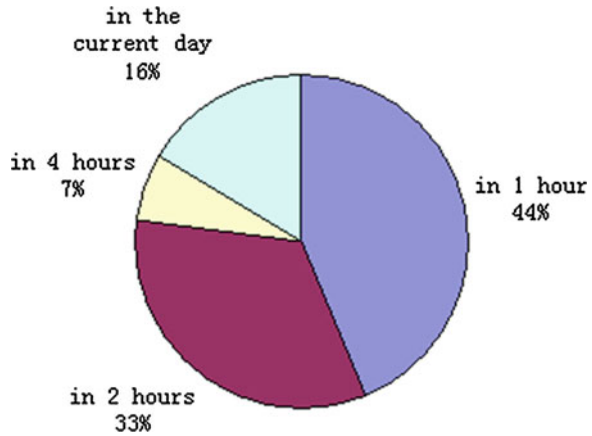
express delivery companies to resolve the claims about damages to, losses of, or
delay of the packages in 24 h and 27 % in 3 days (see Fig. 59.5).

Results of a series of questions to rate each factor that is effective for choosing a
delivery company seemed to show consumers' lower concern about price. Low
price was regarded as the most important by only 34 % of respondents compared
with steady performance (76 %), low damage rates to the packages (74 %), real-
time tracking information (67 %) which ranked the first three most important
factors (see Fig. 59.6).
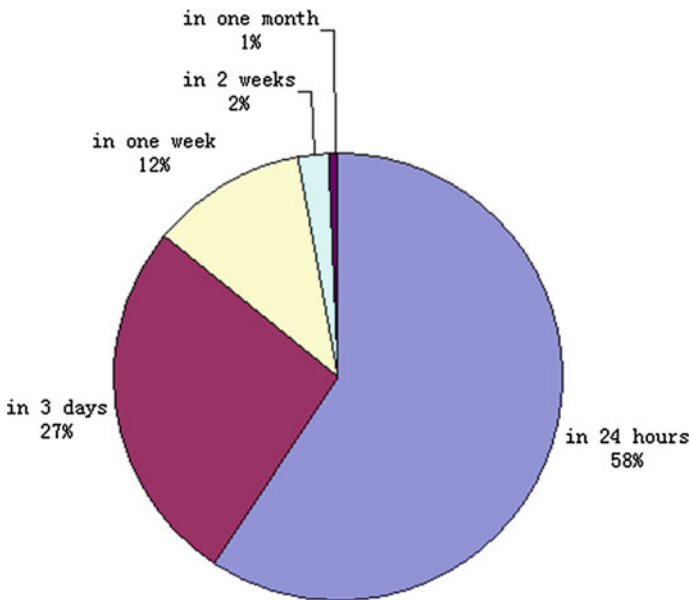
Fig. 59.5 Expectation of response time to claims
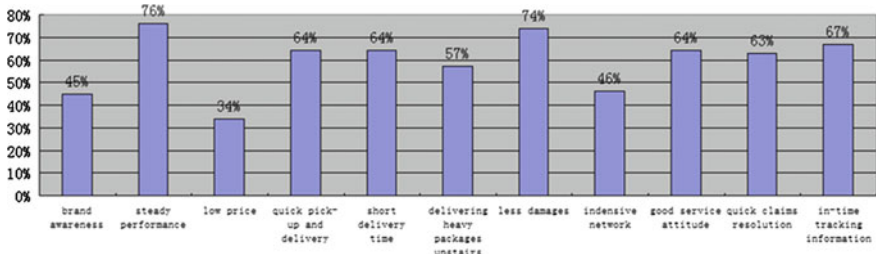
Fig. 59.6 Percentage of respondents who rated "the most important" on each factor to be considered when choosing an express delivery company

59.4 Discussion and Conclusions

This study attempted to rate the features that consumers demand for the express delivery market. Respondents in various industries, and companies of several scales or ownership were found to be relatively represented. The results indicate that consumers tend to pay more attention to better service quality than lower service price, which is illustrated through their strongest concerns about liability and punctuality. It is possible that consumers have expected even higher service levels in terms of punctuality than they have received in the past. For example, only 14 % of respondents in the survey accepted delivery in 3 or 4 days nationwide which is currently common. Furthermore, quicker delivery ranked the first when voting for the services most requested for improvement.

This study can be useful for express delivery companies who are examining their decisions about marketing and level of service. Based on the survey of corporate consumers, this study did not allow us to explore the demands of individuals who are another part of consumers in this market, so future studies on this group could reveal even deeper insights about the express delivery market.

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Part III
Business Intelligence and Applications I

Chapter 60
Comprehensive Analysis and Evaluation on Harbor Industry of Tangshan City

Zuting Zheng and Juan Li

Abstract At present Tangshan city is developing harbor industry to achieve sustainable development. To develop harbor industry, Tangshan should clear leading harbor industry, focus efforts on key harbor industries. The paper firstly analyzes the current situation of Tangshan harbor industries; secondly based on Analytic Hierarchy Process and Fuzzy Evaluation establishes hierarchical structure model; thirdly constructs the criterion matrixes, and make level sorting and consistency check; at last puts forward that Tanghshan should develop industrial parks and processing bases in the surrounding areas of the ports to form port development zones, industrial areas, storage areas and commercial areas, and to promote the rapid growth of the whole economy.

Keywords Tangshan city · Harbor industry · Analytic hierarchy process · Fuzzy Evaluation

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60.1 Introduction

Tangshan City has kept a high growth rate of economy. Its annual GDP has exceeds the provincial capital Shijiazhuang's GDP since 2005, its annual GDP growth rate has been more than 10 %, and its GDP has ranked the top 20 cities across China. With the rapid growth of the economy, Tangshan city is developing harbor industries greatly to achieve sustainable development. To develop harbor industry, Tangshan should clear leading harbor industry, and focus efforts on key harbor industries [1]. According to the characteristics of the hinterland and the ports, the leading harbor industries of Tangshan are iron and steel industry, equipment manufacturing industry, chemical industry, new building materials industry.

60.2 Current Situation of Tangshan Leading Harbor Industries

60.2.1 Iron and Steel Industry

Iron and steel industry is the largest pillar industry in Tangshan. In recent years, with the rapid growth, the iron and steel industry has made great contribution to the economic development of Tangshan, to the increase of people's income, to the encouragement of private capital, and to the better employment. Caofeidian industrial zone has become the center of iron and steel industry in southern Tangshan. At present, fine steel base has been building in Tangshan port region. With the construction of fine steel base, iron and steel industry has become the main leading industry in the port area.

60.2.2 Chemical Industry

With the advantages of location and resources, Tangshan harbor area has developed petrochemical industry, coal chemical industry, and salt chemical industry. Chemical industry has become one of the leading industries. Coal chemical base has been under construction in port development zone, large-scale petrochemical industrial base has been also in build gradually in Caofeidian industrial zone to meet the needs of Beijing, Tianjin, and Hebei region.

60.2.3 Equipment Manufacturing Industry

Equipment manufacturing industry has been developing rapidly. According to the overall plan of Tangshan port area, in the near future, on the basis of Caofeidian deep-water shoreline resources and the fine steel base, Tangshan port will focus on

ship building and repairing, port transportation machinery, power equipment, mining machinery, or other heavy equipment manufacturing industry.

60.2.4 New Building Materials Industry

Building materials industry has a long history in Tangshan hinterland, and ceramics industry and cement industry are among Tangshan ten pillar industries. In 2008, the production of cement arrived to 28.44 million tons, the production of ceramics arrived to 142.7 million sets; in 2009, the production of cement arrived to 37.33 million tons, the production of ceramics arrived to 130.36 million sets.

60.3 Benefit Analysis and Evaluation on Harbor Industry of Tangshan City

Analytic Hierarchy Process (AHP) is a practical multi-program or multi-objective decision method, proposed by U.S. Professor Seaty. Its main feature is that it combines qualitative decision-making with quantitative decision-making reasonably, and it makes decision-making process quantifiable according to the rules of thought and psychology [2]. The modeling steps of AHP are as follows: I Establish a hierarchical structure model; II Construct all the criterion matrixes of the levels; III Single-level sorting and consistency check; IV Total-level sorting and consistency check [3].

Fuzzy Evaluation is the method which applies fuzzy set theory to analyze and evaluate the system comprehensively. Its modeling steps are as follows: Construct factor set $C = \{c_1, c_2, \ldots, c_n\}$, evaluation set $B = \{b_1, b_2, \ldots, b_n\}$, weight $U = \{u_1, u_2, \ldots, u_n\}$. Scoring model $C_i| \to f(C_i) = (r_{i1}, r_{i2}, \ldots, ri_m)$ $i = 1, 2,$ $\ldots, n$. So the evaluation matrix is $R = \begin{pmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{pmatrix}$.

Take the max–min synthesis operation, then we can get

$$D = U \cdot R = (d_1, \ d_2, \ \ldots, \ d_m) \tag{60.1}$$

Normalize D, we get the overall evaluation of a single factor

$$S_i = d'_i * B_T = (d_1, d_2, \ldots d_m)(b_1, b_2, \ldots b_n)^T. \tag{60.2}$$

AHP and Fuzzy Evaluation can work together to operate the qualitative and quantitative factors in decision-making. The two methods are practical, systematic and simple, and are widely used in the evaluation and decision-making of socio-economic systems and engineering technology systems [4].

In the process of harbor industry evaluation, evaluation criteria concerns both quantifiable factors (such as economic benefits, cargo throughputs) and non-quantifiable factors (such as competitiveness, social benefits), so we apply AHP and Fuzzy Evaluation to evaluate the harbor industry.

60.4 Establish AHP Model and Determine the Evaluation Criteria and Weighting Coefficient

60.4.1 Construct Levels

Overall objective (A): the overall efficiency level of the harbor industry.

Evaluation factors:

C_1: Economic benefits-the contribution to the port revenues; C_2: Volume factors-the driving growth in port throughputs; C_3: Technical conditions-the existing technology and available potential; C_4: Port competitiveness-help to improve the overall competitiveness of the port (logistics, trade, etc.); C_5: Policy factors-whether coordinates with the relevant political, economic policy (such as port overall industrial layout, key industrial economic development, pollution, urban location, etc.); C_6: Social benefit- improve employment and development of upstream and downstream enterprises.

Countermeasures level:

P_1: chemical industry; P_2: iron and steel industry; P_3: equipment manufacturing industry; P_4: new building materials industry.

60.4.2 Construct the Criterion Matrix

Hierarchical model defines the affiliation relations between the high level factors and the lower ones. For the factors in the same level, take the adjacent factor which has relation with the upper level as criterion, make pair comparison respectively, and determine each factor's relative important extent based on the consultation with the experts.

If the pair evaluation matrix is $(a_{ij})_{n*n}$ then $a_{ij} > 0$, $a_{ij} = \frac{1}{a_{ji}}$, $a_{ij} = 1(i, j = 1, 2, \ldots n)$, n is the numbers of the factors. How to determine the value of a_{ij}, Professor Seaty suggest that we take 1–9 and their countdown as criterion.

The criterion matrix here is

$$a = \begin{pmatrix} 1 & 4 & 2 & 3 & 3 & 5 \\ 1/4 & 1 & 1/3 & 1/4 & 1/4 & 2 \\ 1/2 & 3 & 1 & 2 & 2 & 3 \\ 1/3 & 4 & 1/2 & 1 & 1 & 2 \\ 1/3 & 4 & 1/2 & 1 & 1 & 2 \\ 1/5 & 1/2 & 1/3 & 1/2 & 1/2 & 1 \end{pmatrix}$$

60.4.3 Level Sorting and Consistency Check

Calculate the largest eigenvalue λ_{max} and its corresponding eigenvector of each evaluation matrix based on the square root method. Normalize the corresponding eigenvector of the largest eigenvalue to get relative importance weight of the certain factor in the level.

Apply sum-product algorithm to calculate the maximum eigenvalue of the matrix and the corresponding eigenvector.

Calculate the product of the factors in each line in the evaluation matrix: M_i.

Calculate nth root of M_i

Regularize the vector $W = \{W_1, W_2, W_3, W_4, W_5, W_6\}^T = \{2.667, 0.467, 1.619, 1.049, 1.049, 0.450\}^T$, and get $U = \{U_1, U_2, U_3, U_4, U_5, U_6\}^T$, U is the corresponding eigenvector of the largest eigenvalue, U is just the weighting coefficient we want.

$$\sum_{j=1}^{n} Wj = 2.667 + 0.467 + 1.619 + 1.049 + 1.049 + 0.450 = 7.301$$

$$U_i = \frac{Wj}{\sum_{j=1}^{n} Wj} \tag{60.3}$$

$$U = \{U1, U2, U3, U4, U5, U6\}^T$$
$$\therefore = \{0.365, 0.064, 0.221, 0.144, 0.144, 0.062\}^T \qquad \lambda_{max} = \sum_{j=1}^{n} \frac{(a * U)j}{n * Uj} \tag{60.4}$$

$$a * U = \begin{pmatrix} 1 & 4 & 2 & 3 & 3 & 5 \\ 1/4 & 1 & 1/3 & 1/4 & 1/4 & 1/4 & 2 \\ 1/2 & 3 & 1 & 2 & 2 & 3 \\ 1/3 & 4 & 1/2 & 1 & 1 & 2 \\ 1/3 & 4 & 1/2 & 1 & 1 & 2 \\ 1/5 & 1/2 & 1/3 & 1/2 & 1/2 & 1 \end{pmatrix} * \begin{pmatrix} 0.365 \\ 0.064 \\ 0.221 \\ 0.144 \\ 0.144 \\ 0.062 \end{pmatrix}$$

$$= (\,2.237 \quad 0.425 \quad 1.358 \quad 0.900 \quad 0.900 \quad 0.385\,)$$

$$\lambda\max = \frac{2.237}{6*0.365} + \frac{0.425}{6*0.064} + \frac{1.358}{6*0.144} + \frac{0.900}{6*0.144} + \frac{0.900}{6*0.144} + \frac{0.385}{6*0.062}$$
$$= 6.271$$

Consistency check.

Define consistency ratio of evaluation matrix CR = CI/RI. CI = $(\lambda_{\max}-n)/(n-1)$, is consistency index (n is the order of the evaluation matrix); RI is random consistency index. If CR = CI/RI < 0.10, that means the consistency of evaluation matrix meets the requirement, that is, the evaluation result is reliable. If not, that means the criterion of evaluation matrix should be corrected. Finally we get $n = 6$, $RI = 1.24$

$$CI = \frac{\lambda\max - n}{n - 1} = \frac{6.271 - 6}{6 - 1} = 0.054$$
$$CR = \frac{CI}{RI} = \frac{0.054}{1.24} = 0.044 < 0.1$$

(60.5)

So we know that the consistency of evaluation matrix is satisfactory, U is the Weight coefficient vector.

60.4.4 Program Optimization Analysis Through Fuzzy Evaluation

Evaluation factor Weight vector.

$$U = \{U_1, \ U_2 \ldots U_n\}^T = \{0.365, \ 0.064, \ 0.021, \ 0.144, \ 0.144, \ 0.062\}^T \ (n = 6)$$

Evaluation criterion $B = \{b1, b2 \ldots bn\}^T = \{90, 60, 30\}^T$ (n = 3)

Construct fuzzy evaluation matrix with the careful evaluation of 5 experts, then we get fuzzy evaluation matrix R_i

$$d_i = U^T * R_i$$

(60.6)

Calculate the overall value S, $S_i = d'_i * B^T$

$$\therefore$$

$$S_1 = d'_1 * B^T = (0.6858, 0.3142, 0) * \{90, 60, 30\}^T = 80.574$$
$$S_2 = d'_2 * B^T = (0.8258, 0.1742, 0) * \{90, 60, 30\}^T = 84.774$$
$$S_3 = d'_3 * B^T = (0.3386, 0.5782, 0.0832) * \{90, 60, 30\}^T = 67.662$$
$$S_4 = d'_4 * B^T = (0.0412, 0.6284, 0.3304) * \{90, 60, 30\}^T = 51.324$$

Through the above S, we know that the turn of 4 Tangshan harbor industries should be iron and steel industry, chemical industry, equipment manufacturing industry, new building materials industry.

60.5 Conclusion

In summary, the development of Tangshan harbor industry should follow the turn as follows: iron and steel industry, chemical industry, equipment manufacturing industry, and new building materials industry. To develop harbor industry, Tangshan city should clear leading industries; focus efforts on large projects; locate some large-scale key projects in Caofeidian port, Jingtang Port; develop industrial parks and processing bases in the surrounding areas of the ports [5] to form port development zones, industrial areas, storage areas and commercial areas.

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Chapter 61
Efficient Color Design Scheme of Children Food Packaging

Shuping Zhang

Abstract The fondness to the color is unique for the children. It is very important to investigate and make use of the color design well in the packaging. Facing the market steep competition, children's food needs the reasonable and accurate application of packaging color. Through the color design of the children's chocolate food packaging, the characterization of color design is analyzed; the feasible suggestion about color design is proposed and used as the children's food packaging.

Keywords Color design · Children's food · Packaging

61.1 Introduction

With rapid development of huge children's food consumption, the children's food packaging attracts more and more interest for the designer. As is well known, Design focuses on people. Thus, the most important aspect of design revolves around our sense of harmony and space [1]. As part of the design process, a target group analysis is used to identify common environmental requirements that form the basis for the design. The color design should create the best possible and least visually intrusive conditions for all children. It also requires dialog and a readiness to communicate and cooperate [2]. When creating solutions to color design problems, consultants and designers have to avoid subjective ideas about color. Colors have certain functions that can not be replaced by any other languages or words,

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it can go beyond the obstacles which are created by different languages, ages and cultural degrees and express much information [3]. Moreover, colors can affect people's emotions, so various color designs would have effects of stimulation on people's metal state. In addition to be considered an essential element of nourishment and taste, the children food packaging needs to be considered the function request which attracts the children to buy the food in packaging design. At the same time, the essential elements that the children's characteristics of different age such as safety, convenience and happiness should be also considered [4]. Generally speaking, the children food packaging wants to be acquired and approbated by the children and their related consumer, the color design must be given prominent in the children food packaging. Therefore, the topic of how to hold the children cognition through the color design is worth to serious consideration.

61.2 Colors Function in the Children's Food Packaging

As it is known, the color stimulates to person's vision nerve, since all color is reacted by the sense of person's vision nerve to light. Color is used widely and must be pay attention to the physiological and psychological effects of color and the effect of color on learning. The psychological aspects of color of interest to instructional designers can be divided into three broad areas: preference, meaning, and harmony [5]. Although there is evidence that color preferences change with age and are influenced by cultural differences and individual characteristics, the overall results show that cool colors rate highest. In most cases, the colors used have not been adequately specified. Colors will look lighter against a dark background and darker against a light background. Similarly, a color will appear to be of higher saturation when seen against a background of its complementary hue (e.g. yellow on blue) than when seen against a background of a similar hue (e.g. yellow on red) Reds and oranges seem to advance and blues and greens seem to recede. Colors at the ends of the spectrum, red and violet, seem to result in greater arousal, and colors in the middle of the spectrum, yellow, green, cyan, seem to be best for discriminating detail [6].

All different kinds of children's food packaging should be paid much attention to color combination; color structure and color constitute. The color effect of children's food packaging depends on whether the color constitute is much to the point and reasonable and whether there is expressive. The color design can be carried to two steps. Firstly the color is chosen one by one in order to show integral color hue. Then the color is changed gradually in order to show the sense of materials body and the space vision according to the structure of food body. The usage of color design in the children's food packaging must conform to the scientific color regulation, and grasp the children's consumption assessment. By means of a lovely image and shape on the children's food packaging, colorful color should draw on all of children curious and should promote the need of food purchasing.

The color design is reflected significantly the inside function of children's food, including enhancing purchasing and their approbation. Experts of the United States on packaging design conclude a lot of successful experience about designing the food packaging which can be provided as reference according to the children's characteristics and market research results. They think that the most basic principle is whether the packaging color makes the children interest. The color design to the packaging, shape and pattern in children's food could enhance purchasing desire. For example, Heinz Ltd did a survey to more than 1,000 children in United States. They had designed a lot of special new colors food packaging and drew much better on large children consumer.

The color design of packaging can come out obviously the sense of taste in food. The choice of children's food can be influenced directly by the color, so the sense of taste characteristics for children should be comprehended abundantly at beginning. On the basic of intrinsic color for foods, color design can be refined and sublimated in order to exhibit the vivid and color foods [7].

Many researches show that high brightness colors are the biggest sense of vision to the children. Therefore a few strong colors are often used including the color of red, yellow, blue and green color. Furthermore by means of the sport characteristic and fondness embodied by color design, the approbation feeling from children and their parents should be aroused. WangWang Ltd, a famous company of the children food in China had designed a series of food packaging color which showed various color and vivid cartoon painting. It is successful for color design because its products have been hot sold.

In generally, children prefer red and purple. In the visible spectrum purple is next to red. Generally speaking for children, red is hot, yellow is warm, green is cool, and blue is cold [8]. It is importantly a cooler version of red mixed with blue. This preference for purple may be related to the finding supporting the second hypothesis that cool colors were preferred over warm colors. Purple may appeal to more children simply because of its mixture of blue and red. Also of note is the low ranking of yellow and orange. Yellow has been a preferred color by young children in the majority of previous studies. Orange is usually ranked lower than yellow in the existing color preference literature. That study confirms this finding. It seems that use of yellow and orange should be limited as wall color in a center. Color design is clearly an important element for young children.

61.3 An Example of Color Design in Children Chocolate Food

It is important to take into consideration the degree of colorfulness and stimuli variations (contrasts) that are beneficial to the children. Monotony and under stimulation (sensory deprivation), through shadowless brightness, a lack of difference in luminous density, textureless surfaces, and dull color schemes can also lead to health problems, just as an excess of environmental stimuli can create potentially dangerous stress levels. Thus, the objective of effective color design is

to find the right combination of balance, diversity, and stimulation to avoid creating a stressful environment and integrate these elements into a visual arrangement.

Color harmony is dependent on many factors. Three of the most important factors relate to the organization, familiarity, and similarity of attributes of the colors used. Harmony is also related to personal likes and dislikes which vary greatly between persons and with the same person at different times [9]. It is important to consider the psychological aspects of color when designing instructional materials. Colors should be chosen that are consistent with the message that is being communicated and that are appropriate for the intended audience. For example, use preferred colors, blue and cyan, for background colors and bright warm colors, red and yellow, to highlight important information. Use bright warm colors for material intended for young children.

According to the children's color cognition characteristics to the food, the color can be firstly taken attention and then black-and-white. Children have more interesting in the color of strongly contrasting, sport and special shape, and they can associate good taste and quality. Therefore, color design must adapt the color series which taste and interest must be prominent. Main methods about the color design are as follows.

61.3.1 Total Hue of Color Design

Hue is the common name for a color, such as red, yellow, green, or blue. The perception of any color is influenced by the value, hue, and saturation of the color adjacent to or surrounding it. Gray on black looks lighter than gray on white and, conversely, gray on white looks darker than gray on black. Any color will tend to look lighter next to a darker color and darker when it is next to a lighter color. Two hues that are adjacent, or nearly adjacent, to each other on the color wheel will tend to shift away from each other when viewed side by side. For example, if yellow and orange are viewed next to each other the yellow will look slightly greenish and the orange will look slightly reddish. It is very important to decide the total hue for the children's food packaging [10]. In this paper, the color design chooses the pure and high concentration color. It means that the color picture is active, happiness, beauty, vivid and achieves more attraction. This kind of hue is regarded monochrome color as the principle melody, together with colorful pattern. Because the brown of the chocolate show the strong joss-stick rhyme, the color innovation as same as the color discernment and the brand specificity must be considered in the color design. So the red, which show the infectivity and festival atmosphere, is selected as total hue to emerge the spirit feeling.

61.3.2 The Moderate of Color Design

The moderate of color design is main factor that influences color hue in addition to the hue, brightness, purity of color. How well colors go together is dependent on the specific colors, the size and shape of the colored areas, and the overall context. It also depends on children's likes and dislikes which vary from children to children and with the same children from time to time. The majority of packages today use characteristic color, which means that the color of the package is associated with the flavor. For example, an orange colored package is chosen to contain an orange flavored product [11]. Uncharacteristic color would not be associated with the flavor. For example, an orange colored package containing a grape flavored product. The final scheme that is rarely used is ambiguous color, which means that the package conveys no color information at all. The color must match firstly an arrangement of the big area, and then displays the food packaging in long-distance visual effect. For example, two large adjacent areas of yellow and blue may not be rated as harmonious, but a small area of yellow on a background of blue may be rated as harmonious. When all colors contrasting are strong, one can enlarge or decrease one's color area. In order to form the fresh and cool impression, so the white is chosen as the collocated color.

61.3.3 The Taste of Color Design

The chocolate food is a main kind of children's food, so through the color design, its total packaging design should impulse and association in the sense of taste, arouse food appetite and purchasing wishes for the children and their related consumer. In the long-term of practice in learning the Nature, colors have already been abstracted into the signs of various sense of taste [12]. For instance, big red fruit can give people sweet feeling, so red is used for conveying sweet feeling in packaging mainly. What's more, red stimulates people to the illusion of warm, happy and revolutionary. Therefore, red is tended to use in the package of food, tobacco and wine to have happy and enthusiastic meaning. However, yellow make people imagine of cakes or bread that have just been baked out, sending out charming aroma [13]. In generally, the red, yellow, orange etc. is emphasized to the sense of taste, means that the food is fresh, delicacy and nourishment; the blue and white color mean the hygiene of chocolate; the green means fresh and delicate. The chocolate packaging is designed as deep brown, and directly reflected the symbol color and sense of taste of product characteristics. Using colorful color such as pink, saffron and jacinth, the fragrant and sweet chocolate can be emphasized. Using warm colors, such as gold and red, the felling of fresh delicious and the nourishment may be given to the people. Furthermore, the green matches along with delightfully fresh and healthy; the pink with the sweet feeling; light yellow with the butter of flavor and tasty feeling. In a word, color design should consider the chocolate as the flavor and tasty food.

61.3.4 Sport and Interest Characteristic of Color Design

In this color design, the children's psychological characteristic, which the children are curious and interesting characteristics, is wholly considered. After the importance of information regarding color has been described, one will have a better idea of color meanings. In food packaging, different colors can evoke different feelings and emotions in children [14]. Packaging professionals must determine what message the product is intended to give off, and match color meaning with the product's message. In the pattern, many chocolate balls of different color are adopted. After the importance of information regarding color has been described, one will have a better idea of color meanings. In food packaging, different colors can evoke different feelings and emotions in consumers. Packaging professionals must determine what message the product is intended to give off, and match color meaning with the product's message.

One hand, the warm color design can tightly grasp the topic of chocolate food; On the other hand, the different size and position of chocolate balls are exhibited the characteristic of sport. Furthermore, the color changing also result the children to strong desire of touching and purchasing [15]. In additionally, the saturation of color is also significant factor in this color design. The bright color which is high saturation is combined with the dark color for low saturation. One is for the children and related consumers to form the gorgeous and glorious feeling; the other is to make the children produce the concept of rusticity, classic elegance and profound.

61.4 Conclusions

On the basis of discussing the importance of color design to the children's food packaging, color design of an example for kinds of chocolate are studied. Color design in the sense of taste, sport and interest characteristics of design thought is given prominence to this chocolate food packaging, and its basic design request of color packaging is satisfied at same time.

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Chapter 62
Research of Rural Collective Economy Based on Village-Level Collective Economic Development

Kaiqun Wu

Abstract Based on the special investigation and research of the village-level collective economic development in 36 villages, Maanshan, Anhui, the thesis explained the dilemma of the collective economy and provided corresponding resolutions. As a result, the problem lies in distorted property rights of the rural collective economy in Maanshan. Therefore, we have to reform its property rights. Based on local case, the thesis finds the problems and proposes targeted measures. We can apply it to China's rural collective economy.

Keywords Athletes · Declining credit · Countermeasures

62.1 Introduction

At first, with lack of experience in the course of carrying out family contract management and not dealing with the relation between "united management" and "decentralized management", we excessively tilted toward family contract management, neglected the collective unified management [1]. Finally, it has resulted in rural collective economic asserts distributed and sold. Therefore it severely has weakened rural collective economic development in the future. In the practice, the rural collective economic development usually appears as a "double economy", rather than a "dual management". Two levels between collective unified management and farmers' decentralized management are unbalanced [2].

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In order to promote the village collective economic development, in 2009, Municipal Committee Maanshan and Agricultural Commission Maanshan, made a special research about the village collective economic development in Maanshan. The team emphasized to survey 10 towns and 36 villages (accounting for 15 % of the total numbers of administrative villages in the city) which were randomly selected from one county (Dangtu) and three districts (Huashan, Yushan and Jinjiazhuang), by a village of unit, in comprehensive statistical foundation, according to the proportion in which the good, middle and poor in revenues respectively occupy one-third of the scale. The basic materials of the paper are based on the special research [3].

62.2 Maanshan's Rural Collective Economic Structures of Revenues and Expenditures

In 1983, the central government released "the first file" which put forward "the detached two authority, the double management" and "united-decentralized union, double management", namely founded in the family contract system of the land, the central government intended to strengthen the functions of the collective economic organizations, such as coordination, services and driving, and enhance collective economic strength. In 2008, the Third Plenary Session of the Seventeenth reiterated, two-tier management system is adapted to the socialist market economic system, in line with the characteristics of agricultural production [4].

We can review the village collective economic development, based on components of the village collective economic revenues and expenditures.

62.2.1 The Revenues Constitution of the Rural Collective Economy

In 2008, the collective revenues of 241 administrative villages in the city are 227 million yuan, on average, 942,000 yuan of each village, 75 % higher than in 2005, with an average annual growth rate of 20.5 %, of which, 578,000 yuan of each village on average in Dangtu and 2.202 million yuan of each village on average in three districts. The collective economic revenues of 36 villages which were mainly surveyed are 45.954 million yuan, including: 7.65 million yuan from the resources contracts, accounting for 16.6 %; 5.233 million yuan from the enterprises in 36 villages, accounting for 11.4 %; 19.575 million yuan of compensations of the lands expropriated by governments, accounting for 42.6 %; 3.851 million yuan of financial transfer payments, accounting for 8.4 %; and 9.646 million yuan of other revenues (including interests, rewards, donations, etc.), accounting for 21 %. The highest village collective revenues belong to Xiangyang, Xiangshan. YangQiao,

Table 62.1 Major survey on the collective economic revenues of 36 villages

Items	2008 year	
	Amount (10,000 yuan)	Proportion (%)
Management revenues	0	0
Resources revenues	4595.5	100
Revenues from contracts of desolate lands	51.8	1.1
Revenues from contracts of water resources	571.6	12.4
Gains of investments (including rents from the houses, revenues from the stocks)	141.6	3.1
Management fees from enterprises in 36 villages	269.0	5.9
Part taxes from enterprises in 36 villages	254.3	5.5
Compensations from the expropriated lands	1957.5	42.6
Financial transfer payments	385.1	8.4
Other revenues (including interests, awards, donations)	964.6	21.0
Rural collective economic revenues (total revenues)	4595.5	100

Huangchi, Dangtu gained the lowest revenues of 33,000 yuan. The details of revenues can be seen in Table 62.1 for revenues composition.

In 2008, Table 62.1 above showed that the management revenues were zero, so the revenues of the rural collective economy (management revenues plus resources revenues) are merely the resources revenues of 45.955 million yuan. It explained that slower growth in the rural collective economic revenues derived from a single source of revenues and that the rural collective economy lacked sources from the management revenues [5]. Development of the rural collective economy must expand the sources from the management revenues, but it cannot only rely on the resources revenues. Among the rural collective economic revenues, the revenues of compensations from expropriated lands, accounting for 42.6 %, were the largest, but they are occasional rather than regular. Moreover, sole villages in suburb, developing zones and national constructing lands relate to compensations of land expropriation, whereas other villages do not. Financial transfer payments have less proportion in revenues, and they also belong to occasional revenues. Donations and awards in other revenues are also occasional. If these three items were excluded, namely land compensations, financial transfer payments and other revenues (interests, awards and funding), the constitution of the rural collective economic revenues would be changed in some ways. Its composition and proportion can be seen in Table 62.2.

It is illustrated by comparing Tables 62.1 and 62.2 that without the three revenues, namely land compensations, financial transfer payments and other revenues (interests, awards, funding), in 2008, the collective economic revenues of 36 samples of villages reduced sharply to 12.883 million yuan, about only a third (28 %) of before. The contract revenues from both desolate lands and water resources increased from 13.5 to 49.39 %, and the investment revenues also increased from 3.1 to 10.99 %. Besides, both managing fees and part of taxes from the enterprises in 36 villages rose from 11.4 to 40.62 %. The less proportions of the investing gains in

Table 62.2 Major survey on the collective economic revenues of 36 villages

Items	2008 year	
	Amount (10,000 yuan)	Proportion (%)
Management revenues	0	0
Resources revenues	1288.3	100
Revenues from contracts of desolate lands	51.8	4.02
Revenues from contracts of water resources	571.6	44.37
Gains of investments (including rents from houses, revenues from stocks)	141.6	10.99
Management fees from enterprises in 36 villages	269.0	20.88
Taxes turned over by enterprises in 36 villages	254.3	19.74
Rural collective economic revenues (total revenues)	1288.3	100

the rural collective revenues explained that the rural collective economy lacked stable investing channels. Revenues from both land contracts and enterprises totally accounted for 89.01 %, and constituted the major resources of the rural collective economic revenues. It showed that the rural collective economic revenues mainly relied on both contract revenues and revenues turned over by enterprises.

62.2.2 The Expenditure Constitution of the Rural Collective Economy

In 2008, 241 administrative villages in the city expended 190 million yuan in total, i.e. 790,000 yuan of each village on average, among which, 525,000 yuan of each village on average in Dangtu and 1.718 million yuan of each village on average in urban districts. Xiangyang Xiangshan Yushan, expended 7.51 million yuan, the highest of the rural collective expenditures. Pengtai Jiangxin Dangtu paid 37,000 yuan, and ranked at the bottom of the rural collective expenditures. The 36 villages mainly surveyed on expended 36.622 million yuan. Expenditures details, specifically the expending composition can be seen in Table 62.3.

Table 62.3 showed that the infrastructure construction accounted for 22.4 %, however, other expenditures accounted for 28.2 % and constituted the main expenditures of the rural collective economy, which should be cut down. The public welfare means rural collective social welfare level, but apparently it has less proportion of 10.8 %, so it should be enhanced. Village cadres' salaries accounted higher, for 16.1 %. In fact, they should get the compensations for the loss of working time, instead of wages.

Table 62.3 Major surveys on the collective economic expenditures of 36 villages

Items	2008 year	
	Amount (10,000 yuan)	Proportion (%)
Management expenditures	0	0
Public expenditures	3662.2	100
Infrastructure construction	820.4	22.4
Public welfare	396.8	10.8
Costs of family planning	158.8	4.3
Salaries of village cadres	588.6	16.1
Compensations for the loss of working time	229.9	6.3
Office costs	104.0	2.8
Debts repayments (including interests payments)	329.2	9.0
Other expenditures	1034.5	28.2
The rural collective economic expenditures (total expenditures)	3662.2	100

62.3 Responses and Thinking: Destination of the Rural Collective Economic Development

Based on situations of Maanshan's rural collective economic development, Maanshan's authorities said that we must vigorously develop the rural collective economy and build leadership groups whose obligations are making villages strong and villagers abundant, actively exploring the paths of the village-level collective economic development, strengthening mechanism of supervision and restraint of the village-level collective economy, and building good environments of the village-level collective economic development.

Nonetheless, according to theories and practices of China's rural collective economic development, this paper claims that based on internal demands of socialist market economy and the rural collective economic attributes, we must proceed to thorough property rights reforms and innovations and effectively seek the realizing forms and organizing forms of the rural collective economic development. Many problems appeared in the rural collective economic development originally derives from its imperfect property rights system, and there is also ambiguous property rights and indistinctiveness between government and business. Then, how do we undertake reforms of property rights system?

On the issues of property rights reforms of the rural collective economy, many scholars have put forward measures and solutions, which mainly included reforms of the joint-stock cooperative system. The joint-stock cooperative system is a sort of new property rights system compatible of both joint-stock system and collaborating system, and it embodies double properties of both joint capital and joint labor. Compared with traditional rural collective economic system, its main body of property rights is clearer. So, to some extent, the joint-stock cooperative system can effectively resolve the accumulated problems about farmers' interests in the long-term, further, clarify ownership of collective assets, and strengthen

personified possession rights, earnings rights, and disposition rights in collective assets. However, in practice, it is a problem about how to organically combine the joint-stock system with the cooperative system. The cooperative system emphasizes on members' democratic managements and profits returned by members' turnovers, while the joint-stock system underscores capital returns and controlling enterprises. Moreover, in power implementation and profits distribution, there are contradictory between the joint-stock system and the cooperative system. Therefore, the joint-stock cooperative system is not a complete reform of property rights system, but only a transitional form of property rights system.

At present, the village-level collective economic development is hampered seriously, and the mainstream views emphasize on developing the village-level collective economy. This paper argues that we should not regard ideology as the golden standard and not insist on the opinion that "more is good" in public ownership system. We cannot develop the rural collective economy just in order to develop it, but we should develop rural economy. We should reform the rural collective economy according to its attributes and orientation, and not solely emphasize on developing it. Scholars dispute both orientation and attributes of the village-level collective economy, and their views mainly includes "the matrix idea" (providing productive basic services), "the main body idea" (providing comprehensive professional services), and the "part idea" (as a part of professional services). The author supports "the matrix idea", namely, village-level collective economy should orientate in providing farmers with productive public services, for example, managing collective lands, water conservancy facilities, and large and medium-sized agricultural machinery, which other rural economic organizations can not afford. Based on these public services, all kinds of professional cooperatives and other agricultural organizations mainly provide farmers with other socialized professional services.

So, with differentiation and transformation of the village-level collective economy, it should gradually evacuate agricultural competitive fields, but focus on providing villagers with productive public services, at the same time, villagers' committees should exercise management functions to the village-level collective economic assets.

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Chapter 63
Differentiation and Transformation of Agricultural Reclamation Economy

Kaiqun Wu

Abstract This paper studied how to reform Chinese agricultural reclamation so as to solve its continued declination. Firstly, we separated government from company, society from company, and made the state farms become a small government but big society. Secondly, privatized the non-agricultural companies founded by the agricultural reclamation system, transformed the state farms into family farms, and turned the professional service companies of the agricultural reclamation system into cooperatives. Finally, the state-owned basic assets continue to provide productive public services. As a result, we have to evacuate the state farms from agricultural productive competitive field, but focus on agricultural productive public service fields. Compared to relative others, this paper researched the rural collective economy systematically and respectively. We can only apply it to China's agricultural reclamation system.

Keywords Sport videography technology · F1 · TV live

63.1 Introduction

In the 1980s, the agricultural reclamation system launched reforms, which have made some achievements, but there are still many problems. Most scholars have studied how to develop the agricultural reclamation economy actually. However, the agricultural reclamation economy has its own natures and logic [1]. Based on

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the logic and attributes, with China's macroeconomic environments, we should research how to develop the agricultural reclamation economy logically or theoretically instead practically [2]. In terms of institutional economics, combined with reforms practices of China's agricultural reclamation economy, author will study how to reform theoretically the agricultural reclamation economy, namely differentiation and transformation of the agricultural reclamation economy [3].

63.2 Reforms of the Management System of the Agricultural Reclamation: Society-Company Separation and Government-Company Separation

The state-owned farms should be independent agricultural economic entities with qualification of legal person, so should they have the characteristics of companies. But, the state-owned farms have borne a lot of social and administrative management functions. For example, education, health, public security, construction, transportation, and civil administration, etc. These social management and public service functions are beyond the business scopes. Therefore, the state-owned farms lie in the mixture of state with economic organizations, community organizations, and political organizations [4]. Hence, the state-owned farms have regional, social, and company triple characteristics. Apparently, the management system of original state farms could not adapt to the internal requirements of socialist market economy, so we must reform farms' management system [5]. The basic idea is to reconstruct management system of the agricultural reclamation based on the centers of government-company separation, society-company separation and a small government but big society. We should make clear about different types of the agricultural reclamation economy with respective economic and social function and orientation, and make them respectively become really competitive entities of market economy [6].

The reforms of agricultural reclamation economy can be seen in Fig. 63.1.

63.3 Privatization of the Agricultural Reclamation System's Non-Agricultural Companies

Industrialization features of the agricultural reclamation refer to the non-agricultural companies (mainly engaging in industrial production) founded by the state-owned farms with the nature of the whole people ownership, namely involving industry, business, transportation, construction, services, etc. In 1979, the agricultural reclamation system began to pilot the joint companies providing agricultural, industrial and business services. By 1984, the national agricultural reclamation system had basically realized the agribusiness comprehensive
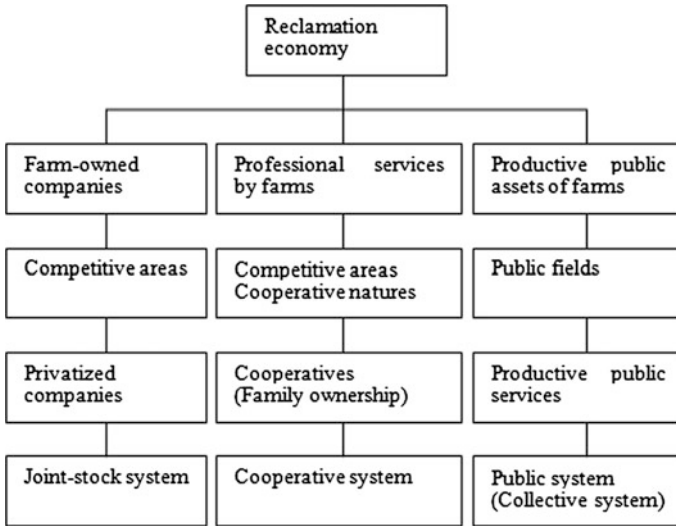
Fig. 63.1 Agricultural reclamation economy: differentiation and transformation

operation. The companies initiated by state farms have two basic characteristics: Firstly, the attribute of community [7]. The companies pursue profits maximization, also arrange employments for surplus labors in the farm community and provide state farms' worker with community welfare; Second, the dependence. The state farms are agricultural productive units. Meanwhile, they are both communities and quasi-governments. The farms could control the companies, which is called "local government's company doctrine". However, the farms have no abilities to promote the farm-owned companies' development by financial and fiscal supports, and the farm-owned companies must pursue to survive in market competition.

Most of the farm-owned companies have difficulties in management. The root causes are faulty property rights system and stiff mechanism. They are not adaptable to market economic requirement. Hence, we must undertake reforms of property rights system. The reform goals are to privatize the farm-owned companies, thoroughly resolve faulty property rights system brought from non-personification of property rights, straighten out property rights relations, and remodel market main bodies by many kinds of privatized means like auction, merger and share. In the main, non-agricultural companies of the agricultural reclamation are basically in competitive industries, but the state-owned companies in competitive fields have less efficiency. Therefore, non-agricultural farm-owned companies must quit from the competitive areas.

63.4 The State-Owned Farms' Realization Forms: Family Farms

Separation of the farms' ownership and the managing rights leads to the agency relationship. The principal governments entrust farm assets to agent farm cadres, then the farm cadres are responsible for unified management and unified distribution. However, governments can intervene directly farm management. The governments are the administrative superior of farms, so it forms the executive order relations between farms and governments. In both relations, ownership is the foundation of the executive power and the executive power relies on ownership to fulfill administrative plans. Therefore, farm ownership attaches to administrative power and administrative power overwhelms ownership. As a result, it distorts institutional arrangement of property rights. Officers of government are outsiders, but farms cadres are insiders, so there exist serious information asymmetry between farms and governments. Agents can hide information to exercise beforehand and afterwards opportunistic behaviors, then, result in serious adverse selection and moral hazard. As a consequently, state-owned farms' agency costs are extremely high.

Farm workers are hired as agricultural labor and both sides of farms and farmers have information asymmetry. It can also cause problems of adverse selection and moral hazard, and also accordingly produce the adverse selection costs and the moral hazard costs. The moral hazard costs are the key of labor transaction costs. The state-owned farms implement unified labor, then, how to measure the labor's marginal contribution? Agriculture has some production characteristics, for example, production process and life process of unity, long production period, strong seasonality and wide spatial distribution. So, it is very difficult to accurately measure the agricultural labors and the costs of supervision are greatly high. On account of the vague measurement of marginal labor, farms are unable to accurately supervise and examine labors, consequently cannot distribute reasonable remuneration according to their marginal contribution. Finally, it causes the incentive inefficiency. According to the logic of collective action of Olsen, each farmer are able to expect to try to obtain some personal incomes that would be less than the costs of his payments, then each farmer will rationally choose slacking, but at the same time hope others work hard. Therefore, the state-owned farms cannot stimulate farmers' enthusiasm and the "free-rider" and "lazy" behavior would be widespread, which ultimately will lead to the extremely high labor trading costs.

Overall judgment, the system costs of the state-owned farms are extremely high while the system efficiency is extremely low.

On the contrary to the state-owned farms, the family farms or families are basic social economic cells with a set of production, consumption, education, which are of lasting stability. According to Hansman's company ownership theory, if farm ownership is granted for family, family can make full use of internal natural divisions. Then it can greatly reduce the agency costs and the costs of decision,

with no measurement, supervision and other trading costs. If ownership gives to countries, employment labor will produce extremely high transaction costs between the farmers and the officers, so will the ownership costs. Hence, it should give ownership to the family farms, that is to say that the family farms are suitable for agricultural production characteristics and become the mainstream forms of the organization and institutional arrangement.

63.5 Professional Service Companies of the Agricultural Reclamation System: Cooperatives

The family farms promote the reforms of the management system of the agricultural reclamation system. In exploring the access to government-company separation, society-company separation and a small government but big society, combined with promoting reforms of three systems of human affairs, labors and distribution, the state-owned farms have streamlined management layers, organizations and personnel, vigorously compressed unproductive spending, and eased the burden and production costs of the family farms with efforts. Streamlined personnel and organizations have consisted in a series of socialized professional service companies responsible for their own profits and losses in seeds, animal husbandry, agricultural materials and agricultural machinery, and formed a complete set of social service system which is obliged to provide family farms with professional services before, during and after agricultural production.

At this time, the property rights of the professional companies still belong to the state-owned farms and their property rights system still has institutional defects. Therefore, it is necessary to reform the institution of professional services. Usually, professional services are in competitive fields, but the state-owned companies in the competitive fields have no efficiency. Consequently the state-owned capitals must evacuate from the competitive fields. The reform approaches should include the following. Firstly, the professional companies can be restructured into the share-holding system; Secondly, the professional companies can be transferred into the joint-stock cooperative system; thirdly, the professional companies can be turned into the cooperative system.

Which one? The cooperative system emphasizes the all members' ownership, democratic management and equality between members, while the joint stock system emphasizes returns on capitals and controlling companies and no equality between shareholders. As a result, in power implementation and distribution of interests, the joint-stock cooperative system is contradictory. Obviously, the joint-stock cooperative system is not the complete reform of property rights system, just a transitional system arrangement. So, where will the joint-stock cooperative system goes? Which one should be selected, the cooperative system or the joint-stock system?

According to the Hansman's enterprises ownership theory or model,

$$c = c_1 + c_2 \tag{63.1}$$

$$c_1 = c_{11} + c_{12} + c_{13} \tag{63.2}$$

$$c_2 = c_{21} + c_{22} + c_{23} \tag{63.3}$$

In Eq. (63.1), c indicates the institutional costs of the professional companies, c_1 presents the market transaction costs of professional companies, and c_2 presents the ownership costs of professional companies. In Eq. (63.2), c_{11} refers to the labors transaction costs, c_{12} refers to the marketing transaction costs, and c_{13} refers to the land transaction costs. In Eq. (63.3), c_{21} refers to the collective decisive costs, c_{22} refers to the agent costs, and c_{23} refers to the risk bearing costs.

Compared with the joint-stock system, the cooperative system is more suitable for agricultural production with socialized and specialized services. In professional services, the institutional costs mainly depend on both labors transaction costs and the collective decisive costs. In terms of Hansman's companies ownership theory, let the seller (families) have the buyer (professional companies) can greatly reduce the marketing transaction costs and the collective decisive costs.

63.6 The Agricultural Productive Infrastructure Continuing to Provide Family Farms with Productive Public Services

On account of some defects of the state-owned property rights system, the state-owned farms engaging in agricultural production increasingly wane. In much local countryside, the state-owned farms exercise mostly management function instead of business function to the state-owned assets, for instance, contracting, lease, share and renting. In fact, they have been out of the agricultural production and operation. In that case, the state-owned farms shall be abolished, furthermore, management function of the state-owned assets should be merged into local governments or community management committees which are obliged to perform the management duty of the state-owned assets and regulate the management of the state-owned assets effectively. After differentiation and transformation, the state-owned assets will only include farm lands, irrigation and water conservancy facilities, and large and medium-sized agricultural machinery (not necessarily), etc.

63.7 Conclusion

According to the intrinsic request of socialist market economy, the state-owned farms must reform management system to realize government-company separation, society-company separation and a small government but big society. This is a

basic premise. Otherwise, we can mention reforms in no way. Then in terms of economic characteristics of the agricultural reclamation and inherent requirement of socialist market economy, we carry out the strategic adjustment of the state-owned farms, namely with differentiation and transformation. Besides, all competitive economies of the agricultural reclamation must be reformed into private economies and left state-owned assets (economies) only including productive infrastructure, which provides family farms with productive public services.

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Chapter 64
Efficient Scheme on Differentiation and Transformation of Rural Collective Economy

Kaiqun Wu

Abstract This paper researched how to reform China's rural collective economy in order to solve its continued declination. Firstly, we divided it into three parts of non-agricultural sector, specialized services and productive public facilities. Secondly, according to their natures, based on property rights, discussed how to reform it. Thirdly, changed non-agricultural sector into stock system of privatization, transformed specialized services into cooperative system in terms of really cooperative principle, and assigned productive public facilities for villagers' committee which is responsible for managing it. As a result, we must evacuate the rural collective economy from agricultural competitive fields, but focus on agricultural productive public service fields. By comparison with relative others, this paper researched the rural collective economy systematically and respectively. We can apply it to all China's rural collective economies.

Keywords Rural collective economy · Rural collective economic organizations · Property rights system · Joint-stock system · Joint-stock cooperative system · Cooperative system

64.1 Introduction

China's rural collective economy is the product of traditional system. It was built based on the remnants of the collective assets when the people's communes were abolished but not based on the requirements of the market economy, with the

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traditional system of thinking and marks [1, 2]. On the whole, our country rural collective economy is weak, low efficiency. Therefore, there is necessary to review the rural collective economy again, undertake strategic adjustment, reform the property rights system of the rural collective economy, and seek for the effective implementing forms and forms of organizations [3]. However, the collective economy has a relatively vague conception. Here, we confine the rural collective economy as non-agricultural industry initiated by the collectives, social specialized service organizations founded by the collectives, and infrastructure held by the collectives.

In Chinese academia, there have been abundant studies concerning how to reform the rural collective economic property rights system [4, 5]. However, most of those focused on how to develop the rural collective economy and stayed in form or on surface. Moreover, they haven't delved into the reasons why the collective economy fails to grow. Some scholars have researched the property rights system of the collective economic organizations from the angle of controlling rights. Some scholars have discussed the property rights system of the collective economic organizations based on ownership, and some scholars have proceeded, from practical perspective, to study how to reform specifically the rural collective economic organizations [6, 7]. However, they all haven't discussed comprehensively about the rural collective economic strategic adjustments and the reforms of property rights from systematic angle. First of all, this paper will discuss the nature and orientation of the rural collective economy, then specially analyze how the rural collective economy differentiate and transform.

64.2 The Nature and Orientation of the Rural Collective Economy

Although the central government has clarified the basic orientation and nature of the rural collective economic organizations, the academia has some divergence, which mainly including three kinds of views: First, the main body of the socialized agricultural service system (the main body idea); Second, the matrix connecting farmers with other rural economic organizations (the matrix idea); Third, the common components of the socialized agricultural service system (the component idea).

The central government explicitly supports "the main body idea" which insists that farmers' service demands are comprehensive. The rural collective economic organizations are capable of providing comprehensive services but other rural economic organizations cannot. Compared with other rural economic organizations, the rural collective economic organizations can provide farmers with the most extensive and intimate services. Hence, the rural collective economic organizations are the main bodies of agricultural services. Farmers' specialized

cooperative organizations have the flexibility and adaptability to play a complementary role.

"The matrix idea" claims that the rural collective economic organizations can provide basic services, not only directly serve farmers, but also connect with other rural economic organizations. For example, it can provide farmers with productive irrigation and water conservancy services, etc.

"The component idea" is mainly based on China's reality of the cooperative economic organizations' development pattern. It hopes to make full use of the existing organization resources, reduce the costs of organization's innovation, and maintain stability and development of rural economy and society. It believes that Supply and Marketing Cooperatives, the rural collective economic organizations and professional cooperatives can constitute the three main parts of the rural economic organization system, form competitive situations, and improve efficiency. Hence, the rural collective economic organizations are only part of the competitive system.

What about the situations of rural collective economic development? The relevant departments massed sampling survey on the rural collective economic organizations in 1991, 1992, 1994 respectively and the results of which showed that, the socialized and professional services provided by the rural collective economic organizations to farmers are the most limited. The services provided were related closely to implementation of the national agricultural production plans, and spread around planting. However, for what have nothing to do with the national ordering tasks, the rural collective economic organizations provided extremely limited services. Overall, the rural collective economic organizations become neither the main body providing socialized agricultural services nor the tie connecting farmers and market.

So, what gradually cause the rural collective economic recession? In form, service functions of the rural collective economic organizations are weak because of their limited economic strength. It seems that the collective economy should be further developed and strengthened. However, in essence, it derives from faulty property rights system and ambiguous relations between the rural community and the rural collective economic organizations.

First, the property rights are vague. For example, the concept of "collective" is not clearly defined. Do collective properties belong to the collective economic organizations or the collective members? The ownership relations between collective members and collective assets are also vague. Second, the relations between the rural community and the collective economic organizations are ambiguous. In order to save the costs of organizations, in most places, party branches, collective economic organizations and the villagers' committees share the same leaders. However, the reality has proved that system costs are much higher than intended. Therefore, collective economic property rights system causes governance structure missing. Consequently, the efficiency is low.

64.3 The Rural Collective Economic Strategic Adjustments: Differentiation and Transformation

The basic plans of differentiation and transformation: Firstly, in competitive fields, non-agricultural collective companies must be completely changed into the joint-stock system to thoroughly get rid of the trouble of the collective economic system; Secondly, in competitive areas, the collective economy providing with professional services should be turned into cooperative economy; Thirdly, in public domains, the rural collective economy should still hold the collective property rights of productive infrastructures, and provide farmers with public services. The program can be seen in Fig. 64.1.

64.3.1 Transformation of the Rural Collective Providing with Socialized Professional Services: Cooperative System

The rural collective economy, which provides farmers with prenatal and postnatal services, i.e. managing circulating business, such as offering seeds, fertilizers, pesticides, diesel oils, processing, storage, transportation and sale, should be transformed into agricultural cooperative including professional cooperatives or comprehensive cooperatives, in accordance with the principles of real cooperative economy.

In 1995, the international cooperative alliance established seven cooperative economic principles. In terms of Chinese conditions, the cooperative economic principles can be simplified to "of the people, by the people, and for the people". The rural collective assets providing professional services should be reformed into professional cooperative system, and the key factor lies in whether cooperative economy is in accordance with the basic principles of cooperative economy.

Why should socialized professional services reformed into cooperatives? According to the Hansman's enterprises ownership theory or model,

$$c = c_1 + c_2 \tag{64.1}$$

$$c_1 = c_{11} + c_{12} + c_{13} \tag{64.2}$$

$$c_2 = c_{21} + c_{22} + c_{23} \tag{64.3}$$

In Eq. (64.1), c indicates the institutional costs of enterprises, c_1 presents the market transaction costs of enterprises, and c_2 presents the ownership costs of enterprises. In Eq. (64.2), c_{11} refers to the labors transaction costs, c_{12} refers to the buying transaction costs, and c_{13} refers to the selling transaction costs. In Eq. (64.3), c_{21} refers to the collective decisive costs, c_{22} refers to the agent costs, and c_{23} refers to the risk bearing costs.
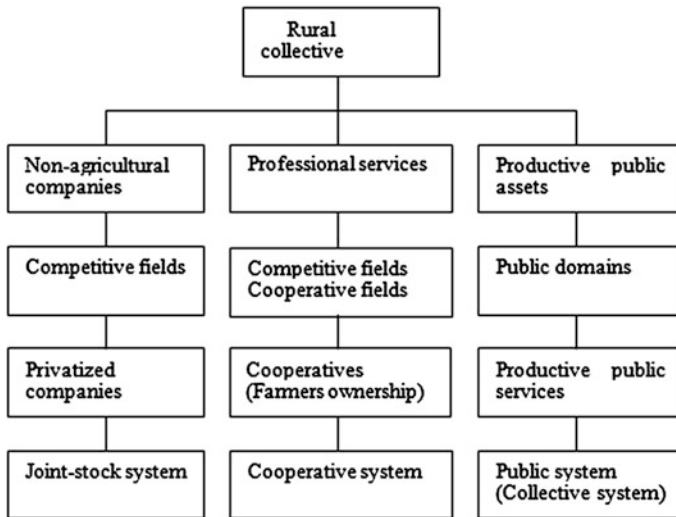
Fig. 64.1 Rural collective economy: differentiation and transformation

In enterprises, the institutional costs mainly depend on both labor transaction costs and the collective decisive costs. If ownership is granted for members or families, then both costs will reduce greatly. Hence, the socialized professional services should be reformed into cooperatives, and let families hold ownership.

64.3.2 The Reform of Non-Agricultural Companies Initiated by the Rural Collective: Private Ownership

Usually, the rural collective companies produce industrial products with few cooperative economic attributes. Companies must reflect the profits maximization principle instead of communities' welfare maximum, therefore companies must be thoroughly privatized through restructuring.

In Eq. (64.1–64.3), if the ownership is granted for shareholders rather than members/employees, both labors transactional costs and collective decisive costs will reduce greatly. The collective decision-making costs depend on whether owners of companies share homogeneous or heterogeneous interests. In companies where shareholders have homogeneous interests, the collective decisive costs are very low. Meanwhile, non-agricultural companies also make labors trading costs lower. Hence, non-agricultural companies initiated by the rural collectives should be transformed into joint-stock system, and let stockholders hold ownership.

64.3.3 The Rural Collective Assets Providing Productive Public Services

In many places in China, the rural collective economic organizations mainly manage the village collective assets, for example, contract, lease, share, rent, etc. In fact, they have withdrawn from the production and business fields. In that case, it works better to revoke the village collective economic organizations and transfer managing function of collective assets into the villagers' committees. In villager autonomous institution, by increasing the transparency of village affairs, villagers can supervise revenues and costs of collective assets, at the same time, also can avoid the payments incurred by political and economic democracy.

In terms of The Organization Law of Villagers' Committee (2010 revision), the villagers' committees have the rights to manage collective assets. It should be emphasized that the villagers' committees can only manage collective assets, which because that the villagers' committees ought to deal with village public affairs instead of other private affairs. Otherwise, nonprofit activities will contradict with profit-oriented activities. Author agrees with the rural collective economic "matrix idea" viewpoint that the rural collective economy should focus on providing with fundamental productive services, for example, managing collective lands, water conservancy facilities, and large and medium-sized agricultural machinery, which other rural economic organizations cannot afford. The rural collectives provide agricultural productive infrastructure, meanwhile, all kinds of agriculture cooperatives and other specialized service organizations mainly provide other socialized professional services.

64.4 Conclusion

Collective economic development must reflect its essential attributes and must focus on providing farmers with basic productive public services. The rural collective economy should evacuate from the agricultural competitive fields and governments should encourage and promote other rural economies to participate in the competitive fields in order to realize optimal disposition of the rural economic resources. As a matter of fact, the rural collective economic decline has proved the viewpoints.

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Chapter 65
Research on Gentle Presentation of Products

Aihong Wang and Jinbo Sun

Abstract Based on the "gentle" which is a very important principle in Chinese traditional culture, this paper has analyzed the representation of the product, including forms, contents and existing problems in making product result pictures. The gentle can be used to guide designers to get a right path to improve the quality of presentations.

Keywords Product presentation · The gentle · Design · Computer aided design

65.1 Introduction

Product presentation is the most powerful tool to express design and idea. It is the communication bridge between the industrial designer and customers. Industrial design can be define as a communication subject: designers deliver ideas to manufactures with concepts; manufactures sell products to customers to express ideas of designers. It is important that the effect of presentations of product will affect the design procedures of products and financial rewards [1]. In the market

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condition, a lot of problems turn up in the industrial design, including presentations. Therefore, to guarantee the quality of the product presentations, the principle of the gentle has been bring forward [2].

65.2 Structure of the Gentle in the Presentation of Products

65.2.1 The Presentation of Products

The presentation of products is an essential and important step of product development process. Design is a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in whole life cycles. Therefore, design is the central factor of innovative humanization of technologies and the crucial factor of cultural and economic exchange [3]. Industrial design plays an important role in every aspect of industrial production process. Designers need to confirm the accuracy of design process and consistency of the process from design to products [4]. They connect every aspect of the design process with the artistic judgments and technical control [5]. Therefore, the accuracy of the expression of designers' objects becomes important. And the product presentation is the most indispensable expression channel in industrial design [6].

The presentation of product is one method of the design visualization (Fig. 65.1). Designers use presentations to show or evaluate their ideas before

Fig. 65.1 The design visualization

manufacturing and consuming, as the most important media. Designers deliver the visual and possibility of the design as well as the detail of ideas. And it is a key point of the communication of designs [7].

65.2.2 The Gentle

The gentle is used to describe a man with great manner and accomplishment, and quoted as the condition of the dialectical relation of forms and contents. The whole system will be harmonious only when forms and contents reach a balance. The gentle means the balance of forms and contents. There are two trends of the contradiction: one is emphasizing forms or contents separately, another one is emphasizing both forms and contents [8].

Confucius thought the gentle can solve the contradiction of forms and contents, which is an important part of the Confucius' doctrine of the mean. His first-ever on this issue are discussed [9]. The great Chinese philosopher and teacher Confucius said, it's ugly when contents is more than forms, and it's subjective when forms is more than forms, and it turns to the gentle when forms and contents get harmony.

From an aesthetic point of view, the gentle is used to resolve the dialectical relationship between forms and contents. The form is extrinsic and the content is intrinsic. The object gets to gentle if the outer expresses the inner appropriately and the inner supports the outer reasonably [10].

65.2.3 Forms and Contents of the Presentation

The presentation is composed of a lot of elements. The form of the presentation is composed of the product design and the expression effect. The product design is composed of colors, materials and styles. The expression effect is composed of compositions and manifestations. These elements are significantly and could be distinguished from the presentation. The content of the presentation is composed of ideas and requirements. The ideas of the presentation are composed of designs and minds. The requirements are composed of target environment, target of people and proper product.

The gentle of the presentation means the styles, materials, compositions and total effects are exact for target scene and user with the idea and visualization. The presentation is a complex compound with the fusion of science and art elements. Each of these elements with inadequate attributes will destroy the balance of the gentle.

65.3 Research of the Gentle in the Presentation of Products

65.3.1 Study on the Presentation of Products

There are two kinds of presentations of products, one is made by hand sketch (Fig. 65.2), and the other one is made with computers. Computer presentation of products can be stored and output in different formats or ratio. It has change the work process of designing. The computer technology is becoming more and more powerful to simulate the product virtualizations. Before prototyping, designers can evaluate ideas directly, exchange thoughts exactly. By modeling and rendering products with computer, designer can get away from tough work of hand draw presentations, and pay more attention on ratio, dimension, material, style, even effect of environments.

Computers have free designers from the hard work of hand draw and inspire their creativity. Compared to the hand draw, computer is more than tools better than skills. After analysis the situation and documents, we can identify the problems below:

Over-rendering becomes common. Designer always show there taste, habit or skill in the presentation in unreasonable way.

Too much routine in the presentations. Designers need to prepare the presentation rapidly in the working process. A lot of designers make out a template to accelerate the speed of the work for a long period of time without change.

Improper expression in presentation. Designers need to use right way to describe details of products and their environments for use.
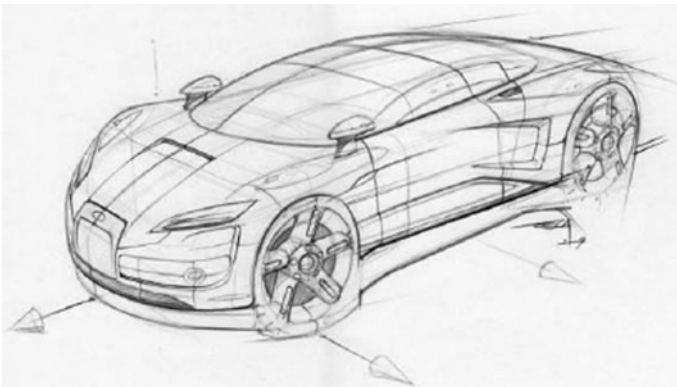
Fig. 65.2 Hand sketch

65.3.2 The Method of the Gentle in the Presentation of Products

To solve these problems above, we need to follow principles above.

First, designers should combine contents and forms of presentations. And designers should put the systemic view into the presentations preparation, use proper structures to contribute presentation with design concept, style and material. Information need to be delivered vividly from designer to customers.

Second, the gentle is the key principle of the presentation. Designers should control the various elements in the process of prepare presentations, such as specific occasions, the crowd and applicable products. Forms are contents' visual foundation. The angles of the view and the materials of the products should be at a proper level or mount to please the customers' requirements. Apple's presentations on the web of its products are clear and bright to emphasize the quality (Fig. 65.3). Apple's outdoor ads use simple colors and shapes to be identified it is popular (Fig. 65.4) and created the specific scene of the target population in the most acceptable results. Another example is Iriver of Korea. Its mp3 series product's presentations contain a lot of pictures to describe the quality of details (Fig. 65.5).

Fig. 65.3 A result picture in Apple's website

Fig. 65.4 Apple's outdoor advertising

Fig. 65.5 Web page of Iriver

65.4 Conclusion

In contrast with current presentations, the gentle is an important principle to the product presentation. Designers can be more efficient in the expressing and communicating in the presentations. We believe the gentle is useful for presentations. In further studies, we will develop an evaluation tools to help designer to collect and restructure the information of presentations.

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Chapter 66
Analysis on Social Adaptation Ability of Graduating Students

Hui Yang

Abstract For a graduating student, the one who has a good ability to adapt the society can make himself face with social pressure better, which has the great significance on the survival and development. By using questionnaires and interview method for the graduated college students and social people, we explored some society factors that impact on the graduated students' ability of adaption. Finally, the evaluation model of college Students' social adaptation ability was established by using the fuzzy formula method, which provides a theoretical basis for the construction of college students' ability to adapt society and provides a good integrated research platform to promote the employment rate of university students.

Keywords Graduated students · Fuzzy method · Evaluation model · Social adaptation ability

66.1 Introduction

The society orientation ability means individual independence processing daily life with undertake social responsibility with attain his age and place the social cultural condition is also the usefulness that the individual adapts to nature and environment the degree for expecting [1]. The university student's social orientation ability means that the university student lives to the university and the strong or weak performance of the adaptability of social activities, being also an university

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Fig. 66.1 The influence factors of social adaptation ability
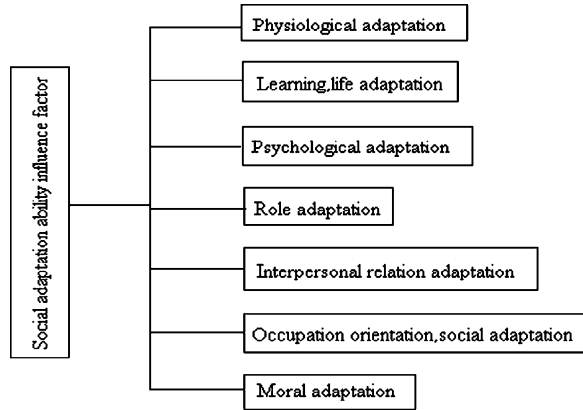
student the conditional change but the characteristic of the change oneself and the ability of the life style is along with the outside environment. Is a national support to contemporary university student, the hope of race is also implementation section in the nation to teach to make a country strong and talented person's big country strategic main force strength [2]. If an university student lacks good social orientation ability, so he cannot adapt to the social activities of modern words, cannot develop own wisdom and ability, to society even nation to say to is all kind of loss [3]. This paper have something to do with network's tidying up through a cultural heritage the data of society orientation ability by adopting a questionnaire survey and, which is the theory foundation that investigates a research. Has been induce, tidied up and combined the problem of the mental expert to the establishment related questionnaire through go sieving to ensure the usefulness of questionnaire and aim at character. The concrete questionnaire should include of contents factors such as Fig. 66.1.

At investigate the social influence factor in the questionnaire to mainly include the spirit, team spirit and information of the cooperation ability, self-educated ability, creative consciousness and hard working to make use of ability, relationship cognition, human relations interaction ability, meet an emergency ability and exist a series of items like ability, etc. with in response to university student and social personnel through go contrast [4]. Combine logarithms according to result through go a T examination, and to result through go to show to analyze, finally make use of a misty formula method, establishment university student society orientation the evaluation mode of ability [5].

Table 66.1 The research object tables

	The undergraduate students	Social workers
Male	31	30
Female	30	34
Total	61	64

66.2 Research Process

66.2.1 Research Object

The object of our study is based on different professional graduates as an example; the society has more than a year of work experience as a reference object [6]. Through the questionnaire survey. The specific situation is seen as Table 66.1.

66.2.2 Data Processing

We applied the analysis method of Mathematical Statistics by a variance to get the data through processing in the line. Come to study in response to the graduation university student and social personnel of showing of social orientation ability contrast [7]. To each evaluation index sign through go a T examination, and carry on analysis as a result to the examination. Its examination result is as shown in Table 66.2.

From the Table 66.3, we can see university student and social personnel to compare in the spirit, team spirit and information of the cooperation ability, self-educated ability, creative consciousness and hard working to make use of ability, relationship cognition, human relations interaction ability, meet an emergency ability and exist ability to compare with social personnel to exist very great

Table 66.2 The contrast table of the ability of social adaptation of variance analysis

	The undergraduate students		Social workers	
	Average	Covariance	Average	Covariance
Cooperation ability	3.700	0.82	3.820	0.809
Self study ability	3.671	0.563	3.714	0.617
Innovative consciousness	3.021	0.543	3.437	0.671
Fighting spirit	3.374	0.687	3.789	0.720
Team spirit	3.125	0.455	3.185	0.789
Information utilizing ability	3.554	0.895	3.782	0.899
Interpersonal cognition	3.358	0.568	3.787	0.653
Interpersonal ability	3.698	0.556	3.832	0.633
Strain ability	3.800	0.814	3.456	0.735
Viability	3.997	0.852	3.558	0.832

Table 66.3 The ability of social adaptation

The individual index X		Family index Y		School index Z	
X1	Level of education	Y1	Family environment	Z1	School education
X2	Interpersonal relation	Y2	Family education	Z2	School environment
X3	Cooperation, competition				
X4	Learning				
X5	Good health				
X6	Social practice experience				
X7	The ability to live independently				
X8	Tolerance				

difference in response to from our the variance the analysis the form [8]. But compare to exist very great advantage in response to university student and social personnels of in the aspects of meeting an emergency ability and existence ability. Is analytical in this variance in of all differ the showing of value level to 0.05.

66.3 Modeling Establishment

We make use of a misty formula method, according to statistic from the data of result establishment the society of university student adapt to the evaluation mode of ability [9]. The establishment of misty model such as Fig. 66.2:

The evaluation system of society adaption ability includes individual index sign X and the home index sign Y, and index sign Z in the school. Among them, the individual index sign X included X1 to be subjected to level of education, X2 relationship (communication, comprehension, compromise, open heart etc.), X3 cooperation, competition (collective consciousness, team spirit, social norm etc.), the X4 studies (is self-educated, creative power etc.), X5 healthy body (physical endowment, energy prosperous degree, have no disease), X6 society practice experience (experience personally social role degree etc.) X7 independently live ability (the ability of taking care of oneself, independent thinking and processing problem ability to the living attitude, life), the X8 bears dint. The home index sign Y included Y1 home environment (home relation, economic condition), Y2 home education. (Parents cultural degree, parents' occupation) Index sign Z in
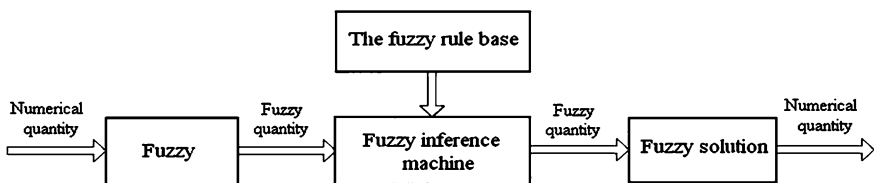
Fig. 66.2 The establishment of fuzzy model

the school included a Z1 school to educate, Z2 school environment. (management in the school, public, private, humanities, academic atmosphere) Such as Table 66.3.

We carry on a misty formula evaluation to all factors [10–13]:

$$U = \{X, \ Y, \ Z\} \tag{66.1}$$

$$X = \{X1, \ X2, \ X3, \ X4, \ X5, \ X6, \ X7, \ X8\} \tag{66.2}$$

$$Y = \{Y1, \ Y2\} \tag{66.3}$$

$$Z = \{Z1, \ Z2\} \tag{66.4}$$

To sum up, we can draw the college student's social adaptation ability evaluation model formula:

$$F_i = \sum (A_i \cdot X_i) \cdot 100 \tag{66.5}$$

Among them, the formula at,

A_i is the evaluation of each index weight coefficient

X_i is the evaluations of the grade of membership of each index quantify value.

66.4 Conclusion

From the statistics data and form of questionnaire, we can see that university student and social personnel to compare in the spirit, team spirit and information of the cooperation ability, self-educated ability, creative consciousness and hard working to make use of ability, relationship cognition, human relations interaction ability, meet an emergency ability and exist ability to compare with social personnel to exist very great difference in response to. But compared to exist very great advantage in response to university student and social personnels of in the aspects of meeting an emergency ability and existence ability.

Analyzing the development path of social orientation ability, we can get the conclusion that contemporary university students mutually adapt the social through a survey. On paying attention to foster the university student's human relations society association ability, this kind of association not only list is the association of the material and benefits, the association of the more important mental state and emotion. A good human relations communicates the ability can foster ego consciousness improve society orientation ability thus. Two is the egos that develops a student to cognize ability and strengthen self-confident heart. The ego understanding can be an university student to recognize the place of his/her own clear advantage and shortage, can discover a problem thus, can be better to put oneself in a suitable height and make oneself be full of confidence. Three is

foster independent life and work ability. Have good independence, can make oneself independent thinking problem, solution problem, a person's independent life ability and one personal life development and successfully have an osculant relation. Four want strongly mental acceptance ability of raising the university student. The mental state bears the exaltation of ability, can make the just-graduated university student raise anti- frustrate ability and helps them to adapt to the exaltation of ability to the society.

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Chapter 67
Study of Light Installation Art in Space Design

Haiyan Liu, Yang Liu and Lei Cao

Abstract As one kinds of art, light installation art has attracted more and more attention. For this reason, this paper mainly introduces the occurrence, development and application of the light installation art in the recent years. With the development of lighting technology, some new light source and materials have been adopted for the design of light installation art, which greatly enrich the design concepts of light installation art design. Basis on these, light installation art has been applied in the design of the architecture, landscape and commercial display space, which not only present the artistic charm and promote the ornamental value, but also give us endless reverie and aftertaste of the art inspiration.

Keywords Light installation art · Interaction · Motion and light art

67.1 Introduction

As the carrier of visual information, the expression of light is better than all other materials. It not only makes the most abundant expression of color, emotion and the atmosphere, but also produces the wonderful shape, space and movement effect [1, 2].

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The current design and application of light mainly concentrates on functional lighting [3–5]. Furthermore, the lighting of outdoor landscape and interior space are inseparable from the pattern of industrialization and modular high-volume applications, all of which proves to be lack of personalized design and similar to each other. However, the installation art is a personalized expression of light. As the optical device is not dependent on the material and the constraints of space shape, it is an art exploration and a test of art design [6]. Therefore, its creative thought often bring some unexpected results to promote its application in the design inspiration of the architecture, home, commercial display space.

67.2 Development of Light Installation Art and Expression Forms

In the field of installation art, the Bauhaus's professor of L. Moholy-Nagy is the first person to use the light as one main kind of creative means. In the period from 1923 to 1933, he proposed the creative shape thought about the light, space and movement. His light work of "regulator of light and space" showed that the light movement could result in the changes of form, texture and space to obtain some strange shaping results. Furthermore, his two important books entitled by "New Vision" and "Vision & Motion" elaborated a new shaping theory. The exploration of light and movement based on the Nagy's writings and work is a revolutionary breakthrough of plastic arts, meaning that light can not only occurs in the painting, but also becomes a magic brush in the environmental space. Therefore, the light and movement can be used as the factors of shaping art to become the pilot of a light installation art.

Due to the progress and development of science and technology, many technology-related art schools including the "Op. Art" appeared in the mid-1960s. They used the optical illusions, visual illusion and visual hallucinations to create many new types of paintings. The optical effects of light perception, phantom sensation and movement originate from the special power characteristics of pictures. The regular arrangement of lines, the cyclical combination of different shape and the colour change of these pictures bring special incentives to our vision, confuse people's visual perception and result in the illusion of flash, radiation, rotation, bump and other motion illusion. Although the optical effect of the paintings does not illuminate itself, this art form promotes the application of light as a creative means to the installation art, and the graphical combination form of optical effect in the painting has a great impact on the application of optical device in the filed of spatial design.

In 1967, 80 artists from 20 countries held a large-scale "Art • Light • Art" exhibition in the Brahma Abbott Art Museum of Art in Netherlands, which promoted the rise of light art in European and American art scene. The reason of this name had a double meaning, which believed that all the work was an artistic light

while the art originated from light. Therefore, this kind of art was named light art. The painters of light art used the new materials supplied by the science and civilization, such as mercury vapour lamps, fluorescent lamps and arc lamps, to create a full artistic light shape. After this, the art has entered a new era. Due to these, some light artists said: "Light is just the language of our time." "The colour of light severs the same function as the specialized pigment tube of painters."

In the early stages of the light installation art, it directly used light sources as a creative element, the lines and shapes in the work was formed by the light sources. The masters of lighting installation art named by Dan Flavin began to create the fluorescent art in 1961. According to three forms including horizontal, vertical and diagonal, ordinary civil lamps were installed in the hall, corner or corridor without any decoration to create a simple, sturdy and light atmosphere. These works proved to be very simple and presented a non-material light illusion effect. In the overnight section of the Paris Sleepless, a light installation art of "question mark" was showed in a church. Seen from the entrance of the church, the suspension of spherical lights hanging at different heights arranged in a simple "question mark" shape to echoes the space environment of the church dome, which seemed to open the believers heart to dialogue with the god in this solemn atmosphere of the church.

In China, some vanguard artists also starts to engage in the light installation art, which is the obvious diversification trend of the Chinese contemporary art and presents a deep change in the field of social ideology resulted from the technology and art.

Therefore, light source is the means of the shape and the performance of object in the early stages of the light installation art. It not only shows the contemporary technology products, but also fully explains the possible combination of technology and art. With the use and understanding of the light source, the artist began to study other physical properties other than the brightness of light, such as reflection, refraction, projection, diffraction characteristics of light in different materials. Although light is immaterial, the reconstruction of light and material can produce a more varied artistic effects. Especially in recent years, the control of the light further is improved with the era of LED light and the total combination of sounds, images and other multimedia techniques greatly extends the installation artist's artistic imagination.

67.2.1 The Use of New Light Source

The emergences of new light source and its control technology promote the changes of three-dimensional form composition from the entity material to the spatial and temporal movement of the non-material light, which create a variety of illusive three-dimensional visual images and flexibly control the morphology and dynamics effects. The lighting device of Jiang Zhenggen showed the new visual experience of the integration of contemporary art and new technology. His "nanoscale work" of

"succession" is derived from the collision of the biosphere "succession" thinking. The visual phalanx composed of machine glass and light guide tube formed the space–time transmutation of life constructive structure. The whole work contained eight circular organic glass boxes (120 × 120, 60 × 60 cm), three thousand and one hundred light transparent plastic hose and silver metal wire, and LED wick (or fiber material). The transparent plastic hose of the light guide was controlled by the program of the LED light and the illusion effect of the work presented a strong vision quiver. The art miracle created by the new technology is the uptake and sublimation from other art forms. The early optical effects, such as those occurred in the 1960s, did not shrink to the corner of history due to the era of progress and development but attract public attentions by means of the power of technology.

67.2.2 Light Interaction Device

In the early period of 1950s and the late period of 1960s, Nicoas Schoffer began to create the complex and strict optical dynamic effect of sculpture based on the control theory. This large sculpture with the effect of movement, light, sound was created by the state-of-the-art technology of computer program, electronic sensor technology, which was capable of sensing the environmental stimulate. With the combination of the movement, sound, light, material, structure and spirit effect, the computer systematic control of the shape created popular environment art and a comprehensive media arts spectacle directly guiding the interaction between the audience and environment.

Using infrared sensors, a light form of "Satire" was designed in 1998 by the Dutch designer Dirk Rotten and Jeroen Kascha to explore the interaction of light environment. Entering the black room, the audiences firstly heard the strange sounds of insects in the surrounding and then there would hang three pupae in the few feet away. When the man approached, they disappeared and left a burst of flapping wings at the top of the head. After a puzzled moment, a 15-foot fiber-optic butterfly would appear in front of the audience with a flash of light. Exhibited in the Victoria and Albert Museum in London, the luminous interactive device named Volume works was completed by United Visual Artists (UVA) and One-pointsix. As a sound and light installation, the wok of "volume" composed of a series of light beam was a wonderful scene of the John Madejski Garden. It had good interactive features and produced a series of visual and sound sensor according to human action.

67.2.3 Motion and Light Art

As an important leap in the field of plastic art, the rise of motion and light art explores a new field of plastic art. The direct use of motion and light adds the time

element to the plastic art, which gives the plastic art a sense of dynamics, spatial awareness and rhythm. As the light is the essential source and factor of vision information, the control and application of light greatly widen the possibility of expression effect and result in an endless vision effect. The combination of power, light and new materials not only produces a new temporal–spatial feature and special expression, but also results in the basic change of the modeling materials, the constructions, the expression forms and expression methods. Therefore, the developments of motion and light introduce the trend and development of the mixed media art, establish the basic value and development patterns, and stand for the exploration direction of the new plastic arts.

Argentine Julio Le Parc is one of the most imaginative light moving artists. He is good at the generation of infinite creative change of light by some simple device. He often selected mirror as a material of the light shape. Created in 1962, the lighting device of "revolves endless-light" was hidden inside the black box. The light projected through the mirror, light-bending mirror, filters and other devices to reach the circle screen. Furthermore, the heating energy emitted from the electric bulbs could be used to push the movement of the light device, all of which presented the changing endless special light effects. "U-go" was a work of Chinese artist Xu Zhongmin created in 2008. A set of closed transmission system showed the change from a living person to dead one, from man to woman, from one person wearing the clothes to a naked one, which seemed like an assembly line of the factory. Every small person was dressed in small suit and small dress appeared with the flash of the white light below the glass fibre reinforced plastic shelf. This light device combined with the voice of the rotary machinery proved to have the sense of monotony, permanence and endless cycle, which could lead to a sensation of dizziness after a long time attention.

67.2.4 Light Sculpture

As an ancient European art, the light sculpture all referred to as "the baroque style celebration of lights". The contours of the baroque style building were constructed by the steel frame, which was a landscape in the daytime while shined bright lights in the night. The Italian International Light Sculpture art Festival was held in the Xuanwu Lake of Nanjing city in the 25th, January, 2010. Thirteen landscape community lighting sculptures composed of 56 millions LED bulbs originated from the Italian landscape. This light sculpture exhibited the beauty of virtual building and the strong feeling of artistic conception.

67.3 Application of Light Installation Art in Space Design

Installation art was originally called environmental art, which not only points out the different between the graphic space and installation art, but also shows that the installation art is dependent on the three-dimensional space. Both the architects and light designers mainly pay their attentions to how to deal with the relation between light and environment, shaping, space, color and the surface materials, etc. That is to say, the light has taken the dominance role in the space design. With the development of lighting technology, it can help us to realize a lot of complex visual effects. Therefore, some designers attempt the application of light device art in the design of commercial space, architecture space and landscape space. The optical device is different from some simple lighting. The features of light, such as brightness, hard and soft quality, cold–warm degree, colour, reality and images, movement and rhythm can have some effect on the human vision and psychology after the designer's managements. Therefore, the application of light characteristics not only creates a mysterious and unique effect, but also adds a bright spot in the space environment.

The light installation art has become one part of the building. Taking into account the public participation and the construction of Memorial, some stylized architectures convey the image as an installation art. Due to the presentation of the light connotation, the night of Bird's Nest and Water Cube have been considered as one art work rather than one building. The UK Pavilion of 2010 World Expo is designed as an open park without roof, the "seed Temple" in the Pavilion core area existed the external growth of more than 60,000 root tentacles extending in all directions. During the daytime, these tentacles would like the optical fibre to conduct the light for the interior lighting and create a strong modern and decorative sense while tentacles built-in light source could illuminate the entire building to make it dazzling in the night.

Up to now, the light installation has become one part of the landscape. As the landscape environment is an open public participation and recognition of outdoor space, the participation of installation art has turned the landscape into one commonality and communication products of outdoor space environment.

The dimensions, form, outline of light installation art and the color, quality and connotation of the material directly reflect the image of landscape, define the functional characteristics of the outdoor space environment, determine the order of the outdoor space, enrich the connotation of the urban landscape environment. To some degrees, light installation art is not only a hard landscape facility but also a soft cultural landscape. Entrusted by the HSBC Bank, a installation art designed by the UVA for the China modern art exhibition has the indication and landmark sense, the inspiration of which was the expression of Chinese Characters using the structural neon lamp. In the Valentine's Day, a 10 ft high cube-like structure with 400 LED acrylic tubes arranged in a transparent sculpture was a light device of Times Square in New York. The red cylindrical component constituted the heart of three-dimensional shape and the bright lights around it were a symbol of pure love.

In addition to these smaller volume light installation art, there were some light sculpture works combining the 3D light project and the LED lighting. In the 2012 Light Festival of Ghent in the Belgium, a grand church of Luminarie De Cagna composed of 55,000 LED bulbs seemed to a mirage standing in some buildings and this 28 m high cathedral became the most dazzling highlight of all the whole exhibition projects.

The combination of light installation art and commercial space not only enhances the artistic taste of the goods, but also makes the optical device of art work move from the hall to the life of common people. Serge Salat is the famous French master of installation art, his space art exhibition of "movement of the light" was the world's top installation art with the cooperation of the car brand. The structure of the entire work was composed of the real vehicle, transparent material and 288 pieces of 5 mm thick mirrors. Furthermore, an enclosed space of infinite mirror was obtained in its internal space. As the combination of imagine art, computer art, music, sculpture and architecture, the works formed a closed and secret universe to produce a weightlessness feeling. The large installation works of "Lady Dior, light package" created by the Chinese artist Li Songsong completed the artistic dialogue between a French and Chinese, contemporary art and fashion. He divided Cannage pattern of the classic handbag into three layers, created the skeleton of the giant device according to its structure, lines and cutting style, and installed the neon lamp on the surface of the installation to reinterpret the Lady Dior.

67.4 Experiment of Light Installation Art

Seen from the light installation in the space environment at home and abroad, the rich artistic rendering power of light is originated from its properties and its different dissemination results in media. In order to further experience the infinite charm of light and have more understanding and grasp of light installation art, a series of experiments in the following about the light material composition, the relationship between light and shadow, the composition of light, the Lumino-Kinetic Constitution and the form constitution of light were carried out. The Tables 67.1, 67.2 and 67.3 show the experiment of the optical device.

Table 67.1 Experiment A of the optical device (city)

Experiment A	Name: city	
Creative description	Night of the city	
Icon	Design	Renderings
Production instructions	Place a certain number of holes in the surface of an abandoned box. The light emitted through the holes of the box formed numerous light sources	
Conclusion	The design installation art was based on the light transmission phenomena in materials	

Table 67.2 Experiment B of the optical device (hot)

Experiment B	Name: hot	
Creative description	Charcoal	
Icon	Design	Renderings
Production instructions	Steel balls, LED lights	
Conclusion	Light changes the visual properties of the material, the cold material will have the hot psychological texture	

Table 67.3 Experiment C of the optical device (tower)

Experiment C	Name: tower	
Creative description	Abstract polyhedron	
Icon	Design	Renderings
Production instructions	The shell is a plastic pad. Skeleton is constituted by wire. The wick is the acrylic plate	
Conclusion	Light can create a sense of volume in the visual	

67.5 Conclusion

The light installation art is the individual behavior of artist based on the combination of science and technology. Once integrated into the structure spaces, such as the Commercial architecture, pedestrian street, etc., it not only creates a romantic and dream, but also evokes the aesthetic resonance, motivates people to experience more mental space. In a word, the light seems like a magical charmer and is worthy of the exploration of the artist.

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Chapter 68
Ecological Research on Agricola Leisure Sports

Hongmei Wen, Tiexiong Zhang, Tingting Long and Feng Mao

Abstract Using the view of bionomics, grasping the life connotation of Agricola, it aims to analyse ecological character of Agricola leisure sports industry. The development of Agricola leisure sports in the ecological view is not only an example of complying with the social environment and the natural environment, but also a new model of modern leisure sports development.

Keywords Agricola · Leisure sports · System

68.1 Introduction

The ecological world outlook reveals the man's ecological generative By Marx's "nature to life", which also reflect in this process. In the process of nature to human, Sports is not only a exploitation and release to human energy. It also a real possess process, which via and benefit for human, and it is a multiple process that human to themselves and to social (human). Maybe we can say: the development of Agricola leisure sports exactly a integrate instance, which mankind comply with social environment and natural environment. It's a new mode of modern leisure sports development. When people workout in Agricola, them have more perceived value to eco environment and more comfort to human's spiritual world and arouse strong desire of the harmony with the nature for green homestead [1].

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68.2 Understand the Connotation of Agricola Leisure Sports Form Ecological Travel

Ecological sports travel is a high-level travel. The domestic scholar assumed that eco should have double means [2]. The first one, eco-means ecology, since from ecological point view. It's must be ensured, be hold and can boost the ecological balance by develop ecotourism, which can embody the persistence of sustainable development [3]. The second one, eco-means economy, Since form the economy point of view. It must obtain economic effectiveness when local residents in this activity. Ecological tourism is an activity that it's to paly or watch fitness entertainment, sports competition and sports communication for the main purpose and it's base on the ecological environment and natural environment as the orientation and it's not only be able to obtain sports benefit and economic benefit, and can also realize ecological benefit and social benefit. Rural tourism leisure sports correspond the characteristics of ecological tourism by held especial activities as 'into farmer's house, do farmers work, live in peasant room, pleasure in house', which is a tourism development form that can transition and realize a perfect combination from tourist products to vacation products, and it accord with the characteristics of the ecological sports tourism. "Organic" leisure sports belong to agriculture ecological tourism in humanism ecological of the sports tourism, and its including pastoral scenery, pasture, fishing area and peasant, you can appropriate to develop some light sports type of ecological sports tourism projects, such as fishing, to pick the melon and fruit, drive up NiuGen car and so on, you also may establish recreational sports village, to develop some sports project such as dancing, horseback riding, bowling, golf and so on. In this place, tourists do both appreciate the pastoral scenery, achieve the purpose of return to your's original nature and achieved the purpose of physical fitness by participated in some favorite sports [4].

68.3 Ecological Analysis of Organic Leisure Sports

Organic is originated abroad rural tourism as a form of tourism. Because rural tourism is belongs to a branch of ecological tourism, "organic" also well-deserved belongs to the scope of the ecological tourism. It's so late to start that its development is more than 10 years in our country and the real alternative to the naming of "organic" began in TaoHua festival form LongQuansaoshufang village ChengDou in 1987. It formed a new form of the tourism which combined farming activities, pastoral scenery in the countryside, local folk culture, rural dwellings and settlement culture with modern tourism vacation, leisure and entertainment. It's slowly to form with more people pursue healthy life idea in the various characteristics of farm leisure activities. As the booming development of "Organic" leisure sports which reflect the characteristics form both origin and other form of it. It's a good reflex that desire of city residents evacuate the city

environment pollution, working too nervous and indifferent interpersonal relation of city and rural simplicity folkways, leisure rural life and beautiful and harmonious natural ecological environment, It satisfies our different needs, and the same time give consideration to the harmonious development of man and nature [5].

68.3.1 It is a Performance of Later Industrial Civilization Social Return to Nature

With human over a long period of years from the primitive society to the later industrial civilization, they have a high pursuit to material and spiritual life. Nevertheless, a later industrial society with possess glorious industrial civilization are losing harmonious companion with natural for human's wanton "pillage" to nature, cause the earth we live in frequent natural calamities, city population expansion, the skyscrapers complexes and traffic jams, environmental pollution and so on, which estrangement from the distance of man and nature, person and person. People urgent need the change of original ecological, return to nature, and close to the life. It is a great time and way they can find to return to rural nature by a subconscious of try to seeking the roots and trace. There is a problem that scholars and people care about is "ecological consciousness" and "ecological benefit" in the 21st century, and the voice of people to pursue ecological balance, and ecological harmonious become more and more intense and praying for the human being and the nature peaceful coexistence. Thanks to people pursue the concept of healthy life is slowly to form in various characteristics of leisure activities, so can organic sports leisure activities got a favorable reception.

68.3.2 It Embodies the Unity of Man and Nature

The "organic" business environment had been composed with natural environment. And leisure sports attractions had been composed with sports, sports culture and sports products for it can embody embodies the human and the nature harmonious. In the process of getting along with thousands of years between Rural residents and natureFengLing, they learned to adapt to nature and construct the harmonious relation between man and nature. "Organic" leisure sports is so popular in the heart of people with some characteristics such as close to nature, consumption is economical, simple and convenient, you can not only sightseeing but also Physical Exercise, which just can become a tourism development form that can transition and realize a perfect combination from tourist products to vacation products. There is formed a different regional sports culture and sports concept, and build the different rural amorous feelings. In the relationship between the nature and people and all of this can reflect the human and the nature harmonious culture constitutes the attraction of Organic sports leisure.

68.3.3 Its Positive Effect to Adjustment of Agricultural Structure and Increase the Income of Peasants

Organic leisure sports are one of important way by which agricultural industry are transformed and upgraded. The planting is playing a main role within Traditional agricultural in China, with low economic benefit and big management risk. It has a great change that from agricultural land itself's single business to a harmonious coexistent broader space with "sky-land-man", which can greatly improve the agricultural economic benefit, not only to business and food service of the third industry, but also can drive the first and the second industry development. It can also help to form industrialization production system, so it can be drove of area industrial structure adjustment and optimization. At the same time, leisure sports can be suitable alternative to the rural labor force, which can increase cost of labor intermingling and improve the standard of peasants' living, make the local farmers' incomes increased. As an example of Huangcao Town. Zixin City. Hunan province. There are 14 farmhouse tourism have been launched in QianChen and Fengling village. The first one is ChenCaixiang's family in 2001, which the tourist income is reached ¥60,000 and the profit of nearly ¥40,000 and the annual income have five times than before. There are 260 beds with this 140 sample family, ¥80 a day and ¥60 a day in off-season, there are received 12,000 tourists, and profit and tax have 250,000 yuan in 2001. Therefore, with the development of the leisure sports, It not only beneficial to improve the whole quality of farmers but also be helpful for the development of rural sports industry. So, we should expand the rural industry structure and let it as a rural income growth and expand the rural population employment new starting point and encourage ecological sports leisure activities, which take the sustainable development route in the new rural construction of new social situation.

68.3.4 The Development of Organic Leisure Sports Can Become the Back Garden of the City Development

With the development of society, more and more people get into the countryside from the city, to the most broad world and enjoy the experience of unsophisticated folkways in organic, which become a spirit residence of modern city people. At the same time, it also achieved a heart complementation between people to people by Country Bumpkins to City Slickers. Organic leisure sports tourism brings people and logistics, more have the stream of consciousness, thoughts flow. The tourism development not only inject the great vitality and vigor to local tourist economy development, but also bringing new tourist concept and thought, the blend and collision of city and a&m culture, the civilization has been brought from city to rural, which improved the rural culture and quality of workers and narrow the gap between urban and rural areas. More new service concept have been brought

which greatly enhance the local residents civilization consciousness and promote the construction of spiritual civilization in rural areas. As the combination of urbanization and rural areas, the Organic gradually make countryman living like Urbanian.

68.3.5 Organic Leisure Sports Can Promote the Development of City Edge Sports

It has a great change of human's life in 20th centuries, With the rapid development of science and technology, which are mainly embodied in the increase of leisure time, the rich of material conditions and intrusion of "modern civilization disease" to body and mind. The increasing of the leisure time is a necessary premise of leisure and economic development provides the material basis for people engaged in leisure. So that people have the ability to choose more leisure, "modern civilization disease" to urge people to actively seek positive and healthy life style, Organic approached the city life quietly, leading to the development of the city edge sports as its operation content and recreational area has certain characteristics and can regard it as a stretch of city leisure sports.

68.3.6 It Can Provide Employment Security for Sports Professional Graduates

In recent years, The unprecedented pressure of college physical education graduates face with is that college physical education graduates has increased dramatically and higher request has been put forward as professionals high level and complex management talent and sports professional graduates just comply with its requirements. As they applied it to farm business, not only spread of professional sports skills but also organic leisure sports can have a further development.

68.3.7 It's Helpful to the Sustainable Development of Industrial Chain

We must pay attention to rural culture connotation of green hills and clear water and regional cultural features if we want to realize the long-term development targets of the Organic sports leisure. It's a activity way for the purpose of pressure release as recover yours original simplicity release the pressure, excitement, adventure fitness and so on, which the biggest characteristic is that you can feel free to select any activities including content and form of activities. We do can

promote the sustainable development of the local economy, realize three great benefits—ecological, economic and social if "Organic" tourist and its product has been gave a scientific planning and design, Different leisure activities and experience has been provided and different sports leisure projects has been developed to focus on different target market and It has been considered like bearing capacity of the local environment, strengthening the protection of resources, environmental protection consciousness, combine the local dominant industry and natural human environment, at the same time, combine the government, natural resource management department and the common people, letting common people real, positive, actively participate in the development of it and drives the development of the sports industry.

68.4 Conclusion

Organic leisure sports as a form of tourism, which reflect the characteristics of the ecological tourism and show the harmony of rural natural ecological background and focus on the performance of the harmonious folk custom between man and nature and dwellings and food culture, it emphasize harmony between business operators and natural ecological harmony and the harmony between local residents and visitors in city. Only can we maintain ecosystem characteristics of leisure sports. In the process of the development, Organic leisure sports tourism will towards a direction sustainable development.

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Chapter 69
Research on China Rural Development Based on Nongjiale Leisure Sports

Tie-xiong Zhang, Hong-mei Wen, Ting-ting Long and Feng Mao

Abstract Using literature documents, logic analysis, professional consultation, research methods to study farmhouse leisure sports and the construction of socialist new countryside, it shows the result that farmhouse leisure sports development meet the needs of new rural construction, realizing urban and rural culture blending and collision. Its background, development and evolution of contemporary Chinese city has an important enlightenment to the healthy development of contemporary urbanization and it also plays the role in demonstration of socialist new rural construction, and the construction of harmonious urban and rural environments.

Keywords Farmhouse · Leisure sports · New rural construction

69.1 Introduction

At the end of the 1990s, Farmhouse economy development of China begins, whose rising is not a kind of social accidental phenomenon and it is when economy, society, and culture developed to a certain stage, the adjustment of agricultural production structure, urban and rural consumption structure transition [1]. When the people experience the farmhouse leisure sports with cultural experience, it is easy to form an individual psychological development demands as the value tendency of cultural consumption concept, namely, development and enjoyment as one of the spiritual and cultural consumption, and this kind of spiritual and cultural

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consumption in consumption character has the general audience health and cultural value tendency. Its existence and development is very important which can promote reasonable consuming structure and promote the regional economic development. Therefore, consumption is the important carrier of economic and cultural integration. The city people in the Farmhouse can enjoy food, participate in local cultural experience. According to these characters, we can foresee the development of rural economy and hope of changing urban and rural economic binary structure. The rise of farmhouse fully embodies: after the development of agricultural production, the traditional single mode of agricultural production needs to break and its also shows the importance of improve the agriculture ecological environment [2]. Farmers was told that the mode of farmhouse development not only focuses on improving the agricultural scientific and technological content of products, but also strive to increase the cultural content, more leisure sports entertainment elements, to adapt the new concept of people health and leisure. To meet the new idea of people health leisure pursuit to get more of the added value. Especially, those project that close to the nature, relaxed become the main content in people's leisure time, in this respect, the combination of Farmhouse and leisure sports has a unique advantage. Using leisure sports of the injection of as a breakthrough, perfect service, blind area and deficiency, promote a farmhouse economic growth and the healthy development, it is undoubtedly a new exploration of promote economic development in rural area. Its background and development, the evolution process of Chinese contemporary city health development has a important enlightenment, and has a demonstration role to the construction of a new socialist countryside.

69.2 Farmhouse Leisure Sports Development Connotation

The form of farmhouse leisure and body building farmhouse leisure and sports and entertainment has many homologies. Firstly, it is a kind of social cultural phenomenon and its essence is to satisfy the people spiritual, physical enjoyment. Secondly, farmhouse leisure and sports body building, entertainment is the social product, after economic developed to a certain extent. As a social economic base superstructure, farmhouse leisure and sports body building, entertainment, and social productivity development is increased, the level of national income and enhance the body, enjoy demand and other factors related to heart. Thirdly, when the economic means to become a lever for social and cultural self—realization of hematopoietic and awesome, and by using the inertia become the effective approach of sustainable development, farmhouse leisure and sports fitness, entertainment to seek their own development, and the inevitable by economic lever means to develop their own. Because physical and Farmhouse leisure both have many common or similar characteristics, therefore, farmhouse leisure sports is leisure Farmhouse and leisure sports is the fusion results. But not for the signing of farmhouse leisure sports is farmhouse leisure and sports. On lexical analysis,

Farmhouse leisure sports is neutral to slightly positive structure vocabulary, "farmhouse leisure sports" with "farmhouse leisure" as the attribute, "Sports" as the core of the word, its focus on the "sports". With the leisure sports, sports and fashion with Xia is a physical form, with the development of modern sports plurality of characteristics and trends. Farmhouse leisure sports emphasized through various leisure sports activities to achieve the purpose of leisure, leisure attitude or to participate in a variety of recreational sports. According to their characteristics can be divided into dominant, auxiliary support, three functions. Its main function is relaxation and leisure; support functions is fitness, entertainment, experience; auxiliary function is ornamental [3]. Therefore, the farmhouse leisure sports are defined as refers to the people in the farmhouse leisure for relaxation and actively select and implement a variety of sports fitness and recreation activities.

69.3 Farmhouse Leisure Sports Development of Farm is a Cultural Exchange Channel and is Helpful for the New Rural Construction and Development

Because the modern production, life transitions and farming culture, much content collapse gradually, with the rise of farm development, these cultural content of the economic and cultural value increasingly prominent. Between urban and rural areas of farm has culture dissemination communication bridge, urban and rural culture become a hub. In the farm consumption subject is the city of the working class, and they are the modern culture and city spirit civilization of the carrier, leisure sports entertainment of contact, multiple interactive relationship, the way of thinking, value orientation and living habits will influence each other. Between the public and the intangible gap between the villagers the mental distance, deepen mutual understanding and identity. Farmhouse development, not only requires the farmer has a beautiful, comfortable, clean indoor and outdoor environment, also ask the operator has a health, civilization, scientific way of life. Through the development of farmhouse, making the farmer in the kitchen, toilets, afforest, beautification home and so on, to develop good health, lifestyle, and will gradually radiation and drive the surrounding villagers improved sanitation and living habits, ideas, spiritual outlook, promoting the construction of rural spiritual civilization. At the same time, through the farm this window, it help farmers to broaden our horizons, increase the degree of knowledge of the external world. People in the city to the countryside to bring new ideas, new concepts, develop modern farmer's competition consciousness and the enterprising spirit and it is construction of new rural area needs a kind of invisible forces. Therefore, the development of farmhouse leisure sports will greatly promote the construction of rural spiritual civilization continued deepening. At the same time, it also can make the slack season do farmers more than a recreational way, beneficial to resist rural vulgar cultural erosion, advantageous to the rural fitness healthy culture to improve the cognitive level of fitness,

maintain rural stability, stimulate socialism new rural construction will play a certain guiding role.

69.4 Farmhouse Leisure Sports is an Integration of Urban and Rural Areas, Rich Village Music City New Form

The farmhouse is not only changing the Chinese people the traditional leisure habits, but also broke thousands of years Chinese farmer must rely on land, crop trading and survival and development economy mode [4]. Farmhouse leisure sports by carrying out "into the farmhouse courtyard, do farmers live, live farmhouse room, enjoy the music farm" the characteristics of leisure activities, with its close to nature, consumer benefits, simple and convenient, can travel, and can exercise body characteristics, realizes the tourism products to the holiday products and a good combination of a transition leisure fitness form, accord with ecological leisure sports characteristics. It is included in the pastoral, grazing, fishing, farming, carried out a number of leisure sports, such as fishing, Orchard Fruits, to reach from ox farmland, can also build sports leisure farm, to carry out a number of dance, horseback riding, bowling, golf and other sports, leisure as a taste of the pastoral scenery, to recover one's original simplicity. Objective, and participated in a number of favorite sports, physical fitness for the purpose. For the rural consumer market infuse vitality at the same time, also the city civilization, life of fresh air to the countryside, narrowing the differences between urban and rural areas; Farmhouse prosperity, let a farmer to realize green, zoology can also make money, ecological protection consciousness began to win support among the people. "Farmhouse" was born in the countryside, not only for the city people to bring joy, but also brings the farmer richness, realizing the true sense of the "urban and rural fun".

69.5 Farmhouse Leisure Sports is Helpful for Rural Sports Development, Forming a New Economic Point of Growth

After the sustainable development of the industrialized society, social, economic structure and the life style of people produced tremendous change, people is increasing rapidly in leisure activities began to create wealth, gave birth to the leisure economy, promoted the rapid development of leisure economy. Leisure sports as a "casual" era people important leisure consumption has gradually become one of the regional economic growth, strong booster [5]. In recent years, rural economics develops hasten delay, the farmer is added receive difficulty, has become the puzzle of agricultural economy and rural society a big problem. The

emergence of farmhouse, make a farmer to use the existing space resource and green resources, let the farmhouse to inject more leisure sports entertainment elements, in order to adapt to the new concept of people health and leisure pursuit, through leisure sports activities promoting drive farm management of sustainable development, in the development of the tertiary industry, transferring a portion of force of rural surplus labor broaden the channels, labor transfer. The farmhouse, from low quality and low efficiency of the extensive management to the higher level of competitive ability in advance, in order to adapt to the new concept of people health and leisure pursuit, through leisure sports activities promoting drive farm management of sustainable development, rural economic development has opened up a new economic point of growth [6].

69.6 Farmhouse Leisure Sports is a New Kind of Complementary Between Urban and Rural Areas, Promoting the Urbanization Process

The farmhouse and urban and rural social exchange provides "free space", this kind of exchange of budding exchange market, the one is alleviated the pressure of two city effectively, the two is accelerate rural social differentiation in some extent. To establish the catering, accommodation and sightseeing leisure sports recreation farm run type transformation, so that farmers' professional division changes. Especially containment of suburban district of our country city land sprawl promoting the urbanization process its background and evolution of contemporary Chinese city changes healthy progress has an important enlightenment [7].

69.7 The Development of the Sports Leisure Farm is to Build a Harmonious Society

The modern civilization has being caused the life of the people of narrow environmental work and routine life. Through the organic leisure sports, people can enter into a new, wide physical activities, which is a main form of leisure environment, getting rid of the life of the program Gifted free nature and self pleasure of people will be released, from the original to a relatively free state, getting rid of all kinds of pressure from the life and work, and up to double adjustment of body and mind. Besides, with good ecologically farm environment, to some extent, It can help person back to nature, enjoy the fun of nature, then that can make people more profoundly understood ecological protection and rational utilization of resources, We would set up the consciousness of environmental protection consciously. It plays a significant role in promoting the harmony between human and nature. At the same time, leisure sport is s also helpful to strengthen the farm and

rich role of social relations, and promote the harmonious society among human beings [8]. Farmhouse and leisure sports can contribute to participants find yourself, develop yourself and promote self-expression, and can keep you refresh the present living conditions consciously. It is of great significance to realize the essence of human being. Last but not least. It is conducive to the building of a harmonious society and promoting the human in essence levels and a social harmony.

69.8 Summary

Entering the twenty-first century, with the human society in the process of information, people will have more and more leisure time and farmhouse leisure sports activities was born in this environment, it is to meet the different needs of the people at the same time, also gives attention to the harmonious development of man and nature. Farmhouse leisure sports' development is the born of modern leisure agriculture and rural tourism industry by using the existing agricultural production process, farmer's life and rural ecological cultural resources. It is for the Multi-purpose development of agriculture, realizes local agricultural products value added sales and speeds up the strategic adjustment of agricultural structure, develops the rural third industry, effectively transfers the rural labor force, walking along zoology environmental protection, cultural heritage. The connotation of development will have a positive and far-reaching impact.

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Chapter 70
Design and Planning Research of Outdoor Advertisement in Urban CI

Lingling Wang

Abstract Based on the ideas and methods of urban CI, research of outdoor advertisement is valuable for urban image establishing. The difference between urban CI and enterprise CI is discussed with the interpretation of the intension of urban corporate identity (CI), and effects of outdoor advertisement in urban CI is given by analyzing the characteristics of outdoor advertisement. For enhancing the urban image identity and approval degree, puts forward the design strategy of outdoor advertisement in urban CI according to four major principles of artistry, culture, innovation and harmonious. From practical application aspect, comprehensive planning, organized development and application management three principal processes of planning management of outdoor advertisement in urban CI is described.

Keywords Urban image · Corporate identity · Outdoor advertisement · Design strategy · Planning management

70.1 Introduction

Urban Corporate Identity (CI) is the application in urban design and planning which ideas and methods has been applied maturely in enterprise field, it can enhance urban individuality as possible and shape distinct urban brand, so has been the new point in urban image establishing [1]. Moreover, outdoor advertisement as the special

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component element of urban landscape and concrete medium of urban culture has integrated into the urban life [2], and plays more important role in urban CI.

70.2 Effects of Outdoor Advertisement in Urban CI

Urban CI includes Visual Identity (VI), Behavior Identity (BI) and Mind Identity (MI) three aspects [3]. Among them, the VI as the identified characteristic of urban total vision is the most intuitional external expression of urban image; The BI as the criterion and mode of urban community behavior is the dynamic individuality characteristic of urban image; The MI as the total quality features and value pursuit is the spirit of urban image. Thus compared with the material and utility factors of enterprise CI, urban CI more emphasizes the social responsibility and pays more attention to urban individuality and general urban development strategy. Furthermore, Outdoor advertisement has not longer limit to pure business behavior and has become the important medium to beautify urban landscape, communicating urban culture and exhibition urban spiritual styles. The concrete effect of outdoor advertisement in Urban CI is described as below:

1. Outdoor advertisement has abundant visual elements and stronger visual infectivity and identify, so it is the important component as well as other element of urban landscape such as building, street and green space etc.
2. Outdoor advertisement is activity medium of urban culture, it imperceptibly influence the public value concept and life style with information communication, and thus widely involved in the formation and development of urban BI.
3. Outdoor advertisement has the feature representation elements of material civilization and spirit civilization and is the effective method for establishing and demonstrating urban spiritual styles, so it plays an irreplaceable role in construction and exhibition of urban MI.

Overall, Outdoor advertisement has comprehensive and positive effect in urban CI. Recent, the research of application of Outdoor advertisement in urban CI yet at beginning stage, gained achievements or lying on the macroscopic strategy level so lacking concrete application guidance, or tending to Construction of urban space environment, just as the domain of urban VI. Thus, the research of design and planning of Outdoor advertisement in urban CI is very necessary and exigent.

70.3 Design Strategy of Outdoor Advertisement

Compared with traditional method of urban image establishing, urban CI not just lies on the forming and expressing of image elements, and based on that, more emphasizes to find out one of image expression way which is suitable to communication, just as enhancing the urban image identity and approval degree with

the dynamic interaction mode through communication and feedback of information [3], so as to avoid urban image establishing get into the trouble of one side thousand cities.

Recent with the deeply develop of urban image establishing, the application of outdoor advertisement has been pay more extensive attention and gradually tend to standardization from disordering, as a result the urban visual image has changed appearance. But it is easy to find there are surprising similarities among outdoor advertisements in many cities that weakened the individuality factors of urban on a certain degree and difficult to be marked deep brand. So the good urban image not only required to accord with the artistic aesthetic principle, but also should have obvious difference of individuality characteristic. Therefore, outdoor advertisement can not just as the decoration of urban image in urban CI, which should be designed for enhancing the urban image identity based on below major principle.

1. Artistic. The public perception for urban image first is the aesthetic judgement on form layer and where the most effective perception factor is vision system. Outdoor advertisement as the most intuitional and active visual symbol should bring the aesthetic enjoy of sense to audience while communicating information by various artistic expression forms [4], so as to build up graceful urban landscape and establish good base for enhancing public perception and memory on urban image.
2. Culture. The urban culture is the epitome of history connotation and civilization level, which more easily producing resonance with audience and marking deep brand on consciousness level. Outdoor advertisement is closely related to social life, and has advantaged communication predominance. So the design of outdoor advertisement should strengthen purposefully the using of cultural elements such as commonweals and regional culture, so as to promoting and regulating urban internal cultural construction, enhancing the external attraction of urban image.
3. Innovation. The urban image is not imitation and self-complacence, only the innovation can make urban image has stronger and more persistent identifiability. The transmission contents and forms of outdoor advertisement be constantly enriched and perfected, so the design of outdoor advertisement should actively innovate through taking technical advantage and excavating regional cultural essence, and thus promote the renewal and optimization of urban image.
4. Harmonious. The urban image is the public total perception and comprehensive evaluation, so it should formed unity style positioning with integrating various image elements. The communications effects of outdoor advertisement be affected by ambient factors such as urban space and culture environment, and react on these factors by own communication capability. So outdoor advertisement should yet pay attention to coordinated with other image elements such as ecology landscape, humanity spirit and value concept while realizing self communication purpose, then enhance the whole quality of urban image and public general approval degree.

70.4 Planning Management of Outdoor Advertisement

Urban CI is a systems engineering, so the planning application of outdoor advertisement in urban CI should be operated in scientific and orderly way based on the general development goal of urban image. The planning application of outdoor advertisement need to thinking of various factors [5], and within limited space, this paper will describe the below major processes in practical planning management, so as to provide reference for the concrete implementation.

1. Comprehensive Planning. The main contents of the comprehensive planning process include determining the implementation targets of planning application of outdoor advertisement in urban CI based on the systematic investigation, and drawing out the implementation plans with practical basis. The important works should be completed in this process lie in the following two aspects:

   a. Target orientation. Target orientation means to determine the general ideas and key development direction of planning application of outdoor advertisement based on the concept represent of urban image in urban BI, which incline to the principle guidance.
   b. Planning making. Planning making means to put forward specific request for planning application of outdoor advertisement based on the target orientation and the plan layout of urban development, which incline to the schematization guidance. Plenty of investigation and research need to be work, so that the specific implementation plans can be drawn out, for example the spaces settings such as the delivery types, art modeling, colors of advertisement in different function district, and the time schedule such as operation procedure and work progress.

2. Organized Development. The main contents of the organized development process include effective utilization of available resources and forces based on coordination with other projects of urban CI, and developing the innovative conception, art creation and works manufacture for outdoor advertisement. The process proceeds mainly according to the self law of outdoor advertisement industry, but still needs to pay more attention to the following aspects according to the principles of design strategy:

   a. Strengthen aesthetic creation. Outdoor advertisement as the external show windows of urban image, although the total quality has been enhanced through rectification, but some phenomenon such as poorness making and content vulgar still exits. So the aesthetic creation needs to be strengthen in order to enhance the artistic grade, not only the optimization of form layer such as modeling, color etc., but also the purification of consciousness layer such as content, thinking etc. [2], in order to avoid outdoor advertisement become the pollution of visual and spiritual.

   b. Inputting humanistic care. Urban image is the comprehensive representation of material civilization and spirit civilization of a urban, and outdoor advertisement has undertaken more responsibility of transmission culture. But the construction of urban humanity characteristics is not the simple combination of traditional and regional cultural elements in outdoor advertisement. The true effective method is inputting humanistic by respect for public emotion, concern livelihood demand, emphasis commonweals and interaction, so as to build good urban cultural environment.
   c. Advocating individuality exhibition. Current conventionalization design pattern of outdoor advertisement has seriously obliterated the identity of urban image. So the expression techniques and forms should be innovated by using of new technologies, processes and methods, as well as the original idea and conception should be innovated with finding out the brilliancy in traditional culture and real life, so that the individuality splendor of outdoor advertisement can be exhibited fully and the aftertaste characteristic of urban image can be increased.
   d. Emphasizing harmonious coordination. Outdoor advertisement is one of the essential elements of urban CI, so which individuality exhibition should adapt to the comprehensive planning of urban CI. So besides forming graceful individual with integrating various creation elements, outdoor advertisement must be coordinated with other essential elements of urban CI as unity style [6], and thus the widely approved urban image can just be established.

3. Application Management. The main contents of the application management process include the managements for the delivery application of outdoor advertisement organizational such as supervision and maintenance adjustment. Compared with other two processes, it has long period and more complex involved factors. The important works in this process are making corresponding regulations in detail according to the demand of urban planning, defining responsibility and strictly carrying out. In addition, establishing fair and reasonable mechanism of evaluation feedback based on the interactive idea emphasized in urban CI, promoting the communication and exchange of management function department and public, will promote both outdoor advertisement and urban image establishing step into health track of steady development.

70.5 Conclusion

Outdoor advertisement plays unneglectable role in urban image establishing by its special effect and fascination. Urban CI emphasizes the systematicness and the construction individuation difference, which is scientific and effective method for urban image establishing. The application research of design and planning of outdoor advertisement will helpful to urban CI better service for urban image establishing, and has active realistic significance and practical values.

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Chapter 71
Research on Internet Marketing Methods and Strategies of Small and Medium-Size Enterprises in China

Jing Yuan

Abstract This paper focuses on a narrow sense of network marketing, defining it as a way, with the help of the internet, to more effectively meet customer needs and desires, to complete market research, marketing communication, product sales, and payment for goods, after-sale service and other marketing aspects in order to achieve corporate marketing goals. On the basis of careful analysis of the present situation and problems of the small and medium enterprises (SMEs) network marketing and the obstacles that small and medium enterprises face when carrying out the network marketing, this paper presents the specific methods and strategies of network marketing for SMEs in China.

Keywords Small and medium enterprises · Network marketing · Corporate marketing

71.1 Introduction

The emergence and development of network marketing is contributed by a combination of factors, such as advance of technology, consumer habits, values change and commercial competition [1]. The emergence of network marketing has its technical foundation, concept foundation and reality basis. From a global perspective, the appearance of search engine basing on internet in 1993, the first "lawyer event" making money by use of internet in 1994 as well as the emergence of online advertising mark the birth of network marketing. With the development

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of market economy, the majority of products, both in the quantity and variety, have been extremely rich and consumers' incomes continue to improve, which allow consumers to select goods and services to an individual's psychological desire. Consumers are not only able to choose, but eager to choose with their own guidelines, to continue to set higher requirements to the enterprises. All these show us that the personalized consumption is rapidly developing [2]. To provide consumers with personalized products is the complete tasks and challenges of the enterprises, which first need a good interaction and communication with consumers, for timely, convenient, low-cost access to a variety of demand information. Network is undoubtedly a good tool for this purpose [3].

Traditional marketing transmission is more often type of "spoon-feeding" and the consumer is very passive [4]. Consumers are eager for information symmetry in the consumption process and to get commodity-related information through a variety of possible ways to compare and analyze and desire to make their buying decisions on an autonomous basis, reducing possibilities of emergence of the risk of shopping and regret after shopping. One of the best choices to meet the aspirations of the consumers is the network. Therefore, the network marketing communication emerges [5].

As market competition is increasingly fierce, enterprises in order to gain an advantage in the competition, need to constantly innovate marketing tools and methods to attract customers, transform the traditional marketing management at a deeper level, reduce marketing costs and improve marketing efficiency. The requirements from market promote the generation of network marketing. At the same time, the generation of network marketing brings new opportunities to corporate marketing.

71.2 The Existing Environment of SMEs in Network Era

With the intensification of competition among SMEs in current era the survival environment of SMEs is tense and stressful. "The Global Enterprise Operating Environment Report in 2005" published by the World Bank, shows that the aspect of through reform to help SMEs create employment opportunities is lagged in China. In the aspect of relaxed business environment, China ranked 91 in 155 countries and regions. According to the analysis of World Bank officials, compared with foreign-funded enterprises and large enterprises, the survival environment of SMEs in China is more difficult. In the context of the Government's macro-control, it is difficult to obtain financial support from the domestic financial system. In the stages of venture and the subsequent development, the SEMs will encounter great difficulties.

In front of the new economy, the domestic enterprises, especially small and medium enterprises, must closely follow the situation and accelerate innovation, including the institutional innovation, technological innovation, management innovation, and marketing innovation otherwise they will be in the danger of being

eliminated. The most urgent task in the face of Chinese enterprises is to follow the trend of the network to gain a foothold in the network society. The core of the new economy is the network economy. The network economy of which the core is Internet technology is a complement and development of the modern economy and is a major trend of the future development of society. The new economy brings the traditional business and network enterprises with century challenges which has opportunities and risks side by side. To survive and develop, the enterprises must study the rules of the new economy and arm themselves with weapons of the new economy. If the SME does not adjust according to the needs of new economic development, they are bound to not be tolerated by the market.

With the social progress and cultural development, people's values increasingly show a trend of diversification. IT has accelerated the spread of modern technology and culture, so that the people's needs become more diversified. For example, in China's population with strong purchasing power, the level of education is generally higher; they often use the Internet to learn about the latest changes trend of the commodity in the international arena and access to the commodity price, quality, style and other information to make autonomous choices. Of their consumer tastes improved, the more complex requirements to the goods; they respect for individuality, hoping to show their difference in a variety of ways. Moreover, these groups generally have a strong sense of social responsibility, and pay more attention to products of energy saving and environmentally friendly. The information age makes people's consumption structure changed. For example, in China's large and medium-sized cities, with the continuous reduction of the Engel's coefficient, the personal informationized consumption level is also increased every year and the expenditure for the purchase of computers, mobile phones, communication costs is in a fast growing trend.

At the same time, with the popularity of computers and the reduction of Internet access charges, as well as the emergence of online payment means, such as online banking, shopping mall is no longer the only place for people's shopping, while online shopping is beginning to show its unique advantages. Internet shopping allows consumers to stay at home to buy many goods, and complete shopping in a free self-service, and the degree of satisfaction with services is greatly increased.

The effects of networked environment on corporate marketing activities will surely have a far-reaching impact on the existing business concepts and methods. SMEs who are able to recognize and seize this opportunity can occupy a more favorable position in the future market competition.

The virtual market is that with the help of modern computer network technology, both supply and demand do not need to meet each other, information communication, transaction negotiation, contract signing, ultimately achieving the economy overall of the two sides' trading transactions. The virtual market is composed by four types of market, business to business (B To B), businesses and consumers (B to C), consumers and consumers (C to C), business and government (B to G). From the related data in previous China Internet Development Statistics Reports released from CNNIC, the number of Internet users in China rapidly increases, the permeability of the network on social life constantly enhances, the

number of firms using the Internet continuously increases, online business model constantly develops and updates, on-line business activities have become increasingly frequent and mature. All show us a formed and rapidly growing network virtual market. For the majority of small and medium enterprises, the formation and the rapid development of the virtual network market are both an opportunity and a challenge. Only with constant practice and exploration of net-work marketing, we can seize opportunities and meet challenges.

71.3 Strategies for Network Marketing in China's SMEs

For SMEs network marketing has its own characteristics, in order to carry out effective network marketing, the key is that aiming at the characteristics of SMEs, integrate with needs of enterprise marketing and business and develop the right online marketing strategies. Network marketing functions can be summarized as the information issue, branding promotion, market research, online distribution, online promotion, customer service, customer relations. Due to their own different conditions and operational characteristics of SMEs network marketing function requirements are also different. Underneath of this article will focus on different network marketing functions, and analyze the network market research strategy, no-website online marketing strategy, website building strategy, website promo-tion strategy, network marketing channel strategy, network marketing advertising strategy, network marketing public relations strategy, network marketing personal selling and sales promotion strategy, network marketing services strategy, and marketing strategies for SMEs relying on the network service providers.

Looking for opportunities for networking market, forecasting changes in the network market and precisely meeting the diverse needs of the network market, what the network marketers rely on is collection, analysis, judgment of a variety of environmental information. The limitation of traditional marketing research methods makes a lot of SMEs have difficulties in collecting market information and intelligence, so a lot of marketing decisions have to be by virtue of experience, estimates or rough survey. This situation has greatly increased the probability of error of marketing decisions.

Traditional questionnaire is time-consuming, laborious, high cost, so many SMEs cannot effectively use. But putting questionnaire on the Internet is basically solved the above problems. SMEs can place the questionnaire on their own website regularly, and dynamically monitor changes in the market through visi-tors' feedback. In order to improve the effect of the survey, SMEs can increase the promotion intensity of the website, to attract more consumers and other stake-holders to visit the corporate website, and can also take lucky draw, gifts and other measures. One of the benefits of this research approach is that enterprises can timely grasp data to save manpower, time, and be not prone to typographical errors. If SMEs think that the only use of the site is also difficult to meet the requirements, they can also choose to use portal sites with large quantity of

flow, e-mail, virtual communities, to publish the questionnaire, but also through online advertising to attract respondents to participate in the investigation.

With the growing number of enterprises using Internet, the website has become the platform for people to understand and communicate with the specific enterprises. A variety of marketing dynamics of business competitors have always been issued on the internet, such as the development of new products, price adjustments, channel policy adjustments, promotion activities, etc., so that enterprises can make use of the access to a competitor's website to understand the dynamic of the competitors, promptly adjusting their marketing strategy. In addition, to browse the specialized channels of a comprehensive site (such as Sina auto channel, handset channel), or to visit the dedicated portal sites (e.g., China Chemical Information Network, China Power Network) can also keep abreast of industry market intelligence and demand message.

With the rapid development of network information resources, the secondary data which can help corporate research changes in the market and determine the market trend become more and more. The primary data collection requires a lot of money, manpower and financial resources and a long time to possibly get conclusions of the investigation. While second-hand information, because of its economic and efficiency, becomes an important part of the corporate market research. Scientific and rational use of second-hand information can help enterprises improve the effectiveness of market research. Especially in small and medium enterprises, the application of the second-hand information should be of particular importance. The network provides economical and convenient platform for secondary data collection, and can provide powerful assistance to SMEs in marketing research.

In the network marketing conditions, the combination of the traditional channels of distribution patterns and information network technology, promotes innovation of the enterprise distribution channels. The advantage of traditional marketing middlemen access by geopolitical reasons is replaced by the virtual nature of the Internet. At the same time, the high efficiency of information exchange on the Internet has changed many links of the traditional distribution channels and simplifies the complicated relationship into a single relationship. The development of the Internet has changed the structure of the traditional distribution channels.

In the network marketing campaigns, SMEs take online trading platform as information intermediaries and through the platform get in touch directly with customers, to achieve sales of the product. Taking the policy as a guide, SMEs form the channel structure of the "enterprise + information brokers + customer".

The typical information broker, such as Alibaba, is only as a trading site. Alibaba is the only place for the user to find trading partners, consultations for transactions of goods and services, and access to the various trade-related services. However, Alibaba cannot control the quality, safety or legality of the involved goods, the authenticity or accuracy of trading information as well as the ability of counterparties to fulfill their obligations under trade agreements. Alibaba cannot and do not control the parties' ability to fulfill their agreement obligations. In

addition, Alibaba's customers should be noted that the risk of transactions with foreign nationals, minors, or persons acting by fraudulent means is an objective reality. Network information brokers can be divided into industry B2B platform (e.g., China Chemical Network, Chinese clothing, etc.), integrated B2B platform (such as Alibaba, China Trade Net, etc.). SMEs can take full advantage of these two types of platforms for the collection of sales leads, mining of potential customers, and then through online linkage, get the final deal to create profits for enterprises.

SMEs can use indirect distribution model of "manufacturer–Network brokers–the consumer". Network brokers here refer to via the Internet to provide the online store of goods to consumers. In theory, the network enables producers and consumers to trade directly. Brokers will lose the basis of survival; displacement utility will be achieved by the distribution company. In practice, however, the network in the level of elimination of distribution channel, does not demonstrate an obvious role, but to create a new batch of brokers, that is, online shops who do not engage in the production. Amazon bookstore is the representative of this type of network intermediaries. At the same time, some traditional brokers conduct transformation of their business with IT. That is to run their online store, become hybrid brokers with both online business and offline business. One of the largest department store chains in U.S., Wal-Mart department store, is the representative of this kind of middlemen. The fixed costs of these two online stores are significantly lower than the same size traditional shops. Meanwhile, the use of IT can also save a lot of manpower, so that the variable costs are significantly lower than that of the traditional shops of the same size. In addition, because the online store is also easier to obtain economies of scale and scope than traditional stores, these factors have created the cost advantages of network brokers comparing with traditional brokers. Network brokers can also provide free information services, discounts, coupons and other promotions to attract consumers for shopping; both are to promote sales and make the consumer surplus increased. Of course, due to the impact of the number of Internet users, logistics distribution, security, payment and other issues, at present, this "manufacturer–Network brokers–Consumer" mode is only as a supplement of the traditional distribution model. With the development of the times and technological progress, the above problems surrounding online marketing and e-commerce will be solved step by step. The status and role of this model in the marketing system for SMEs will be increasingly important.

Dissemination of traditional public relations often have to rely on mass media, and media reporters, editors act as gatekeepers of information dissemination, by them to decide whether the information can be published. At this time, the corporate public relations staff cannot directly control the mass media. They often need to establish and maintain good relations with the media personnel to ensure the smooth development of public relations activities. Relative to large enterprises, it is more difficult for small and medium enterprises to establish good relations with media. Many SMEs because of the lack of confidence do not make efforts in this regard. Through traditional mass media to propagate image of enterprises and

establish good public relations becomes a luxury for many SMEs. In the network public relations, public relations officers of SMEs can make use of online media to promote activities and to decrease the dependence of the reporters and editors. Corporate website, public forums, newsgroups and so become media controlled by public relations officers in SMEs.

Through the traditional means of communication to establish one-on-one communication with related public will need high cost, it is difficult for SMEs to achieve. Interactivity of online media provides a unique condition to "one to one" public relations communication. E-mail, a variety of chat tools, forums, news-groups, electronic magazines, and others become the tools that corporate public relations staffs and the public are free to choose. Enterprise public relations officers can deposit information of customers, dealer collected through traditional methods and network into the enterprise database. And on the basis, provide personalized information services to our customers and dealers. Customers and distributors can make use of the network to reflect a variety of requirements and recommendations to the enterprise. This "one-on-one" communication is convenient and with very low cost, very suitable for the requirements of SMEs.

In recent years, the development of network media is at an alarming rate. Influence of websites such as Sina, Sohu, Netease in the news dissemination is no less than some of the traditional TV, newspaper, magazines and media. Due to lower relative threshold, through these online media to publish news about the companies no doubt provides a good public relation opportunity for many SMEs. Moreover, if the corporate website has adequate number of visits, the site itself can to some extent, instead of news publishing function of the traditional media press. SMEs can also through public forums, newsgroups related to their business to publish the news which can also achieve good results.

71.4 Conclusion

This paper focuses on a narrow sense of network marketing, defining it as a way, with the help of the internet, to more effectively meet customer needs and desires, to complete market research, marketing communication, product sales, and payment for goods, after-sale service and other marketing aspects in order to achieve corporate marketing goals. On the basis of careful analysis of the present situation and problems of the small and medium enterprises (SMEs) network marketing and the obstacles that small and medium enterprises face when carrying out the network marketing, this paper presents the specific methods and strategies of network marketing for SMEs in China.

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Chapter 72
Research on Continuable Construction of Urban Wetland Park Development

Xiao-Bo Li

Abstract As a comprehensive system of protecting city, utilizing wetland and promoting the construction of urban ecological environment, urban wetland park has gained attention in Chongqing City which is sufficient in freshwater resources. This paper analyzes the planning and design concepts, sustainable development concept, harmonious coexistence concept, etc. of the first "National Wetland Park" Caiyun Lake Wetland Park in Chongqing City, and also proposes corresponding suggestions, in order to provide more theoretical basis for the future wetland park construction.

Keywords Caiyun urban wetland park · Continuable construction · Discussion

72.1 Introduction

As urban wetland is qualified with ecological function and social service function, it is one of the important ecological systems in city. The reasonable protection, development and utilization of wetland resources play an important role in promoting the construction of a harmonious and healthy living environment. In recent years, as Chongqing City is at the climax of urbanization, urban wetland is confronted with serious threats from ecological degradation, the protection and

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construction of wetland that is the "kidney" of city have attracted more concern and attention. In order to create "livable Chongqing", many large-scale wetland parks are constructing or have been constructed in the main city zone of Chongqing City. In this paper, the first "National Wetland Park" Caiyun Lake Wetland Park of Jiulongpo District in Chongqing City that had been checked and accepted by National Wetland Centre in 2011 is studied, in order to clear the planning and construction technology and management strategies of urban wetland park, which would provide some references for the sustainable development of the wetland in urban areas.

72.2 Concept of Urban Wetland Park

The concept of urban wetland park can be defined as following. Urban wetland park is a public garden that locates in urban area or near suburbs, it provides sightseeing, leisure, popular science education and other activities which are in harmony with natural ecological process, the main environment is constructed by reserving, imitating and restoring wetland habitat, the sewage is disposed through a constructed wetland system, the main target of this park is to protect and construct the diversity and self-succession ability of the local ecosystem, meanwhile, ecology, art and technology are combined in this park [1].

It can be seen that the urban wetland park is quite different from general urban parks, and it is not equal to the traditional water park, the landscape of planting aquatic plants and creating wetland or merely urban wetland plus urban cultural park [2].

72.3 Historical Vicissitude of Caiyun Lake Wetland Park

Taohua Stream is one of the largest rivers in the main city zone of Chongqing City, during the nearly two decades from the mid-1980s to 2005, because of the rapid urbanization in both sides and the backward urban construction and management, the beautiful Taohua Stream has become a "side bilge" which threatens the ecological environment of both sides and seriously affects the lives of local residents. And it would become a disaster during heavy rain, which not only seriously affects the health of local residents, but also contaminates the Yangtze River and threatens the ecological environment of Three Gorges reservoir area.

In order to beautify environment, purify water, reproduce the old blue Taohua Stream on which you can enjoy fishing and boating and ensure the water resources security in the upper reaches of Yangtze River, the project on the comprehensive improvement of Taohua Stream valley was set up by Chongqing Municipal Development and Reform Commission in 1999, which at the same time is one of

the major projects in "Pollution Prevention Plans for Three Gorges Reservoir and its Upstream" of State Environmental Protection Administration and an important part of "eight popular project" of Chongqing Municipal Government in 2002. However, with the urbanization of Taohua Stream valley, Taihua Stream will be difficult to be maintained in the future for it has no running water resources. Therefore, by adopting the terrain condition of hill and deep groove cutting in the upper reaches of Taohua Stream, 17,000 m^3 reclaimed water and surface catchment generated from the treatment of sewage treatment plant everyday flows into Caiyun Lake Reservoir after the treatment of artificial wetlands. Caiyun Lake Reservoir covers an area of about 20 hm^2, is 1.68 million m^3 in water retention capacity and nearly 80 m in average depth, which provides constant flow of clean water for lower reaches, and also provides water for green irrigation, fountain water and some other aspects in park. The planning and design of Chongqing Caiyun Lake Wetland Park was started from 2006, and is checked and accepted by experts in 2011, currently, an "ideal public resting area with green mountains and blue waters" has been gradually revealed.

72.4 Overview on the Base Address of Caiyun Lake Wetland Park

Land use condition. Caiyun Lake Urban Wetland Park consists of the east area of Erlang high-tech park of the original planning and the Taohua Stream Park, the planning area of park covers an area of 107 hm^2, and it is divided into east and west areas by Kowloon dam, the east area covers an area of 80.2 hm^2 (the area of water is about 21.7 hm^2), the west area is 26.8 hm^2, and the total investment is 730 million yuan. The landform is the shallow hill landscape, which consists of two gullies, a reservoir and a slope, and the land use of wetland is mainly distributed in the low-lying gully. Most of the original landscapes are vegetable field, some are rice field and grassland, the woodland is scarce and the soil is purple soil. The surroundings of park are high, and it is surrounded by the city. The whole park can be overlooked at the surroundings, which is qualified with the topography, landscape features of typical bottom park.

Hydrologic condition, The water supply of Caiyun Lake wetland comes from two aspects: first, it is from the reclaimed water generated from Yangsheng Bridge Sewage Treatment Plant and Southwestern Ecological Sewage Treatment Plant, the water can meet the first-class standard of National Discharge Standards, but it still has a certain amount of N, P, oils, etc.; second, it is from surface rainfall, surface catchment includes the water flow from Zhongliang Mountains and the rainfall of surrounding cities, but the water quality also need to be purified.

Fauna and flora situation, According to the latest statistics from Chongqing Municipal Forestry Bureau, currently, Caiyun Lake has 361 species of plants and over 90 species of animals in total. Among which, there are 16 kinds of fish, such

as crucian, grass carp, carp, mullet and so on. The island in the middle of the lake that locates in the conservation areas has more amphibians and reptiles, such as tree frog (Latin name), toad, gecko, black snake, cauliflower snake and so on.

72.5 Key Points of the Planning and Design on Caiyun Lake Wetland Park

The planning and design of Caiyun Lake is to combine mountain, land, waterfront, lake and wetland organically through an adequate consideration of its site conditions, and to form a three-dimensional expanding landscape network system according to sustainable development, ecology, landscape esthetics and some other theories and principles, in order to create a good ecological environment of wetland, maintain dynamic balance of regional ecosystem, reflect the biodiversity of wetland and highlight the ecological theme. The cultural mood of Caiyun Lake is presented in the three levels of "wetland landscape", "ecological protection" and "Culture of land of peach blossom", to create "land of peach blossom in city", and the cultural design idea of "land of peach blossom beside Caiyun Lake" is proposed, to gain a good ecological results.

Wetlands layout: wetland system is the "flesh" of Caiyun Lake Park, its layout is designed according to mountain terrain, is displayed in the valley in three-dimensional space, the linear arrangement of "sewage treatment plant (ecological moisturizing facilities) → three-dimensional wetland → lake body of Caiyun Lake → three-dimensional wetland → water flow of Taohua Stream" is formed, wetlands interlock and link with each other in three-dimensional space, the ecosystem of wetland park is constructed, and it also is the water purification system of Caiyun Lake.

Plants layout: the planning and design of plants is carried out from mode of "water–shore–hillside–peak", different plants and configuration are chosen in different areas according to the habit, function and distributing rules of plants, which reflects functionality, ecological beauty and beauty of three-dimensional arrangement of plants. For example, aquatic plants with strong purification function is planted in the stream part in various forms like terraces and so on, water garden and green island (biological floating bed) are constructed on the open lake surface, which will further purify the water; emergent aquatic plants, wetland plants and forest belt are planted in the shore, and they constitute a plant group landscape with distinct gradation and prominent landscape greening effect; the hillside is the main resort, landscape trees are selected as the main vegetation, and aromatic plants, flowering plants, fruit plants or bamboo are used for embellishment; the peak is the shelter forest belt of the ecological buffer control zone, native species and pioneer tree species are selected, arbores, bushes and grasses are combined organically, so that the plants will succeed naturally, and form into a stable ecological pattern gradually.

Layout of three-dimensional tour road: the main tour road is in the middle of mountainside and around the lake, footpaths penetrate into the stream sides, valleys and wetland plants of terrace; in wetland conservation areas, air travel trail is constructed by using elevated urban sewage tank culvert, it can prevent wetland from the impact of visitors, and at the same time provide a place for overlooking the terrace and stream wetland; series of viewing platform are planned beside main traffic road of southern part in the park, and you can overlook the Caiyun Lake in this platform.

Construction layout: the "hidden" is to play the leading role, and the "significant", the supplementary one. The layout of all the buildings (individual buildings and groups) within the wetland park and its surrounding environment are combined organically, which reflects the architectural style of folk house in Sichuan and achieves the coordination between construction and mountain, water. Except for landscape buildings with special requirements, the story heights of the rest buildings are controlled within 2 stories, in order to protect the natural landscape of park.

72.6 District Planning of Caiyun Lake Wetland Park

In the district planning of wetlands, the prevention of wetlands is the direct purpose, the restoration of the ecological functions of wetlands is the precondition, the full play of its environmental benefits is the target, the arrival of the public is attracted by the territory with rustic landscape, and the propaganda function of protecting wetland resource and ecological environment is achieved through various forms of scientific activities. According to the natural resources, economic and social conditions of wetland region and the land use status of wetland park, aiming at the functional requirements of wetland park, Caiyun Lake Wetland Park is constructed to be the running water resource of Taohua Stream in the upper reaches of Yangtze River, a green core in the main city zone of Chongqing, a wetland ecological tourist site with strong local cultural characteristics and a demonstration and education base of national urban wetland wastewater purification and wetland ecological protection and sustainable utilization by fully utilizing the urban sewage purification function, ecological protection, constant green remaining and urban flood control function of wetland, setting tours, management, service, scientific work, etc. and using effective grading development and utilization. The park is divided into five functional areas: core zone, buffer zone, function display zone, sightseeing zone and management zone.

Wetland conservation zone (core zone): the core protection area is the iconic indispensible area of urban wetland park, this key protection area is set aimed at the region of protecting the integrity of ecological system and species diversity in wetland, and it is the best sample of the characteristics of wetland natural areas. Generally, the determination of the core zone should be no less than 10 % of the park area, only scientific research, protection and observation of wetland are

allowed to carry out within the zone, all the artificial facilities within the zone should be constructed on the premise of ensuring the original ecosystem integrity and the minimum interfere [1]. The protection core zone of Caiyun Lake Wetland mainly includes Caiyun Lake, some parts of the lake surrounding area, the valleys lie downward the Yangsheng Bridge Sewage Treatment Plant that is behind dam and the west part of watercourse, it covers an area of 25.0 hm^2, which help to establish secure landscape ecological pattern.

Ecological buffer control zones: it generally locates around the core zone, and it is qualified with the function of protecting the eco-development of each wetland zone and the self-succession of ecological process in core zone. This zone can reduce the impact of the interference from outside development. The common method is to determine an auxiliary protection and management area around the conservation core zone. And various artificial ecosystems can be constructed according to development needs of local economy, which will provide a demonstration for the biodiversity recovery in the local areas. Caiyun Lake wetland ecological buffer zone mainly includes the slope and forest belt around the park and surrounding waters around the core zone, which is the green screen and protection barrier between park's wetland and city, and it covers an area of 9.36 hm^2.

Wetland function display area: the areas with relatively lower sensitivity that generally locates around core protection area or in adjacent lots are used to construct sightseeing display zone, appropriate amount of walking appreciation roads and relative facilities are constructed, to provide a window to understand wetland for public. It provides people with the opportunity to feel and share the landscape values of wetland heritage closely by displaying wetland ecosystems, biological diversity and wetland natural ecological landscape, and scientific propaganda and education activities of wetland are carried out. The function display zone of Caiyun Lake Wetland consists of the ecological water purification facilities and the ravines on both sides of the facilities, and it locates at the end of the wetland and covers an area of about 5.7 hm^2.

Sightseeing zone: appropriate activities and recreational facilities are planned in the wetland area with relatively low sensitivity, and the type, number and mode of activities are controlled, to ensure the impact to the park ecosystem is in the minimum extent. The sightseeing zone of Caiyun Lake Wetland is from south bank of Caiyun Lake to the southern part of northeast bank in the park, which has less impact on wetland, wetland landscape viewing, tea tasting, body building and some other recreational activities are mainly carried out in this zone, and it covers an area of about 11.6 hm^2.

Park management and service zone: the zone mainly includes the management, service organizations and facilities of Wetland Park, and the service area covers an area of about 0.4 hm^2.

72.7 Management Strategies of Caiyun Lake Wetland Park

Caiyun Lake Urban Wetland Park was open to public for free in July 2010, the construction is still underway, and the management is confronted with various new problems like capacity control of park tourist environment, coordination of external environment, constraint of tourist behavior, environment propagandism and education, etc. Caiyun Lake Wetland Park will be constructed into a demonstration and education base of national urban artificial wetland wastewater purification and wetland ecological protection and sustainable utilization by using successful management experience at home and abroad for reference.

Wetland 3R management policy

Urban wetland 3R management policy of the coordinated residents recreation, wetland restoration and wetland research is implemented, to raise public awareness of wetland knowledge by directing the public to take part in recreational activities actively in urban wetlands, in order to get public support for wetland conservation; exploring the ways of wetland sustainable development by increasing the study of urban wetlands, in order to improve the assessment and management efficiency of urban wetlands [3].

Implementing positive, active, open and mutually beneficial community co-management model.

The working units and community residents around the wetland park are required to participate in the decision-making, implementation and evaluation of protection program, and manage the natural resources with protection areas together. The condominium and win–win model between sustainable development of wetland system and surrounding livable ecological environment is formed [4].

Strengthening management based on "Assessment Criteria of National Wetland Park". Guiding tourist behavior and educating tourists by taking effective measures, in order to reduce the adverse effects for wetland systems, such as Hong Kong Wetland Park, it covers an area of about 60 hm^2, has 540,000 annual visitors, and it is estimated that it will receive over 700,000 visitors each year when it is completely built, thus, the pressure of reception and management is very heavy. Therefore, in addition to park staff, more than 1,300 volunteers are recruited to assist the natural conservation work of park, provide good guiding service for park visitors or assist the implementation of education. As Caiyun Lake Wetland Park is open for free, there must be a large number of tourists, the management mode of Hong Kong Wetland Park can be used for reference, that is, the staff, volunteers, surrounding community residents are needed to protect the wetland park together [5, 6].

72.8 Conclusion

The consciousness of sustainable development and environmental protection is presented in the landscape design and architectural design of Caiyun Lake Urban Wetland Park, and the possible conflicts among the objectives are successfully

solved. With increasing public awareness of ecological environment, the Wetland Park will be a remarkable tourist attraction after completion. But it should be noted that the wetland is qualified with complexity and diversity, and it locates in urban area, various conflicts like land use, water re-purification, human interference, etc. would affect the sustainable development of wetland. In addition, the reconstruction and recovery of urban wetland ecosystem is a forefront work, the construction and development time of wetland is relatively short, the planning and design theories are at exploratory stage, although the development and management of wetland parks at home and abroad can provide valuable experience and lessons for the construction and management of urban wetland park, as the wetland is an open system, its development is in dynamic balance, even the successful case at the present stage still need to be verified by time, a long-term and developing vision is required in the evaluation and adjustment, in order to promote the further enhancement and improvement of urban wetland park, and to provide an important reference for the ecological and economic development in local areas.

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Chapter 73
Study on Economic Evaluation of Oil and Gas Exploration Projects

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Abstract Oil and gas exploration project is comprehensive large-scale system engineering, with uncertain factors, investment, high risk long duration and other characteristics. There is a lot of money invested in exploration each year in China. Although attaching great importance to the geological evaluation of the project, but few systematic economic evaluations are operated. This affects the quality of decision-making and exploration benefit from varying degrees. The economic evaluation of exploration projects is discussed from aspects such as the principles and methods of economic evaluation of exploration projects. Hope to reach a certain reference for further economic evaluation of such projects.

Keywords Oil and gas exploration projects · Economic evaluation method · Risk of exploration projects

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73.1 Introduction

Oil and gas resources bury deep underground. It is a valuable non-renewable energy. Its exploration and development is a more uncertain factor, investment, high risk and long duration of the industrial economic activity. At present, the situation of the oil–gas exploration is becoming more and more serious. Old oil-field has entered three high-extraction stage of "high water-bearing, high degree of recovery, high rate of oil production". New oil field has limited production. And it is more and more difficult to exploration, thus the exploration cost is getting higher and higher. Oil companies pay less emphasis on economic evaluation of exploration projects. They ignore cost savings while they quicken their speed of exploration and exploitation. It conflicts with the idea of the construction of conservation- minded society. Thus, it is necessary to emphasize economic evaluation to gain more benefits at the expense of less cost. Correct decision-making can get huge returns; on the contrary will result in the investment effect of lower investment failure. Therefore, the economic evaluations of oil and gas resources become increasingly important.

73.2 The Basic Principles of Economic Evaluations

The method of economic evaluation of exploration projects should be based on the following a few basic principles [1]:

73.2.1 To Combine the Economic Benefit Analysis of Stage and the Whole Process, Taking the Whole Process as the Main

The whole process of the oil and gas exploration has the stage characteristics, the economic evaluation should be throughout the whole process of the exploration work. That is to say, before the input of the exploration or various stages of the exploration process-regional exploration, pre-exploration and evaluation of exploration, economic evaluation and tracking evaluation should be made. Analysis of the economic benefits of each exploration stage is an important component of economic efficiency analysis of the whole process of exploration projects, only by ensuring the quality of the stage of economic efficiency analysis, can improve the reliability of the analysis of the economic benefits of the whole process.

73.2.2 To Combine the Analysis of Quantity and Quality, Taking the Quantitative Analysis as the Main

The essence of the economic evaluation of exploration projects is to give clear and comprehensive concept of the number through investment and effective computing from many factors in the exploration, in order to analyze the economic benefits. However, due to restriction of the exploration features and degrees, it will take some time to understand the underground resources. It's difficult to accurately give the quantitative, and it can only give the feasibility and probability.

73.2.3 To Combine the Analysis of Value and the Physical Volume, Taking the Analysis of Value as the Main

The direct result of oil and gas exploration project is a physical quantity, namely reserves. As the grade of the reserves varies, it can't really reflect the pros and cons effectiveness of exploration investment. The final exploration benefits can only be reflected by the magnitude of value. That is how much to invest in developing of these reserves and then how much revenue can bring back.

73.2.4 To Combine the Analysis of Dynamic and Static, Taking the Dynamic Analysis as the Main

The value of funds is related to the time. Investors and policy makers must establish the concept of time value of funds. Analyze the inputs and outputs of the oil and gas exploration by dynamic analysis, achieving rational use of funds for construction and improve exploration efficiency. Of course, the emphasis on dynamic analysis does not exclude the static analysis. Especially oil and gas exploration project due to the limitation of the degree of exploration, particularly in regional exploration and pre-exploration stage, the understanding of the underground resources is not comprehensive, accurate. Therefore, you must calculate the static indicators; combine the dynamic analysis and static analysis.

73.2.5 The Principle of Multi-Objective Comprehensive Evaluation

Since exploration is a multi-disciplinary, multi-types of combined operations systematic project, with multi-process, and long cycle characteristics. The exploration and economic benefits is not only the result of comprehensive exploration, but also the result of exploration and decision-making, management,

executive level and geophysical and geochemical exploration, drilling, geological comprehensive study together. With any one single indicator is difficult to make a comprehensive evaluation of exploration and economic benefits. Therefore, we must implement the principle of the all-around, the whole process, and the multi-evaluation index evaluation [2].

73.3 Economic Evaluation Methods

Exploration economic evaluation is based on comprehensive measure exploration investment, output and economic indicators, analyzing exploration projects with an economic method, providing the basis for scientific decision-making of the exploration project through a multi-program comparison.

73.3.1 Discounted Cash Flow Method

Discounted cash flow method is based on oil-bearing area, oil thickness, effective porosity, oil saturation; relative density of crude oil, crude oil formation volume factor parameters which are provided by geological staff, according to the project has happened and is expected to happen in the investment of exploration, predict the investment of development and operating costs, oil production, oil prices, a variety of taxes, calculate the net present value, payback period, internal rate of return and other economic evaluation, analysis of project profitability, and with the key factors which affect the economic indicators, analyze the uncertainty. The evaluation method used in the discounted cash flow method is the net present value method, internal rate of return method [3, 4].

73.3.2 Minimum Cost Method

The minimum cost method is to select the minimum cost solution for the optimal solution. This method is generally used only for regional exploration stage. As the main purpose of the regional exploration stage is to complete certain geological tasks, the exploration result is difficult to value.

73.3.3 Decision Tree Method

Decision tree method is a kind of multi-stage decision decision-making way. Many actual decisions are often a multi-step decision-making problem, each step to select a decision scheme, and the next decision depends on the last decision-making and

its results. The application of the decision tree in oil and gas exploration investment decision is: during the exploration of a basin (or block), its original decision-making is a "do" or "not". The problem faced is drilling based on the existing data or further seismic exploration work after deciding to "do"; it is likely success, or also may be a dry well; As for a dry well, whether to drill a second well? This is a new problem. Therefore the original decision problem is just the first ring of a series of decision-making chains. In this case, while to make a choice on the original decision; we must consider the subsequent decision-making problems, have comprehensive analysis and considerations [5].

73.3.4 Marginal Value Method

Marginal value method is actually the economic boundaries research of the exploration technology. Including the boundary value of the scale of reserves of exploration, the boundary value of the scale of investment, the boundary value of the oil and gas prices and the cost of oil and gas production. Because of the uncertainty of the exploration is very large, determine the boundary of uncertainty, When the uncertainties reach the vicinity of the boundary value, we should strengthen management; adopt measures to ensure the profitability of the project.

73.3.5 Comprehensive Coefficient Method

Comprehensive coefficient method is also known as the queuing method. It is a kind of decision making economic evaluation method which on the basis of its risk (geology, engineering, economic risk) and attractive (resource potential, resource abundance, strategic value, the scale of reserves, reserves, grade, net present value, the market). It uses probability theory and mathematical statistics of forecasting technique, scoring method is taken on the basis of the project geological condition, reservoir condition, geographical condition, economic factors with a comprehensive survey. Then draw a comprehensive evaluation of each project factor–the optimal assessment value, evaluating the project according to the optimal assessment value.

73.4 Problems of the Investment Decision-Making

There is a lot of theoretical study of investment decisions on oil and gas exploration project. In practice, however, the exploration project investment decision-making is still a trouble. Determine which project can invest and how much to invest, how to take effective action to improve project return on investment has become increasingly difficult. Why the exploration investment decision-making

research is rarely actually used in the industry. There may be the following reasons with comprehensive analysis [5]:

Exploration project itself has a high complexity; it is different from the general construction projects. The question now is the geology experts do not understand the economy, economic experts do not understand the geology. There is no link between the geological and economic thinking. Therefore, there is not much targeted, resulting in the present situation. Although there are more theoretical results, but the application is insufficient.

The oil field is at different exploration and development stage and different exploration stage of exploration project. People have different understanding and requirements on investment objectives, investment performance, risk and uncertain tolerance. This also affects the progress of the study of oil and gas exploration and investment decisions.

Lacking the holistic and global system thought. Existing exploration project investment decision is mainly for individual exploration project. Do not consider the position in the overall business strategy and investment objectives of the project. And have it together with other investment projects, from the level of costs, benefits and risks to compare.

Decision-making process is simply equal to the assessment process, and over-reliance on the financial assessment. The assessment is the important part of the exploration project on investment decisions, but can not completely replace the decision-making.

Different stakeholders of Enterprises have different cognitive and interest demands. They form an important force to influence the investment decisions of the exploration project. Thus, theoretically effective exploration project investment decision-making methods in practical applications may not be able to play its due role [6]. Therefore, even with the norms of decision-making process and decision-making, investment decision-making of exploration project is still a subjective process of dynamic. Various forces in the enterprise intentionally or unintentionally, rational or irrational influence the decision-making results. However, the vast majority of studies use the rational model approach, ignoring the useful supplement from the knowledge of psychology and sociology to exploration project investment decisions.

73.5 Conclusions

The economic evaluation of oil and gas exploration project is an integrated system engineering, evaluation is a dynamic process. At present, China has not formed a relatively complete theoretical system of oil and gas exploration and economic evaluation. However, after the efforts of many scholars, research of exploration economic evaluation has been great progress. In practice, we should execute dynamic evaluation system according to the actual situation. Not only to be evaluated before a project approval, but also evaluate it on and after the project.

Let evaluation throughout the project all the time. In addition, we should gradually introduction of social, environmental benefits assessment. Not only to evaluate the quantitative indicators, but also attach importance to the qualitative indicators. Evaluate the macro-economic benefits of the project, in order to adapt to the trend of sustainable society. This is also the future research should focus.

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Chapter 74
Research of Management Innovation in Small and Medium Size Private Enterprise

Jindong Wei and Wei Wu

Abstract From the last 80s, our private enterprises express all around like the bamboo shoots after a spring shower. With the country policy support, they obtain the rapid development and provide a great contribution to the national economy development. This article will start from the division of small and medium size private enterprise. Moreover, it introduces the management professionalization, life cycle theory, management innovation, and evaluates the resistance elements during the enterprise management and innovation. At last, this article will provide some reasonable advices. Research the management mode of small and medium size private enterprise, analyze the disadvantages and shortages, and provide the effective innovation is the emphasis and a hotspot in the present society, which has the significant meaning to solve the enterprise questions and develop the national enterprises.

Keywords Small and medium size enterprise · Management · Innovation

74.1 Introduction

At present, the small and medium size private enterprise obtains the full development space that under the guidance of national policy, regulation, and laws. The enterprises obtain the rapid development with definite scale. However, with the enterprise development there follows the series of questions such as capital, technology, and staff management. The enterprise faces the un-precedented crisis.

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At this time, it is important to transform the management concept, break the old ideas, and innovate the new to the management [1]. This is the way to develop the enterprise. The most private enterprises of small and medium size are the family management enterprises [2]. Although the products are various, the facing management question and problems are very similar to each other. It is necessary to find out the existed questions and the solutions for the small and medium size private enterprises.

74.2 Theoretical Research

74.2.1 The Small and Medium Size Enterprise

The division of small and medium enterprise in china is basically depending on the enterprise staff number, saleroom and the total assets. Based on the the small and medium enterprise standard (Temporary Provisions), in the industrial enterprise, the staff number is under 2,000 people, the annual saleroom is under 30 million RMB and the total assets is under 4 billion is the small and medium size enterprise [3].

In our country, if one person or the family grasps 50 % or above property right, this enterprise belongs to the private enterprise. Follow the above definitions, the enterprises that correspond with the two conditions belong to the range of small and medium size private enterprise [4].

74.2.2 The Management Professionalization of Private Enterprises

The most private enterprises are the management control mode of family or friends. During the entire management process, it is not slandered with the staff's ability. Instead, the relation decides the position. Figure 74.1 is the explanation.

Fig. 74.1 The staff right arrangement in private enterprise
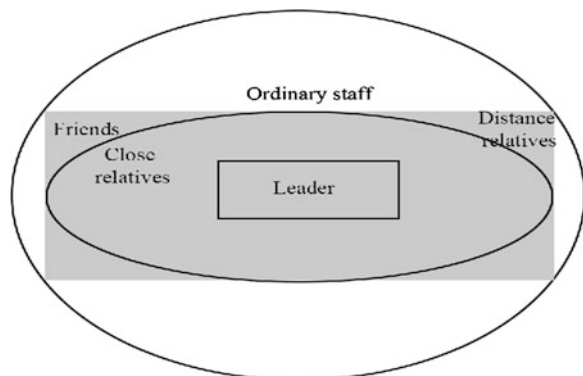
74.2.3 The Application of Enterprise Life-Cycle Theory in the Private Enterprise Management

One person needs to grow following the sequence of baby, teenager, younger, middle age, and old age. As well as the enterprise, there has the similar sequence. From the establishment of the enterprise, it steps into the establishment period. In the business quantity development, it steps into the development period. Along with the increasing maturity of saleroom and technology, the mature period is coming. If there has no revolution at this time, the enterprise will be caught up with other competitors and gradually quit the market. From the manager transformation, the period divides into three parts.

In the paternalism period, the family or one person contributes the enterprise. The establishment depends on someone. This person is the principal of the enterprise. This person decides the paternalism during the enterprise management and everything about the enterprise.

In the paternalism period, the scale becomes larger. However, one person's limitation requires more helper to manage the enterprise. In the private enterprise, the staff comes from family, friends, classmates and so on. They form the unit of benefit. At the same time, the talent staffs join into the management and bring the new method.

During the business management, the enterprise scale becomes larger. The primary managers retire to the backstage and only take part in the further trend management. The detailed management will finish by the business manager. At present, the foreign professional manager becomes perfect, although our country is still under the searching period. Only some large-scale national enterprises start to push the professional manager management. There still has long period to develop with the regulation perfection in the small and medium size private enterprise.

74.2.4 The Enterprise Management Innovation

The present market is beyond the requirements. The production not only needs to consider about the quality, but also needs to think about the production differences and personality. With the rapid development of computer technology, the market information becomes clearer, the information transmission have reached the synchronization. That is why the production period becomes shorter. This provides the higher requirement to the enterprise management. It is necessary to obtain more market share through innovation.

The modern society is the knowledge society. The enterprise competition is the talent competition. The manager needs to ceaseless learn the new knowledge, grasp the development direction, understand the condition at home and board, and reduce the environmental effect as far as possible. It is important to reform the superficial layer system of producing process and the deep system of organization structure. All these start based on the innovation. Figure 74.2 is the detailed process.
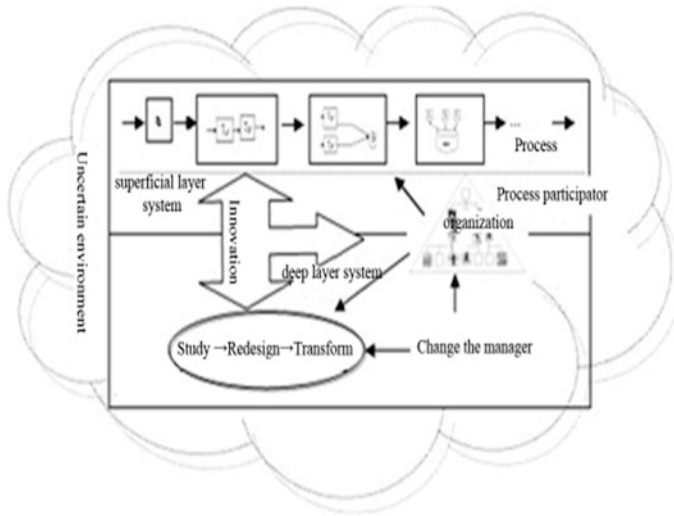
Fig. 74.2 Innovation process of enterprise management

74.3 The Management Innovation Question of Small and Medium Size Private Enterprise

74.3.1 The Questions in the Small and Medium Size Private Enterprise

At present, the small and medium size private enterprises are full of various industries and provide a great contribution to the economic development. In the eight regions along the coast cities, the un-balance distribution in small and medium size private enterprise places more than three-fifth among the whole country. This provides widely platform for the employment. With the ceaseless economy development, the enterprise and strength increases the same. It is mainly expressed in the following aspects.

74.3.1.1 The Close Structure of Property Right

The family idea is strong in the small and medium size private enterprise. The property right completely belongs to the entrepreneur and the family members. They do not take full advantage of the foreign capital and even have the exclusion thinking.

74.3.1.2 The Oneness of Property Right and Managerial Authority

The small and medium size enterprise manages by one person or the family. They take much care on the managerial authority, especially the staff management mode of the outside persons. They don't want other people to do the scientific management.

74.3.1.3 Imperfection of Employment System

There has no reasonable regulation to promote or punish the staff. There exists great randomness and relative only. Especially in the general manager, finance, and human recourse, they do not think about the practice level of the manager. However, they only consider about the genetic connection, the close and distance relationship.

74.3.1.4 Patriarchal Decision

The development direction and decision is absolutely followed the thinking of the founder. From the primary period of the enterprise establishment, it depends on the founder's hard working, and the breaking spirit. The founder obtains the success and establishes the right. As time passes, no matter big or small, all the questions will decide by the founder. Other ideas are only the references without any effectiveness.

74.3.1.5 Low Working Effectiveness

During the enterprise operation, the manager can optionally take part any departments at any time and modify the work process. The more family members in the private enterprise will lead too many managers show the opinion and idea that the staff cannot know what to do.

74.3.1.6 The Uncritical Systematism

In every enterprise, there have the specific culture and the serious regulation. In many small and medium size enterprises, the system is the constraint for the subordinates, not the manager's relatives and friends. It will make the scattered discipline and timing of the managers. The staff cannot mention the ideas, and then the enterprise will lose the cohesive force.

74.3.2 The Element that Influences the Enterprise Revolution

74.3.2.1 Social Political System

The long-term influence of feudal culture makes the rootedness of the monarchical power in people's mind. Although the democratic process has the rapid development after the reform and openness, we still cannot stop chasing the power. It is very hard to implement the democracy in the enterprise without the social democracy. Especially the vital problems in the enterprise, they are totally decided by the mangers that cannot develop the democratic and scientific discussion.

74.3.2.2 Social and Economic Condition

More than 30 years after the reformationary, is the serious period that influenced by the foreign advance thinking and decayed culture. At the same time, the traditional culture obtains the impact. People are too hotness seek the money. It is common to lose the social credit and has great influence to people' thinking. The imperfection of the professional manager system has few managers with various qualities. Enterprise is the life of the directors in the small and medium size enterprise and they cannot deliver the enterprise management to the professional manager.

74.3.2.3 The Imperfection of the Regulation and Laws

Our country is stepping into the legal system. The enterprise needs law protection. On one hand, the bad credit of some small and medium size enterprise will make lose of the country or other enterprises. On the other hand, the loan difficult will make the bad found fouling.

74.4 The Management Innovation of the Small and Medium Size Private Enterprise

Twenty first century is the talent century and the most important thing in the enterprise is the talent. The revolution in small and medium size enterprise needs to be centered with people and innovate in opinion, strategy, system and culture in order to obtain the higher benefit.

The reform needs to start from the opinion. Only the advance management thinking and idea, the enterprise can obtain the sustainable development. The opinion innovation needs to establish the new overall point of view, the idea of innovation revolution, the sustainable development thinking, and the mind of

people oriented. Strategy innovation pays attention to the enterprise future and grasps the market trend and external environmental transmission. Culture innovation makes staff feel the sense of belonging, and express the perfect spirit during the enterprise development. The system innovation puts the system in the first place. Even every detail will in strict accordance with the system and the constitution. The enterprises will develop rapidly through the above aspects.

74.5 Summary

This article searches and discusses the small and medium size private enterprise aiming at the management innovation. At first, the article evaluates the enterprise division, management professionalization, enterprise life cycle, and the management innovation. In the second, aiming at the existed question in the small and medium size private enterprise, there provides the detailed analysis and points out the main element that influence the innovation. At last, the article evaluates the management innovation and support the general result. For the length limitation, although we do not provide the detailed innovation examples of the small and medium size private enterprise, the principle has definitely provided. Hope the article can support help to the reader, which interested in this article.

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Chapter 75
Research on Inter-City Transportation to Promote Changsha-Zhuzhou-Xiangtan Urban Agglomeration Economy Integration

Fu-chun Xie, Lingling Zhang and Jie Min

Abstract This paper analyses the inter-city traffic system improvements of Changsha-Zhuzhou-Xiangtan urban agglomeration to promote the economy factors to flow. It probes and explains that the inter-city transportation has much effect on the urban agglomeration economic integration based on the positive relationships between the inter-city transportation and transport of goods, that is to say, the inter-city transportation promote the flow of economic elements, deepen the division and cooperation of the industry among the Changsha-Zhuzhou-Xiangtan urban agglomeration then formate and improve of the urban hierarchy urban agglomeration to achieve its development.

Keywords Inter-city transportation · Economic integration · Flow of economic elements · Changsha-Zhuzhou-Xiangtan urban agglomeration

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75.1 Introduction

The Metropolitan is the main driving force in industrial innovation and economic growth in the national economy in the contemporary society [1]. The development of inter-city transport is always accompanied by the development of the urban agglomeration development in the process of economic development of the urban agglomeration, On the one hand, the development of the urban agglomeration of economic integration must be accompanied in a certain extent by the generation of a lot of traffic demand, therefore, the development of the urban agglomeration of economic integration promote the development of inter-city transport. On the other hand, a certain stage of the rapid transport capacity of the inter-city traffic will accelerate the economic development of CZT city cluster. Therefore, the interaction between the above two factors promote jointly the social-economic growth of the total at the base of the urban agglomeration of economic restructuring and the operating mode of intercity transportation coordination.

75.2 An Overview of the Inter-City Transport

75.2.1 The Concept of the Inter-City Transport

It is the inter-city traffic that establishes the civil aviation, railways, highways, waterways channel transport network of the transport system of the five levels of social integration such as the intercity transport network, transport equipment, transportation organizations, transportation laws and regulations and transport information of the transport resources. Its goal is to meet the intercity transportation needs of the market, the rapid increase in intercity transport capacity, to quickly upgrade the level of transportation services and the promotion of the sustainable development of the regional social-economic and transport [2].

75.2.2 The Function of the Inter-City Transport

The convenient inter-city transportation system is consisted of various modes of transport such as air, land and sea, large capacity, high-speed channel transport system, which is divided into passenger transport system and freight transport system. It achieves the development goals of the quick passenger and freight overloading logistics through the inter-city transportation system, which is the main net of an integrated transport system in the intercity network [3].

75.3 The Overview of the Formation and Development of the Changsha-Zhuzhou-Xiangtan City Group

The Changsha-Zhuzhou-Xiangtan city group were arranged in a triangle along the Xiangjiang River, which is divided into three branches within the distance of less than 50 km [4]. Being the old industrial base of China and major Midwestern city group,Chang-Zhu-Tan city group have come into being the eastern and western regions development characteristics, which has typical and representative ones all over our country. In the 1950s, some experts put forward three cities to build "the city of Mao Zedong"; In the first time of 1980s, it was presented by Zhang Ping to build the Chang-Zhu-Tan city group regional integrated consideration which was the preliminary design, It was in the year of 1997 that Hunan province government made the development of Chang-Zhu-Tan economic integration strategy [5, 6]; It was in the August of 2005, Hunan province people's Government approved the "pool of long individual plant city group regional planning", which marks the end of the Chang-Zhu-Tan overall planning stage; In December 14, 2007, with the consent of the State Council, the national development and Reform Commission formally gave the order, which approved the Chang-Zhu-Tan city group as a "national resource-saving and environment-friendly society construction which is a comprehensive reform experimental zone". So far, the Chang-Zhu-Tan city group development began to enter into a brand-new phase [7].

75.4 City Group Economic Integration Overview

75.4.1 City Group Overview

During the city group research history, there have been many thoughts such as the "garden city" mode of the British scholar Howard [8]; the French scholar Jean [9, 10]. Gottmann proposed the new city groups which was the concept of "megalopolis"; American scholar Freedman described the industrialized society form and function multiple nuclear clusterin collection city area as "Urban field"; our country city geography scholars Zhou Yixing called the city group as the metropolitan city group (MIR) at the base of the research of Western megalopolis and the similar new city group space organization of the coastal area of our country [11, 12]. Our country scholar Yao Shimou defined the city group as a relatively integral city with a core city which are constituted by the intercity traffic network among the close and different cities [13].

75.4.2 City Group Economic Integration Overview

City group economic integration is a dynamic process, which does not only reflect the general rule of economic development, but also has the gradual and evolution characteristics of the city group system spatial structure. Its function and space will become more advanced stage in the development process.

City group economic integration contains the contents of three aspects: The first are economic factors in the market economy society such as commodity, capital, labor, information in the city group which flow freely to form an unified market; The second accelerate different city subject among the city groups to achieve the resource sharing, complementary advantages and common development which will build the effective industrial cluster and diffusion pattern of economy by the way of the government's macroeconomic control and market economy of multiple factors; Finally, with the strength of the division and cooperation of the city group and the affect of the market economy, it is gradually formed and perfected the function and the sound system of city group, and with the city development of group of economy, the city group system will evolute to a higher stage.

75.5 Practical Research on the Intercity Traffic to Promote the Changzhutan City Group Economic Integration

75.5.1 The Changsha-Zhuzhou-Xiangtan City Agglomeration Intercity Traffic Resources

The Changsha-Zhuzhou-Xiangtan city agglomeration have built the transportation network around the center city of Changsha which are constituted of railroad, highway, canal age and aviation with the development of the three cities the inter-city traffic resource since the planning implementation of the Changsha-Zhuzhou-Xiangtan city agglomeration. There are four major railway lines such as Jing-Guang, Zhe-Gan, Xiangqian, Wuguang cross the Chang-Zhu-Tan city group in the field of the railway resources, and the city of Zhuzhou is South China's largest transportation hub. There are 4 State highways, 18 provincial Roads, the Jing-Zhu expressway, the Shang-Rui expressway, Chang-Zhang expressway and the Chang-Yong expressway, It is especial that the expressway between the Chang-Tan and the Chang-Zhu have been built. So the intercity highway transportation network is so developed in a crisscross pattern; The Xiangjiang river goes throughout the Changsha-Zhuzhou-Xiangtan city group in the field of its water resources; There are over 100 airlines from the Changsha Huanghua Airport of the Changsha-Zhuzhou-Xiangtan city group aviation resources.

75.5.2   Practical Research on the Intercity Traffic to Promote the Chang-Zhu-Tan City Group Economic Integration

75.5.2.1   Promote Chang-Zhu-Tan City Group Economic Element to Flow

There happened to be a total amount of 24,780,000 tons of logistics, logistics volume is 10,949,950,000 ton km and highway passenger volume 118,630,000, passenger volume is 10,736,320,000 km by the way of road transport; There happened to be a total amount of 97,844,800 tons of logistics, logistics volume is 7,304,027,500 ton km and highway passenger volume 102,380,000, passenger volume is 6,185,390,000 km by the way of water transport; And there were 10,206,000 tons through the inland river port. All the above date come from the 2006 statistics data.

It was the Intercity water and land technology and highway construction that were effective to accelerate the flow of people, logistics and capital flow among the Changsha-Zhuzhou-Xiangtan city group to circle and update, which provides the economic integration with adequate blood and security. These are the interactions among the stream of people, logistics and capital flow that make them to form a kind of benign loop in the circulation process so as to ensure the flow of factor of production is more reasonable, to achieve the overall advantage to strengthen, to achieve resources and reasonable to be configuration, so that the city group economy in the field the export-oriented economy has bigger and better development space.

75.5.2.2   Promote Chang-Zhu-Tan City Group the City Function Division and Industrial Agglomeration and Diffusion

There are respective divisions of labor in the process of the city group development of the Changsha-Zhuzhou-Xiangtan three industry clusters. Changsha has been filled with electronic information, machinery manufacturing, food processing, biological medicine, new materials industry system, the three industry is relatively developed, such as scientific research and technical services. Zhuzhou formed transportation equipment manufacturing, non-ferrous metals, chemical raw materials, and chemical products, non-metallic mineral products which are the main body of the industrial system, Xiangtan formed a steel, electrical and machinery manufacturing, chemical raw materials and fine chemical industries system. Therefore, by the way of the establishment of the industrial cluster internal strict division of labor and cooperation system, the city group can effectively make use of the resource advantage of each district, make full use of regional director and realize dimensions economic benefits, at the same time it is benefit for enterprises to make full use of external resources to prevent external uncertainty risk and realizes the enterprise external economies of scope finally.

The one hand is that the intercity transportation development make the flow friction of the economic elements reduced, thus guarantee effectively the Changsha-Zhuzhou-Xiangtan city group interior regions with different specialization division of labor and industrial space layout, and produce assemble effect, so as to achieve the sharing resource, the clear collaboration, increasing returns to scale, and improve the whole social-economic welfare; The other hand is that improve the Changsha-Zhuzhou-Xiangtan city group investment environment, optimize the economic elements in Chang-Zhu-Tan city group development condition, guarantee the domestic and foreign capital in Chang-Zhu-Tan in further agglomeration and build transportation infrastructure for Chang-Zhu-Tan to give the overall effect of agglomeration. These basic hardware facilities will promote effectively the Chang-Zhu-Tan city group industrial structure adjustment, strengthen the Changsha-Zhuzhou-Xiangtan city group and the surrounding city industrial docking and complementary advantages. Therefore, intercity transportation development promote effectively the Chang-Zhu-Tan city group the city function division and industrial agglomeration and diffusion.

75.5.2.3 Improvement of Chang-Zhu-Tan City Group of City System

With the construction development of Changsha-Zhuzhou-Xiangtan city group and the implementation of regional planning, there are 4 State highways, 18 provincial Roads, the Jing-Zhu expressway, the Shang-Rui expressway, the Chang-Zhang expressway and the Chang-Yong expressway to go through the city group, It is especial that the expressway between the Chang-Tan and the Chang-Zhu have been built. So the intercity highway transportation network is so developed in a crisscross pattern. Especially the intercity expressways construction, they greatly promoted the development of towns along the lines with the condition of the Chang-Zhu-Tan city group as the core city and the small town as a satellite city. Thereby at the formation of a hierarchy of urban system in central city and satellite city and a win–win development process, they will reflect the higher city population level effect.

The intercity traffic resource development level is a reflection of development of the Chang-Zhu-Tan city group productivity, the high developed productivity will promote the development of the Changsha-Zhuzhou-Xiangtan city group and make its appear core pole of the anti aggregation effect, at the same time, the continuous progress of the intercity transportation technology promote the city's polar nucleus diffusion and expand the Changsha-Zhuzhou-Xiangtan city group (3 + 5) with the development of the core power source.

It is the advanced city traffic technology that provide effective infrastructure for the Changsha-Zhuzhou-Xiangtan city group economic development; It is the perfect and perspective strategic planning for Chang-Zhu-Tan which provides it power and direction, it will greatly enhance the Changsha-Zhuzhou-Xiangtan city

group aggregation function, the two factors will help the Changsha-Zhuzhou-Xiangtan core city and satellite city to make a rapid progress and common development, which ensure continuous improvement and development of the city group system and construct the reasonable and hierarchical city group system.

75.6 Conclusion

It is the intercity traffic development that reflects the city productivity development, which effectively promotes the sustainable development of regional economy and the traffic and transportation; the city group economic integration refers to the economy factors flow freely, the intercity cooperation and the complementary advantages among the city group, which achieve sustainable economic development of the city cluster. This paper analyzes positive relationship between the rationality of the layout and construction of intercity traffic developed degree and logistics freight volume, then it carries out a practical study the effect between the intercity traffic and city group economic integration, that is to say, it promote the free flow of economic elements, deepen the industrial agglomeration and diffusion of city groups, construct the reasonable and hierarchical city group system, thereby effectively promote the development of the city group economic integration.

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Chapter 76
Study on Lean Management Mode of Production and Operation of Enterprise Teams

Ying Wang, Ting Zhou and Zhihua Liu

Abstract The efficient management of enterprise teams is the foundation of the successful management of enterprises. According to the concept of the lean management and the features of enterprise teams, we clarified the connotation of the lean management of production and operation of enterprise teams first. Further, we constructed the lean management mode of production and operation from four aspects that are rules and regulations, techniques and methods, organization construction and culture and operation philosophy. Among them, the culture and operation philosophy plays the core and final role. Combined with characteristics of enterprise teams, the detailed contents and measures of the four aspects have been revealed to support the implementation of the lean management mode of production and operation in enterprise teams. Finally, we concluded the application value and significance of the lean management mode of production and operation in enterprise teams.

Keywords Enterprise teams · Lean management · Mode

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76.1 The Connotation of the Lean Management of Production and Operation of Enterprise Teams

The lean management which originated in Japan's Toyota Motor Corporation was formed into a more complete management theory in 1990. The essential idea of the lean management is to waste elimination, continued improvement and staff participation [1].

Teams are the basic cells of the enterprises. The team management is the foundation of the management and development of enterprises. Enterprise teams have their special attributes such as small structure, complex actions, concrete tasks, minute and complicated management, staff participation and other characteristics [2]. Considering the actual work of enterprise teams, we determine that the connotation of the lean management of production and operation of enterprise teams mainly includes the following aspects: short lead-time, orderly connection of production links and rational reduction of the waste of non-value-added during production and supply.

76.2 The Construction and Implementation of the Lean Management Mode of Production and Operation of Enterprise Teams

In this research, combining the concept of the lean management with the actual work of enterprise teams, we establish the lean management mode of production and operation of enterprise teams which consists of structure [3] and content. As shown in Fig. 76.1, the mode is composed of four parts which are culture and operation philosophy of the lean management of production and operation of teams, rules and regulations of the lean management of production and operation of teams, techniques and methods of the lean management of production and operation of teams, and organization construction of the lean management of production and operation of teams. Among them, the first part plays the core role.

Subsequently, in order to effectively promote the implementation of the lean management mode of production and operation in enterprise teams, we will not only give the interpretation, but also discuss detailed contents and measures of the four elements mentioned above.
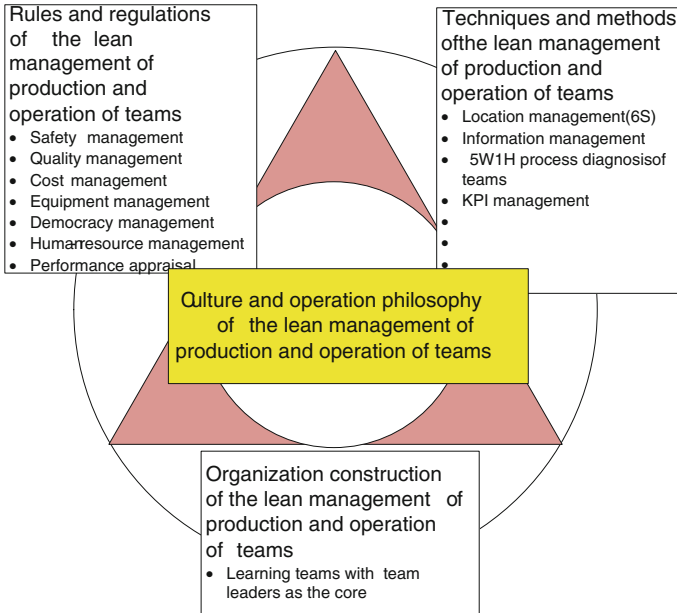
Fig. 76.1 The lean management mode of production and operation of enterprise teams

76.2.1 Rules and Regulations of the Lean Management of Production and Operation of Enterprise Teams

According to the mode content, we consider that the overall construction of rules and regulations of the team management is an important guarantee to create the lean management of production and operation in enterprise teams [4]. The rules and regulations mainly concern safety management, quality management, cost management, equipment management, democracy management, human-resource management and performance appraisal. What's more, facilitating continuous improvement and effectual implementation of the concrete rules and regulations of enterprise teams is of great significance.

76.2.2 Techniques and Methods of the Lean Management of Production and Operation of Enterprise Teams

Various management technologies and methods will provide good management and technology support for the achievement of the lean management of production and operation in enterprise teams. Next, we will respectively discuss some techniques and methods in detail.

76.2.2.1 Location Management (6S)

The 6S management [5] which originated in Japan is an effective on-site management concept and method. Classify and distinguish between the necessary and unnecessary items. Remain the necessary and clear the unnecessary. Through rational placement of the items and thorough cleaning of the workplace, we will obtain a neat and tidy production site. The implementation of the 6S management urges team workers to comply with the rules and regulations, develop their good habits and enhance their professional quality. Besides, the 6S management which lay stress on team workers' safety education and professional training helps to eliminate potential dangers furthest.

76.2.2.2 Information Management

The information management of enterprise teams is to standardize production design, security monitoring, equipment maintaining and other processes. The optimal combination of production factors and the rational allocation of resource will be achieved by applying the real-time management. Therefore, enterprise teams need to introduce a comprehensive information management system such as Management Information System (MIS) and Enterprise Resource Planning (ERP) to obtain the integrated operation of the information collection, management, transmission and application [6].

76.2.2.3 5W1H Process Diagnosis of Teams

5W1H process diagnosis by which we adjust the team workflow dynamically according to the changing environment is an effective method. Through holding process analysis meetings which combine the work experience of junior team workers with lean management techniques, we make diagnostic analysis on the current team workflow. In accordance with the order of cancellation, merger, change, simplification and spare, we optimize process nodes individually. Meanwhile, the 5W1H analysis method is used to regulate the process design on each node. During the improvement of the workflow, we will also introduce the PDCA method and plan management mechanism to strengthen the risk management.

76.2.2.4 KPI Management

The KPI assessment is used to measure the quantitative indicators of the performance of enterprise team workers. Then based on the indicators, the 6σ analysis method determines the improvement project, direction and degree. The evaluation of enterprise teams can be divided into four parts which are leading items, participation items, incentive items and negative items [7]. Among them, leading

items refer to the key performance indicators; participation items refer to indicators like job skills, staff discipline and cost of quality; incentive items refer to innovations; negative items refer to violations. Based on assessment cards and summary performances, team leaders are in responsible for carrying out the performance appraisal for a certain period.

76.2.3 Organization Construction of the Lean Management of Production and Operation of Enterprise Teams

The organization construction of the lean management of production and operation in enterprise teams is composed of two aspects. Next, we discuss the two aspects concretely.

76.2.3.1 Construction of Team Leaders in Enterprise Teams

Team leaders are at the core of enterprise teams. Strengthening the construction of team leaders is the key to the realization of the lean management of production and operation in enterprise teams [8].

We shall standardize the selection and appointment management of team leaders. A highly qualified team leader reserves are proposed to be established in accordance with the standard procedures that are democratic recommendation, evaluation, inspection and publicity. Moreover, by learning training, certification training and exchange activities for team leaders, the professional level and management abilities of team leaders are to be improved greatly. Then by organization evaluation, assessment by the masses or mutual appraisal, we will regularly or irregularly make evaluation on tasks of team leaders such as work arrangements, security management and team building.

Enhancing incentive mechanism which contains material and spirit aspects is necessary to encourage team leaders to work better. Thus team leaders can not only gain higher position and more salaries, but also obtain improved honor treatment. Beyond that we'd better reinforce the rules and regulations for dismissing those unqualified team leaders who badly neglect their duties, excessively emphasis on production but look down on safety.

76.2.3.2 Construction of Learning Teams with Team Leaders as the Core

Building learning teams is to activate every cell of enterprise teams. The construction of learning teams is suggested from the following aspects [9]:

Establishment of the Common Vision of Enterprise Teams

The common vision which includes the vision, values, mission and objectives is the aspiration of all the members in enterprise teams. It's the lighthouse and driving force to motivate team members to study and work well.

Improvement of Team Workers' Skills

Enterprise teams are shifting from labor-intensive to high-tech skills-based. In order to master modern production equipment and create higher labor productivity, team workers should be excellence on their jobs and improve their skills.

Construction of Team Learning Platforms

Enterprise teams should adhere to instilling the idea that learning is the need of survival. Building learning and communication platform like comprehensive employee learning center in enterprise teams is of great significance.

Encouragement of Team Workers' Innovation

Through strengthening innovative mechanism which focuses on the cultivation of innovative talents and encouragement of innovation, the innovation of management and production technology in enterprise teams are to be driven smoothly.

Improvement of Team Incentive Mechanism

Furthermore, enterprise teams should reinforce the teams' incentive mechanism which mainly embodies in three respects that are the rules and regulations of the appraisal, the rewards and punishments and the supervision.

76.2.4 Culture and Operation Philosophy of the Lean Management of Production and Operation of Enterprise Teams

Culture and operation philosophy are the intrinsic quality and external image of enterprise teams, which deeply influence the values and behaviors of team workers [10]. Comparing with management techniques and methods, culture and operation philosophy are relatively stable, essential and far-reaching.

The construction of people-oriented culture is the core of the lean management of production and operation of enterprise teams. Managers should trust people, cultivate the talents, and utilize the initiative of team workers. Also strict rules and regulations are required to be put in place to constrain team workers' behaviors. Further, applying lean management techniques and methods will promote the scientific and accurate management of enterprise teams. With enterprise teams facing more competitive production environment, the construction of learning teams with team leaders as the core plays the important role. We should combine the construction of learning teams with team leaders as the core with enterprises'

development goals, enterprise culture and team building, etc. It will forge the enterprise teams a good professional image, bold innovation spirit and positive team spirit. Thereby, enterprise teams' cohesion, combat effectiveness and creativity will be enhanced.

As a consequence, developing good culture and operation philosophy which is long-term mechanism should be the ultimate goal in the practice of the lean management of production and operation of enterprise teams.

76.3 The Significance of the Lean Management of Production and Operation of Enterprise Teams

The effective implementation of the lean management of production and operation will not only promote the cohesion and execution of enterprise teams, but also contribute to connect all production links scientifically. The application value and significance of the lean management of production and operation in enterprise teams mainly embody in the following four respects.

Firstly, comprehensive quality of team workers will be improved commendably. The lean management of production and operation in enterprise teams emphasis on people-oriented culture. By keeping on learning and innovating, team workers' professional quality will be improved continuously.

Secondly, costs of production and supply will be reduced to a great degree. Applying the lean management of production and operation in enterprise teams will effectively eliminate employing excess, idle assets, failed workflow and other wastes in all aspects of production and supply.

Thirdly, the level of safety and quality management will be increased effectively. With "Safety is the first and prevention is the main" as a precondition, enhancing the on-site management and quality management will ensure production safety and improve product quality.

Fourthly, the management innovation of enterprise teams will be promoted greatly. The persistent implementation of lean management measures will develop team workers' sense of innovation in technology, processes and management. Reasonable proposal which is of great value will drive the management of enterprise teams to a higher level.

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Chapter 77
Empirical Analysis of Effect of Rural Infrastructure Construction on Agricultural Economy Growth

Wei Wang, Hongrui Zhang and Guangji Tong

Abstract Empirical research of influence of rural infrastructure construction on agricultural GDP was made in this article, by using EVIEWS5.0 software, on the basis of data of Heilongjiang from 1980 to 2009. It is found that influence of rural road construction on rural GDP is reversed. In VAR model, influences of the first-order lag and the second-order lag of rural road construction on agriculture are contrary, and both rural effective irrigated areas and rural power consumption has close relation to agricultural GDP. Impulse response function showed that impact of rural power consumption has an obvious effect on agricultural GDP, impact effect of rural power consumption on agricultural GDP is obvious, and impact effect of rural water conservancy construction and rural road construction on agricultural GDP is smooth, which indicate that each rural productive infrastructure in Heilongjiang Province is effective on promoting agricultural growth in the short term.

Keywords Rural infrastructure · VAR model · Impulse response function

77.1 Introduction

Investment multiplier theory of Keynes considered that investment on rural infrastructure would cause multiplication of local agricultural economy. On the background of the socialist market economy with Chinese characteristics, investment multiplier theory of Keynes was used in this article for positive

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analysis of investment on rural infrastructure of China, main problem investigated was if rural infrastructure construction really effectively accelerated the growth of agricultural economy, and how about the influence. If there is difference between the generated influence and the theory, the blocking factors should be found out, which has very important theoretical and practical significance for accelerating the growth of local rural and agricultural economy, establishing scientific economic evaluation index and reasonable policies, etc.

77.2 Index Selection and Data Sources

77.2.1 Index Selection

Since nonproductive infrastructure like communication and education, etc. has strong external effect [1], which effect on agricultural economy growth is difficult to measure, the writer only adopted each element of productive infrastructure in analysis of effect on agricultural economy growth.

Selection of infrastructure index

The writer selected the following quantitative indexes, rural water conservancy construction: selecting effective irrigated area (WAT); rural electric power construction: selecting rural power consumption (ELE); rural transportation facilities: selecting rural road mileage (ROA).

Selection of agricultural economy growth index

Agricultural GDP (AGRGDP) of each year calculated with the fixed price of 1980 was selected in this article, unit: ten thousand Yuan, being used for reflecting agricultural development situation.

77.2.2 Data Sources

All data's come from statistical yearbook of Heilongjiang Province, statistical yearbook on agriculture of Heilongjiang Province.

77.3 Empirical Analysis

77.3.1 Stability Test

Stability test [2] of time series usually refers to unit root test. ADF test was mainly adopted in this article, and was completed through the following three models:

Table 77.1 Results from stationary test of time series

Variable	ADF test form	T test value	1 % critical value	5 % critical value	10 % critical value	Conclusion
LGDP	(C,T,1)	−0.47353	−3.6852	−2.9705	−2.6242	Not smooth
DLGDP	(0,0,1)	−2.78536	−3.6959	−2.9750	−2.6265	Smooth
LROA	(C,T,0)	15.0005	−2.58968	−1.9439	−1.6147	Not smooth
DLROA	(0,0,0)	−3.44996	−3.6959	−2.9750	−2.6265	Smooth
LWAT	(C,T,1)	0.09624	−3.6852	−2.9705	−2.6242	Not smooth
DLWAT	(0,0,0)	−2.97367	−3.6959	−2.9750	−2.6265	Smooth
LELE	(C,T,1)	0.44549	−3.6852	−2.9705	−2.6242	Not smooth
DLELE	(0,0,1)	−3.1959	−3.6959	−2.9750	−2.6265	Smooth

Note Three items in ADF test form respectively stand for if there is constant term, trend term and lags existing in test equation, and 0 stands for nonexistence. Variable with D before it stands for first order difference

Model 77.1 with constant term and trend term:

$$\Delta X_t = \alpha + \beta t + \delta X_{t-1} + \sum_{i=1}^{m} \beta_t \Delta X_{t-i} + \varepsilon_t \qquad (77.1)$$

Model 77.2 with constant term and without trend term:

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{i=1}^{m} {}^{i=1}\beta_i \Delta X_{t-i} + \varepsilon_t \qquad (77.2)$$

Model 77.3 without constant term and trend term:

$$\Delta X_t = \delta X_{t-1} + \sum_{i=1}^{m} \beta_t \Delta X_{t-i} + \varepsilon_t \qquad (77.3)$$

Test sequence was model (77.1), (77.2), (77.3), if null hypothesis could not be refused, steady state was formed, and it was considered that time series was not steady, and difference must be taken for original series, then the above mentioned test sequence was repeated till steady state was reached. See Table 77.1 for test result.

Test result indicated that the four serials: LGDP, LROA, LWAT, LELE were serials of I (1).

77.3.2 Analysis of Vector Auto Regression Model (VAR Model)

Selection of optimum lag time

Table 77.2 Test result of Johansen co-integration

Null hypothesis	Characteristic value	Trace statistics	1 % critical value	Value P
Non-existence of co-integration	0.744296	68.22998	60.16	0.0000
Existence of one co-integration relationship at most*	0.416183	31.40911	41.07	0.0543*
Existence of two co-integration relationship at most	0.371642	16.87860	24.60	0.1183
Existence of three co-integration relationship at most	0.148272	4.333182	12.97	0.2365

Note *indicates that original hypothesis is refused under the critical value of 1 %

For selection of optimum lag time, optimum lag time was selected as 2 by integrating AIC and SC criterions in this article.

Test of co-integration

In this article maximum likelihood method of Johansen [3] was adopted to take co-integration test for variable LGDP, LROA, LWAT, LELE in this article. See Table 77.2 for test result.

The test results indicated that there is co-integration existing among the four variables, and number of the co-integration is 1. The co-integration equation is:

$$LGDP = -0.286673ROA_t + 0.923709WAT_t + 1.094158LELE_t$$
$$[-8.2021][25.239][25.671]$$

$$(77.4)$$

The values in square brackets in the Eq. (77.4) are t statistics of the coefficient.

The co-integration equation shows that positive correlation is presented between agricultural LGDP and field water conservancy LWAT, positive correlation is presented between agricultural LGDP and rural electric power consumption LELE, negative correlation is presented between agricultural LGDP and rural road LROA, which indicates that there are some problems existing in rural road construction in Heilongjiang Province.

Vector error correction model (VEC model)

VEC model reflected the interaction of variables in short terms, i.e. once I (1) variables deviated from its equilibrium value, these variables will automatically return to its equilibrium value [4]. And VEC model was established as follows according to the co-integration Eq. (77.5):

$$DL(GDP_t) = -0.079(ECM_{t-1}) + 0.8723DL(GDP_{t-1}) - 0.0177DL(GDP_{t-2})$$
$$-0.1092[-2.281][4.1555][-0.0924][-0.6221]$$
$$DL(ROA_{t-1}) + 0.0542DL(ROA_{t-2}) - 1.4798DL(WAT_{t-1})$$
$$+ 0.8569DL(WAT_{t-2})[0.2757][-3.2275][2.2427] + 0.4464DL(ELE_{t-1})$$
$$+ 0.5874(ELE_{t-2})[0.5757][0.6670]$$

$$(77.5)$$

The values in square brackets in the Eq. (77.5) are t statistics of the coefficient.

Goodness of fit for this model is 98.24 %, with small AIC and SC, so the overall fitting effect is ideal. In this VEC model, rural road construction appeared negative influence on agricultural GDP in the first lag time, and became positive influence on agricultural GDP in the second lag time. Likewise, rural water conservancy construction appeared prominently negative influence on agricultural GDP in the first lag time with an influence coefficient of -1.4798. In the second lag time, the gradually improved water conservancy facilities will prominently accelerate agricultural development with an influence coefficient of 0.8569. In the first lag time or in the second lag time, the rural electric power consumptions appear positive influence on agricultural growth with influence coefficients of 0.4464, 0.5874. Coefficient of error term is -0.0790.

77.3.3 Granger Causality Test

See Table 77.3 for test results.

From Table 77.3 we can see that the rural electric power consumption is Granger causality of growth of agricultural GDP, but agricultural GDP is not Granger causality of the rural electric power consumption. The rural electric power consumption is Granger causality of rural water conservancy construction. Rural road construction is not Granger causality of growth of agricultural GDP, which is the same as the analysis in former VEC model.

Table 77.3 Results of Granger causality test in short term

Null hypothesis: no Granger causality exists	Value P	Conclusion
DLGDP → DLELE	0.8452	Null hypothesis is accepted
DLELE → DLGDP	0.0238*	Null hypothesis is refused
DLROA → DLELE	0.1406	Null hypothesis is accepted
DLELE → DLROA	0.6958	Null hypothesis is accepted
DLWAT → DLELE	0.4872	Null hypothesis is accepted
DLELE → DLWAT	0.0014*	Null hypothesis is refused
DLROA → DLGDP	0.9698	Null hypothesis is accepted
DLGDP → DLROA	0.0347*	Null hypothesis is refused
DLWAT → DLGDP	0.0157*	Null hypothesis is refused
DLGDP → DLWAT	0.4431	Null hypothesis is accepted
DLWAT → DLROA	0.5370	Null hypothesis is accepted
DLROA → DLWAT	0.8967	Null hypothesis is accepted

Note *indicates that null hypothesis is refused above the level of 5 %

77.3.4 Impulse Response Function

Impulse response function is able to intuitively describe dynamic interaction effect and influence between variables, being shown in Figs. 77.1, 77.2 and 77.3.

Figure 77.1 showed that when an impact is given to rural road construction in current period, it begins to decrease in the first period, and then begins to increase from the third period, till reaches the most obvious promotion effect in the sixth period. The reasons were that farmers invested too much money in road construction in initial investment, so investment in agricultural was reduced and agricultural growth was restrained. In pace with the change of investment cycle,

Fig. 77.1 Response of LNROA to LNGDP
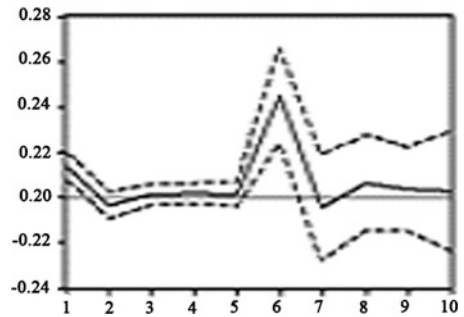
Fig. 77.2 Response of LNWAT to LNGDP
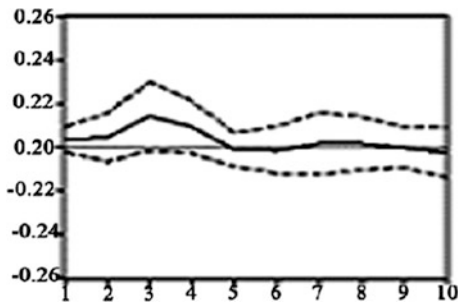
Fig. 77.3 Response of LNELE to LNGDP
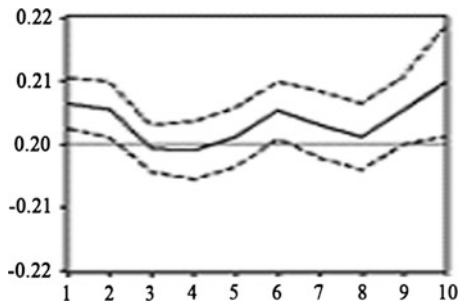
road construction after becoming steady will have a great acceleration effect on agriculture, which has the most obvious representation in the sixth period.

Figure 77.2 indicated that when an impact is given to effective irrigating area in current period, there exists a positive response in the first three periods, and the effect will reach the maximum, and then gradually decrease to the fifth period which is a maximum negative responding point, then rapidly disappeared. This showed that water conservancy construction will improve agricultural GDP at earlier stages in Heilongjiang Province, which will increase the investment cost of the farmer. Therefore, speed of agricultural growth will be restrained.

Figure 77.3 reflected that the respond generated by the impact of one standard deviation of agricultural growth to rural electric power consumption. At earlier stages, there is a positive impact on rural electric power consumption, and there exists a negative response in the first four periods. Then it will rise gradually, and accelerate the development of agriculture after the fourth period. This is similar to the description in VEC model.

77.4 Conclusion

Empirical result: in the short terms, effect of rural electric power consumption on agricultural growth is the most prominent, and effect of rural irrigation and rural road construction on agricultural growth is smooth. In the long run, rural water conservancy construction and rural electric power consumption have a positive influence on agricultural economy, and influence of rural road construction on agriculture is reversed, but the impact effect is not obvious. Construction of productive infrastructure of Heilongjiang Province is good on the whole; however, some problems exist in rural road construction. Therefore, blocking factors should be found out in time to ensure coordinative and steady development between each rural infrastructure and agricultural economy. In investment of rural infrastructure construction, government at all levels must make scientific planning and policies.

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Chapter 78
Analysis of Legal Countermeasures to Solve the Problem of Education Equity

Bin Liang

Abstract In recent years, China places increasing emphasis on education equity issues, and take legal and administrative measures to reform. But education is a large project. In order to achieve a better result, it must uphold for a long time. In this paper, it analyses legal countermeasures to solve the problem of education equity by talking about the concept of educational equity, the importance of education equity, education equity problem, and reason, and education equity issues legal countermeasures.

Keywords Education equity · Problem · Legal countermeasure

78.1 Introduction

Education equity plays an important role in social equity [1]. It is not only an important means of social equity, but also an important way of social equity. Solving education equity will be able to better achieve social equity and promote the development of a harmonious society. How to use the legal countermeasures solving education equity, it has become a worth thinking thing of the relevant departments.

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78.2 Concept of Education Equity

The so-called education equity is the equity, justice, and impartiality of education [2, 3]. It emphasizes the subjective evaluation of the objective content, the reasonable adjustment of the interest, and the value judgment of the resource rational allocation. Commonly, the education equity in human sight is an extension and expanding on an equitable basis, and is a subsystem of the social equity system. On this foundation, the education equity can be divided into education starting point equity, education process equity and education result equity. Education starting point equity can be divided into the equal education rights and equal education opportunities [4]. The equal education right is a prerequisite of equal educational opportunity, while the equal educational opportunity is the forming of the equal education right. The equal education process means the students are treated equally in the education process [5]. Equal education result means the students' academic achievement is equal and education output is equality, which can realize the true sense of the fair.

78.3 Importance of Education Equity

With China's accessing WTO, we are facing the competition not just economic competition or comprehensive national strength competition, but also talent competition. And talents are from institutions. While these institutions want to cultivate more talented persons, they should carry relevant education. For now, our nation attaches great importance to education, not only proposing the content of adhering commonweal education, increasing education investment, formulating education fees and establishing education financial aid system, and ensuring that the children of migrant workers enjoy equal education in the 17th Session of the General Assembly [6]. Premier Wen Jiabao also pointed out in the Education development Plan: Educational equity is the very most basic, important social equity. He stressed to use about 10 years basically completing balanced development of compulsory education, to incline more educational resources in rural areas, remote areas and ethnic minority areas, which will ensure the a school-age child won't be unable to go to school because of family financial difficulties. It can be seen from the above that educational equity is a global, strategic tasks, and long-term goal of educational reform and development [7, 8]. Educational equity, as an important component of social equity, plays an important role in maintaining social stability, building a harmonious society, and improving their international competitiveness. Education, as an extension and manifestation of social equity in the field of education, is also the fundamental of social equity. However, although education equity plays an important role in the social equity, its problems in the actual application process has not been effectively addressed. Now, dissatisfaction with the education equity has already been more than 56 %. In this case, in order

to better achieve educational equity, it should long-term adhere appropriate policies. After all, education is a long-term project.

78.4 Education Equity Problem and Reason

Now, there are certain problems in our examination system. It mainly appears on the inequity between cities and countryside. Although China implements a unified college entrance examination system, it is not admitted in accordance with the scores, but according to the provinces' and cities' quota. Even if the exam is unified, the admission takes province-based on first. This is very unfair to those areas with high scores, especially for those candidates in high scores areas. Even this will bring the appropriate candidates more inequity in education. Because of dissatisfaction with the entrance examination requirements, several Shandong high-candidates sued the Ministry of Education on the reason that the enrollment plan acted wrong while it caused education rights unequal between different exam areas in 2001. Since then, education is not fair becomes a hot social topic. Some parents and experts also have complained to the education reform which is lagging behind. In the urban and rural development process, there is also unfair. Although the papers between urban and rural areas are same, the admission score is different. Especially the admission score for large city candidates is far lower than those in rural areas. According to authoritative statistics, urban high school, secondary, tertiary, undergraduate, and graduate students' proportion is 3.6 times, 16.7 times, 56.6 times, 282.6 times, and 324 times than rural areas. In this trend, more students that are rural are distributed in the universities where the educational resources and teaching quality is relatively weak. In our higher education, there are also non-standard school and the behavior of arbitrary charges. When admitting, someone who can't meet the standard will be able to enroll by virtue of power, influence or money. With these corruptions which can not be located, it is bound to affect the fairness of the students who pass the exam and should be admitted. In this case, it often causes the society and parents of students dissatisfy with the education equity. Unreasonable space layout of universities and inequity among colleges and universities, in a certain extent, also bring a negative impact to education equity. There are several factors of the educational equity problem, not only subjective factors, but also objective factors. The objective is inseparable from China's national conditions. After all, our social and economic resources can not better meet people's material needs and spiritual and cultural needs, which have seriously hampered the improvement and development of higher education in China, letting alone higher education equity. Economic imbalances mainly appear on the regional economic imbalances which cause the regional educational resource inputs imbalances, and it makes a clear gap between the developed economic zones and backward economic zone. It is also reflected in the class differentiation. In the process of economic transformation, there must be a fierce competition. In the fierce competition, it is bound to make part of the people rich, while another

part of the people trapped in poverty. In this case, some people can not afford their children's learning cost, and the education equity problem happens. Unreasonable system and arbitrary charges in the higher education will also lead education equity problem. Now, although China has identified the unified fee system, as the current situation of our country, the education equity problem cannot be resolved in a short period of time. It need substantially increase teaching inputs, and also need quite a long period of time, use legal means and administrative means to adjust and reform in order to achieve educational equity.

78.5 Legal Countermeasures for Solving Education Equity Problem

78.5.1 Establishing Equal Legal Principles

To solve the education equity problem, equal legal principles must be identified on the basis of relevant laws, in order to better achieve legal and standardization on the concept. It could add education equity legislation principles in the general provisions of relevant laws, or add equal rules outside of the general provisions. However, China's existing laws and regulations failed to achieve the equal demand for contemporary education. In this case, in quite a long time after this, it should gradually increase the part of the equal legislation, and always carry out the education equity which is the core value of education legal system. There would be conducting a comprehensive cleanup to the legal system, once found the term which does not reflect the education equity, it should be removed. In addition, national authorities should take education equity as a scale to correspondingly comb the law and accordingly amend the principle of equity in Education Act in accordance with the a fair and impartial principle, and eliminate unfair part, in order to avoid or reduce adverse impact that simply focus on the value brings to the education.

78.5.2 Improving Equity-Based Education Legal System

For now, unfair statuses still exist in the current Chinese education. In order to change this situation, it should eliminate the inequity that emphasis on order and form-equality and efficiency value bring, and take education equity as a core value to reconstruct education law system. The specific method is formulating education equity-based law. Its contents include not only equity principle in national education legislation and allocation of rights and obligations, principal of the rights and obligations, but also including education equity's implementation, monitoring agencies and the corresponding pattern as well as the corresponding responsibility that

obeying the education should bear. On this basis, it should enact laws on pre-school education, law about examination, and law aspects of education investment, in order to ensure the integrity of the entire education law. To Education, examination system is very important. It's not only related to the distribution of education resources, but also related to the key of the overall situation of distributional equity of education resources. It's only changing the original simple test score-based allocation method, and integrated-justice-based allocating accordingly, can better reflect education equity. Specifically, it should comprehensively assess the strengths and weaknesses of the education equity form by judging demand distribution, identity distribution, assignment, law distribution and balanced distribution, taking its essence, making it social justice, harmony and education equity screening guidelines, and on this basis, establish a national-conditions-started exam education law system. The relevant data counts that before 2006, no one of the nine education-related laws reflect education equity, except the compulsory education law in 2006 which set up a liability for breach of education equity. In another three education law, only the Employment Promotion Law and the Law on the Protection of Persons with Disabilities have educational equity-related liability provisions. It can be seen the importance to improve the education equity law.

78.5.3 Establish and Perfect Education Laws and Regulations

In order to make education equity been better implemented, it should establish and perfect laws and regulations, strengthening education legal system construction. Perfecting relevant laws and regulations, it must start from our national conditions to clarify the scope and content of the equal education right in a legal form. It should also require the investment responsibilities of the central and provincial governments to strengthen the central and provincial financial investment, especially investment in compulsory education, in order to ensure the continued growth in education funding, and truly realize the true sense of the free system of compulsory education, to ensure that citizens enjoy equal education rights and obligations. The country is not only the main body of the education right, but also the main body of right protecting. Therefore, once the education right of vulnerable or disadvantaged sectors is damaged, the state can have the relevant laws and institutions to ensure their legitimate interests. In addition, it should strengthen the authority of the education laws and regulations, and stop the arbitrary collection of fees in education. To constantly improve the administrative, educational, and other laws and regulations, in order to better guarantee the education sector to administrating according to law, in accordance with the law, urging the school to run the school in accordance with the law, managing school according to the law and clear responsibilities and obligations of parents, through the appropriate education publicity, it will continuously improve education right awareness of disadvantaged groups, and establish a sound legal system of supervision, promoting the development when realize education equity.

78.5.4 Implementing Investment Tilts and Optimal Allocation of Resources Policy

In addressing educational equity problem, in addition to the necessary legal policy it should have the necessary administrative policy. On the basis of administrative policy, it can better achieve legal policy. In education, we can draw a number of education systems in funding grants and giving priority to education in remote or backward areas from developed and developing countries. Implementing a comprehensive waiver of tuition of poor children, it will provide real free compulsory education. By improving teachers' salaries, it will attract a large number of outstanding people involving in teaching. At the same time it should also encourage outstanding teachers to tough local or grass-roots work and provide favorable conditions. It should create conditions in urban and rural exchanges, increase the exchange intensity of urban and rural teachers, increase the intensity of the rural teacher training, and establish a special transfer payments education fund. Each year, according to the specific needs of different local, it would plan to allocate to poverty-stricken areas and rural primary and secondary, to establish a database of premises, equipment or books, in order to improve the school hardware level. It will improve the education level of the remote and rural areas, promoting the continued development of educational undertakings.

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Chapter 79
Industrial Chain Design in Industrial Enterprise and Environmental Benefit

Wu Yan

Abstract With the rapid development of science technology and the deepening awareness of environmental issues, the dominant industrial enterprises in the national economy are imperative to take rational economic industrial chain in the future. The rapid development of industrial enterprises has resulted in large quantities of waste discharged to the environment when raw materials are produced, the emission of industrial gas, noise, waste residue has caused great destruction on the environment. At present, the problem of environmental pollution has been referred to the agenda by many government members in developed countries, many environmentalists have long called for requirements to slow down the process of industrialization in the civil, and urged relevant government departments to take effective measures to protect the living environment which is increasingly being destructed.

Keywords Recycling economy · The design of industrial chain · Environmental benefits

79.1 Introduction

At present, many industries and enterprises have adopted a development model of circular economy chain in developed countries; this model has been recognized as the most rational mode of production optimization in the international community.

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It has changed the backward ways of the traditional economy chain in one direction [1, 2], makes the whole industry chain become a new model to be able to end to end and realize the production mode of raw materials → products → waste → raw material [3, 4]. This new type of production chain model emphasizes sustainable production development mode. Before of reproduction, it choses each raw material reasonably, adopts new processing technology, after products on the market, the waste generated in the production process and after the product is used, is recycled and processed to become raw materials that can once again be put into production workshop, in order to achieve economic industrial chain can be recycled [5].

79.2 Design a Number of Circular Economy Industrial Chain

Because of variety of industrial products, the required of raw materials, processing technology and product produced during processing are not the same, so there are some items that have some relevance on a circular economy industrial chain to form relatively independent circular economy industrial chains. For example, iron and steel industry gases and heat produced by the process of the processed products can be collected and used as their own resources. These emissions, heat are concentrated in a switching device through a special collection device into useful energy to support the production of iron and steel processing plant, so that not only can save the energy needed for firing steel, can make use of the exhaust and heat, greatly reducing the atmospheric pollution of industrial production, and the ambient temperature is not high at normal temperature to reduce the nuisance caused to the surrounding residents to heat. Moreover, some of the iron and steel scrap in the production process can also be collected, and then directly into the steelmaking furnace to be processed and the steel industry to play a role in order to reduce the waste of recyclable resources [6].

In some cities, there are specially designed some simple circular economy chains, such as industrial waste → building materials, garbage → electricity, waste animal and vegetable oils → bio-fuel oil. In fact, products produced by industrial enterprises are connected; there is no separate existence but not contact with other products. The raw material of a product is a product of another production chain, the product of a production chain can also be the prototype of another product. Therefore, we need to strengthen the link between these industrial enterprises, to coordinate the development between each other and contact each other to form a whole chain of circular economy. Waste residue, exhaust generated in every production process are been a reasonable plan, invested in new production, the amount of waste emissions is reduced to a minimum level, the extent of pollution to the environment is reduced to a minimum level [7].

79.2.1 Integrated Forestry-Paper Industry Chain

The rapid development of the paper industry increases the utilization of forestry and results in a sharp reduction in forest area, which not only greatly reduces green vegetation area, but also greatly increases the cost of the enterprise. If the paper industry can build a own saplings base, and invest heavily in forest land protection, then the natural forests will be taken from an inexhaustible source. Enterprise is taken from the forest for the paper industry and then consumes the trees replenish. The other hand, waste paper can also be re-used in papermaking, in paper industry, waste paper is called "secondary fiber". Recycling waste paper which has not social value, not only saves paper raw materials, but also reduces the sedimentation rate that the land absorbs waste paper. With relevant experts estimate: It of waste paper could produce 800 kg pulp, equivalent to the amount of 18 trees to produce pulp, that can save a lot of water, electricity, coal. In addition, the paper industry can introduce advanced wastewater treatment technology to reduce the amount of effluent discharge wastewater through multiple loops, filter, into reuse industrial water, which not only can save a lot of water but also reduce the pollution to environment and water. In paper bleaching, pollution-free chemical bleaching instead of chlorine, sulfur compounds can be used to reduce harmful to the environment.

79.2.2 The Economy Industrial Chain of Coal Industry - Electricity-Iron and Steel Manufacturing

In China's energy structure, non-renewable resources accounted for a large proportion, the majority of industrial enterprises are relying on coal fuel to provide heat, shortage of resources has become increasingly serious, we can no longer rely solely on coal mines to support the development of industrial enterprises, it is priority to develop a new renewable, recycled resources. The development of coal mines, not only damages the geological structure of our country, but also a potential danger to residents who live rich in coal seat. In many industrial processes, exhaust gas of coal combustion is discharged into the air which contains large amounts of SO_2, SO_3, NO, NO_2, CO_2, CO, and other harmful gases, the gas is not only greatly reduce the air quality, but also affects temperature. Record shows that since the industrial era, the earth warming every year, Antarctic ice has begun to melt, sea levels is rising, this series of changes are derived from the human environment tremendous impact. If these emissions are converted to combustion gases by a certain chemical reaction, it could reduce harmful gas emissions, increase combustion energy and slow the speed of coal development, which really serve multiple purposes of a good thing.

79.3 Creation All Kinds of Ecological Park

In the overall construction of circular economy industrial chain, industrial enterprises should actively take into account a city's industrial unified planning, in close contact with each other within the mutual advantage of each other raw materials, products, waste gas, waste residue, namely to establish a comprehensive eco-industrial park. The new eco-industrial park inherits the traditional production orientation, but is difference in the production ideas. Every industrial enterprise in the ecological park are closely linked through some common products equipment and waste treatment equipment. Reference to relevant examples of domestic and international success stories, it selects the park site, makes good park plan, reasonable arranges the various enterprises on the location, sets up public infrastructure in the center position, it is easy to every company convenient and fast to use this device, thus to reduce energy consumption, shorten production time.

In the process of establishing eco-industrial parks, it should be rationally considered plan, pre-simulation and investment. We should refer to successful model abroad, introduce foreign advanced technology and equipment and establish a high-tech industrial park. We could try to run in some areas which identify deficiencies to be improved further to promote, create a national eco-industrial park, industrial waste of the various enterprises in the park are recycled and turned into treasure. After selected sites, various departments in the park should do the full experiment, advanced computer technology can be used, multiple on-site demonstration should be done by artificial intelligence simulation support system, every step of the test is correct as far as possible, then specific construction plans is done.

79.4 The Relationship Between Circular Economic Chain and Environmental Benefits

Undoubtedly, the impact of industrial development on the environment is enormous, especially in the last decade, the rapid industrial development impact on the environment. The environment has been greatly changed around us, living in the city, we see the sky is not blue and transparent, always likes a layer of gray fog concealed; our air is not so fresh, a variety of industrial production exclusive gas and vehicle exhaust, are mercilessly got into our lungs; the lake water is even more dirty, industrial water and municipal solid waste are all discharged into the water; fish is less in the water, food poisoning things are often occurred because some people eat fish which has a lot of toxins; In the spring each year, we rarely see the beauty of the flowers, often winds rolled sand mercilessly pound pedestrians, this is the deforestation of the consequences. Humans have destroyed the earth beyond recognition, and nature in various ways warns the mistakes we have made. Each year, various natural disasters occur at home and abroad, floods, earthquakes, tsunamis, landslides, mountain landslides, etc., these are all warned us to reflect on self-examination.

Industrial enterprises developed circular economic chain is undoubtedly a good thing for people and country. Through a circular economic chain, it can reduce their emissions of harmful substances, the degree of pollution to the environment, production of raw materials and the cost for enable enterprises. At the same time, enterprises take the lead in doing good for society, which not only corporates brand image, but also be able to play very well to enhance the role to win the respect and support of society. In short, industrial enterprises promote the circular economy industrial chain, response to the national sustainable development strategy, is a persistent career which has a variety of benefits.

79.5 The Development Dilemma of Circular Economic Chain

First, the number of SMEs continues to grow with Chinese rapid economic development. However, the managers of these SMEs are lack of understanding to the circular economy industrial chain. In addition, the general idea of the private owners of small and medium enterprises is relatively narrow, and they think their own small-scale enterprises could not afford the investment of building circular economic chain, therefore, most are not considering the development of circular economy industrial chain.

Second, many companies and some scholars are lack of research of circular economy industrial chain system, could not improve the theoretical support, have no-depth discussion and exploration, naturally, are less application specific content for many of the industry chain.

Third, the Government's concern is not enough, also contributes the chain of circular economy not to promote. In priority, produced market has more freedom, has developed rapidly and drove the gross national product, so that the people's living standards have been greatly improved, so the expense of the process to achieve the purpose of the rapid development of industrial enterprises in a series of limited resources not be pursued, even a little encouragement. Until recent years, environmental problems caused by industrial development have been a very serious, that was caused great attention by the relevant departments.

Forth, there is no effective incentive mechanism in promoting circular economy industrial chain. On the circular economy, the level of knowledge of enterprises is not high, and they don't carry out by themselves. Government agencies play a leading role in this regard lack of incentives, will inevitably lead to such a situation, which affected the development process of the chain of circular economy in some extent. On the way to encourage the development of circular economy, the government should play a more supporting role, should also be vigorously advocated the broad masses of the people involved, so that all citizens can improve recycling economy environmental benefits associated with thinking and understanding.

79.6 Conclusion

At present, China's circular economy development awareness is still very weak, in order to rapidly improve the awareness level of the business philosophy of recycling economy, government departments should be strong advocacy to strengthen civic participation, mention the specific plan of the circular economy industrial chain in procedure agenda, and actively expand the work content. The government wants to do a good job, is also inseparable from the strong cooperation of industrial enterprises, so that large industrial enterprises play an exemplary role, cooperate fully with the professionals work.

China's industrial development is rapidly, however, there is still a distance to reach the international advanced level. If we continue to disregard all for economic development, industrial development, that the destruction of our environment will be greater. Therefore, we should firmly take the road of socialism with Chinese characteristics, and should not be too hasty, and only connect with our national conditions to do stable and orderly development, so that is sustainable development. In the process of developing circular economy industrial chain, it should refer more to the success of projects abroad, learn experience, combine with the actual situation of our own work. The promotion of circular economy industrial chain, not only can save production costs on a large extent, the most important contribution is to protect the environment, protect human living space, in addition to economic benefits, it also brings great environmental benefits.

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Part IV
Language Teaching and Management

Chapter 80
Layered English Teaching in Higher Vocational Colleges

Jianqi Chen

Abstract In recent years, higher vocational education has been unprecedented developed, and the quality of students could not been guaranteed for large-scale recruitment. Differences between students is growing, and as well as learning methods and motivation. Traditional "One size fits all" teaching model is no more suitable for current status, and brings a lot of English teaching difficulties, so the implementation of layered teaching in vocational colleges is imminent. This paper mainly demonstrates the current teaching situation of vocational colleges, analyzes the introduction of layered teaching of English in vocational colleges, and proposes main strategy of implementation of layered teaching in English teaching, hoping to provide a reference for peers.

Keywords Layered teaching · Vocational colleges · Layered evaluation

80.1 Introduction

In recent years, with constant increasing scale of higher vocational colleges, which results in students of vocational colleges become more complex, and their level of English is of a big difference. For this uneven situation of students, according to "uniform requirement, grading guiding" in vocational colleges, that is to divide students into levels of A, B, C, according to different levels, different learning methods and different learning interests. In English teaching of higher vocational colleges, regarding "layered teaching, classified guidance, grading standards" as guiding ideology, has a practical guidance for breaking traditional "one size fits all" teaching model, and improving students' English learning level.

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80.2 Current Situation Analysis of English Teaching in Vocational Colleges

Behind large-scale expansion of enrollment in vocational colleges, there is a decline of the quality of students directly leaded by it [1]. Student source of vocational colleges is complex and uneven. The student source is of the following types: a small portion of students are from the college entrance examination, having the highest cultural level and lowest practical experience; parts of them are from technical secondary school and parts of them are from vocational high school; also a small part of them are from the social previous middle school students or high school students. The later three parts of students have a low level cultural level, but a higher social experience [2]. Even for the same source, there is also big difference among students, and there is significant difference in academic achievement. A large portion of students are from undergraduate section because of poor English performance [3]. However, the current vocational colleges is basically divided into classes by their professions, not by the source of students, which leads to a big difference of learning levels and learning interests, especially the problems of English and mathematics are most obvious [4].

In English learning, students of vocational colleges are passive, few of them would speak in class, and they are lack of curiosity and independence in English learning. English learning experience, learning expectation and levels before they have entered vocational colleges could directly influence the effect of that in vocational colleges. Class teaching mode leads to little chance for oral expression of students, and students could not achieve the joy of success for a long-time. This phenomenon is reflected in students' not emboldened enough in answering questions, afraid to speak English, little interest in English learning, and finally leading to students' low motivation, low participation, incorrect learning attitude, not willing to overcome difficulties when encountered, learning maintenance could not be kept for a long time. In the classroom, it is difficult for teachers to interact with students, generally is the teachers making speech.

English teachers could not grasp the degree of difficulty of the course, facing layered students in the same group of students. English classes become grammar explanation class or translating class, listening and speaking class changes to a one-act play. Plain English teaching content could not satisfy students of higher levels. However, if the difficulty of class is increased, there are some students sleeping, playing telephone, speaking, making teachers dumbfounding. One of the students in vocational colleges complains on his blog: "I got a good score in college entrance examination, now I couldn't even imagine the English class in vocational college, which is like teaching junior middle school students … it is a waste of time taking English classes, may as well learn something on internet …". This is a current situation of lots of college English. Thus, as educators, we must develop a practical solution to this problem as soon as possible.

According to a recent survey of part of our English teachers and vocational students, students have significant difference in learning ability, learning emotion,

effects and methods. In general, for students who are interested in learning English, they tend to have initiative, scientific learning method, targeted learning objectives, and good learning effect. What's more, good learning effect could increase students' confidence, easy to form a virtuous cycle of learning. In learning process, some students have the following characteristics, weakened initiative, lack of interest, do not want pay our labor for remembering. Through questionnaires, 70 % of the students are because of poor foundation, they could not understand the content in class and hope the teachers to lower its difficulties; 87 % of the students think that learning English well is good for future career; 70 % of the students have showed their willingness of learning English well, but are afraid of remembering vocabulary and unwilling to endure hardship.

80.3 The Introduction of Layered English Teaching in Vocational Colleges

Under the current situation of English teaching in vocational colleges, English levels are different in a class, so there is significant difference of learning motivation, methods, interests etc. between students. Vocational college teachers teach English by different professions, using the same method, teaching the same content, and achieving the same objective. There would be no more students feel unsatisfied, while student with poor foundation could not digest the knowledge, and difficult to teach in classroom. With the implementation of layered teaching, these problems could be solved in a certain degree.

Using layered teaching in English teaching class, could effectively solve the problem of low quality of teaching, and promote the comprehensive development of the overall quality of students. Starting from its own characteristic, layered teaching designs different teaching activities, provides different teaching requirement. For different objectives, design different teaching methods and teaching content, so that teaching activities of vocational college could better meet the learning requirement of different level students. Thus, promote students to develop good study habits, form learning attitude of healthy personality and optimistic attitude, and let students of different levels be developed.

Layered teaching has high flexibility and adaptability of teaching conditions, high maneuverability and adaptability, which is relatively suitable for the actual situation of current vocational colleges. The achievement of layered teaching is dependent on the school system, students, teachers, teaching materials, evaluation system, and management mechanism etc. In current, teaching management of vocational college is quite independent, teaching equipment has actualized information and technology, the flexibility and independence of teaching content selection, research capability of teachers has been strengthened, the overall quality is improving, and many colleges have achieved the credit system, all these changes have created a good condition for introduction of layered teaching.

80.4 Implementation Strategy of Layered English Teaching in Vocational Colleges

80.4.1 Reasonable Layering of Students: Before Layering Students

English teachers should fully understand and study the students, not only to understand students' general characteristics, but also to grasp specific situation of students. On the basis of grasping students, layer them according to students' willingness, could layer them within class into A, B and C, or layer them into classes A, B and C. Level A students are top students possessing generally having a solid foundation of English, and have a good accept ability; level B students are middling students; and level C students backward students who have poor intellectual and non-intellectual factors, having low English level, even some are zero. Layering by class is to break the existing class boundaries when having English classes, and taking English class according to the layer they belong to, and return to their original class after finishing the classes. Layering in class is to divide students into 3 levels according to students' situation with a class. Students have the right to choose their own level, and English teachers should listen carefully to the students' views. Which level should the students belong to should be achieved by coming to an agreement by teachers and students. Only through joint consultation of teachers and students, can the students be responsible to their English learning, and be pro-active in learning. The level of student does not stay the same for a long time, and English teachers should encourage them to enter a higher level according to their performance and progress, that is, from C to B, then from B to A. In the same way, if students have difficulties in learning, English teachers should negotiate with students, and persuade them to level B or level C. Teachers must let students know entering into higher levels or lower levels is more suitable for their English learning. Teachers should think for students enthusiastically, in order to establish mutual trust between teachers and students, and access to the success of teaching and learning.

80.4.2 Layering Teaching Objectives

Scheduling students into different levels according to students' English levels, is to satisfy the learning need of students in different levels, and make gradually improve on the existing basis. Therefore, teaching requirement and teaching objectives should show the principle of moderation, and divided into several levels. Layered teaching focuses on the individual difference in development process, making learning objectives based on different levels, and instructing

teaching for different levels, in order to make students be fully developed on the basis of existing learning. Therefore, obtain good teaching effect. Thus, according to the learning situation of students, teacher could divide teaching objectives into three levels A, B, and C, making students be gradually improving. Objectives in layered teaching should include basic target, improving target and developmental objective. For level A students, teachers should choose developmental objectives, with heuristic teaching as its main teaching method, assisted with discovering method, to develop self-learning ability and seek for more quality. Meanwhile, some extra content should be added to level students. Not only require them to pass CET4 examination, but also try to pass CET6 examination, and higher requirement on ability for use. For level B students, teachers should choose improving target, but also in the direction of developmental objective. Require students to achieve the requirement of outline three, try to pass CET4 examination; for students of level C, they have low foundation, and most of them have lost the confidence of learning. So, teachers should choose basic target and encourage them to get close to improving target, making them have a sense of achievement. Do not force them to pass English test 3 or 4, but should achieve grade B requirement of "Basic Requirement" after 3 semesters' learning, and must pass the examinations organized by college, encouraging them to a higher standard; when the learning target could be expected, students could have something to look forward. Otherwise, layering classes is meaningless, and has no practical significance.

80.4.3 Layering Teaching Materials and Teaching Content

Any teaching materials have some teaching concepts, teaching objectives and teaching requirement. When teachers are choosing teaching materials, it should be determined in accordance with the reality of teaching, not only thinking about the students' actual level, but also fully considering characteristics of teachers. Implementation of teaching objectives and selection of teaching methods is constrained among teachers, students, teaching materials and teaching methods. Choosing proper teaching materials for students is helpful to students' progress. For low level class, could in the first place choose phonetic teaching materials, and high level class should not be limited to one kind of materials, and could provide some extra reference book for them to read. Even if using the same version of material, the arrangement of teaching materials should not be the same. Teachers could process the textbook according to the level of students, and try their best to meet the students' cognitive ability. In English teaching of the same class, to consider the difference between different students, and divide teaching content into basic content and improving content, leaving the students enough space for freedom.

80.4.4 Homework Assignments and Layered Correcting

In actual teaching process, teachers assign different homework on the basis of student's actual situation, which requires more communication between teachers and students, finding their weakness and strengths respectively, and make their homework different in quantity and difficulty. Encourage students to choose their own homework, and promote them to challenge the difficulty, and choose more practice that is higher than their English level. For example, level A students is allowed to read extra books, and teachers would give them a large number of challenging homework, letting them learn more, and develop their divergent thinking; level B students are required to has a good knowledge of teaching materials, and finish moderate homework and then encourage them to finish more challenging homework; for level C student, they need to finish basic homework. For students who have more difficulty in learning, teachers could choose to have more classes for them, and guide them individually, and the method of helping each other could be taken as well. For correction of homework, level A students can use comments or in the form of peer assessment, level B students or level C students are better to correct face in face or whole batch, which is good for them to know their mistakes and could timely correct for a good results.

80.4.5 Layering Evaluation

Examination is an important way to evaluating a student, and the purpose of test is to let teachers know the degree of grasping the content of the learned content, to help them grasp future learning focus and direction, and at the same time, to help them know their English learning progress and problems in it, help them to make a learning plan that is suitable for themselves. Therefore, testing standards and testing methods should be suitable with teaching content, teaching requirement and teaching methods, in order to achieve the effect of improving teaching effect. Different testing standards and testing methods should be designed for students of different level according to the actual teaching situation. For example, for level A students, higher language application ability is required in teaching objectives, and should reflected in the test in order to stimulate students' motivation. According to different levels of students, layered test should be applied, paper A, paper B and paper C. As for different levels of students, place three levels of questions in the paper by A, B and C with the same scores and different values. This test could let different level of students acquire high scores through their own efforts, especially for level C students, who have never seen their potentials. And this kind of evaluation could avoid the phenomenon of losing confidence because of large difference of scores. Thus, different levels of students can actively develop their own level, but also to encourage students to break the layer and increase, creating a learning atmosphere.

80.5 Conclusion

Of course, apply layered teaching of English teaching in vocational colleges is committed to start from the individual student, help students to improve in a maximized way, and has promoted the change of the majority of educational concept of English teachers, and has changed the bad practice of focusing on food students, which is a strong increase of overall education level of vocational colleges.

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Chapter 81
Comparative Analysis of Diversification of Language Teaching Curriculum

Zhilun He

Abstract Language teaching diversification for teachers is teaching staff training of teacher candidates, school training and the acquisition and study of the outside information. All these need matching the teaching procedures, and only in this way can teachers carry out the teaching tasks effectively in the future. This paper, by using the similarity and variance analysis method to select university disciplines, and through the combination of qualitative and quantitative analysis to compare language teaching, compares and analyzes from six aspects: disciplines, teaching experience, general information courses, elective courses, teacher training and curriculum schedule to carry out the analysis of the diversification of language teaching curricula.

Keywords Languages teaching · Variance analysis · Qualitative and quantitative analysis · Diversification

81.1 Introduction

A course is what people expect to learn and how to teach it. Briefly speaking, a course includes students participating in education at school and also formal and informal courses [1]. Curriculum needs constant evaluation and update to reflect current trends in education, which is very important. It exists in a wider range of areas, and it may contain any social construction or regulated activities [2]. It will

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choose from social culture in some way, and finally realize individual transformation [3].

Now, along with the promotion and spreading of modern information technology, English listening teaching has been relatively improved [4]. But the teaching has long been without an effective model to improve the students' English listening teaching, and listening is still the weak link of the students' English learning. Therefore, how to carry on the English listening teaching reform, guide the student to carry on the effective English hearing study, and improve the students' listening level is still a problem to be solved [5].

Curriculum reflects occupation skill, community values and expectations to a great degree [6]. It must balance these three aspects. For example, occupation skill is very important especially in higher education [7]. Now higher education is becoming more interesting than before. Much money was used for higher education; more students enrol in higher education; and a growing number of courses are used in teaching [8]. However, the core problem in higher education is the lack of curriculum in public debate and in literature. Despite of these, courses are still changing rapidly in significant ways. These changes also gains attention in the college course in higher education. In higher education, different departments of different colleges differ in their courses in language teaching program to some extent. This paper aims to study college language teaching curriculum, and to compare language curriculum from qualitative and quantitative perspectives.

81.2 Research Process

This paper adopts the combination of qualitative and quantitative methods. By researching on language teaching in some colleges, and making similarity and variance analysis in disciplines, teaching experience, general information courses, elective courses, teacher training and curriculum schedule, this paper analyzes the diversification of language teaching curriculum.

First of all, this paper researches on collected data through the qualitative analysis of literature. Literature analysis includes analyzing the written material of the provided objective factual information. In qualitative analysis, literature analysis can be used as a data collection method, but also can be combined with other methods of data collection. Literature analysis method is used in the research on university curriculum and course contents. To ensure the effectiveness of selected indicators, and through expert evaluation indexes, the themes of the course are made into forms for data collection. The symbol (*) is used to mark certain curriculum practices has no marking, and the symbol (?) is used to mark different curriculum practice and theory teaching time. Courses in the table contain at least eight college curriculum standards, and the objective of the curriculum. Universities in the table are marked by U1, U2, U3, U4, and U5.

81.3 Data Analysis

Through content analysis, it is found that indicators related to the language teaching curriculum are disciplines, teaching experience, general information courses, elective courses, teacher training and curriculum schedule.

Until now, listening strategy teaching does not have fixed, mature and effective teaching modes available for reference. The main way of hearing strategy training is confined to concentrated training, scattered training, and individual guidance. The author, in the hearing teaching reform in the process, with the reference to Chamot mode, integrates listening strategies teaching of Pre-listening Activities, listening Activities and Post-listening Activities. Trainees for our business English professional level are students from 3 classes of 09 international business English, a total of 118 people. Implementation process lasted for 1 year, 4 lessons per week. Based on the students' listening strategy mastery and use, we mainly monitor their training plans, monitoring and evaluation of the metacognitive strategies. There are other strategies such as forecasting, reasoning through context, cognitive strategies and emotions such as control, eliminating the uneasy and other social/emotional strategy.

We can conclude that grammar of the context I–II, advanced reading and writing I–II, listening and pronunciation I I–II, oral communication skills, lexical competence, literature I–II, linguistics I–II, and second language I–II–III are common courses in universities. The aim of these courses is to improve the students' language skills, so that the students are aware of the relationship between language structure and words, to change students' skill to comprehend and analyze more complex original text from the perspective of structure and concept, to develop the students' listening skills, and through the use of original materials to provide the students with basic listening materials and learning materials suck as vowels and consonants, stress, rhythm and intonation of speech, and phonetic learning and so on. Introduce literature analysis and pay attention to various kinds of literature to enhance the students' understanding and appreciation of plot, character, theme, image, idea, environment, ironic color, symbol, metaphor, metonymy, arrogance, exaggeration, paradox, language and dramatic elements application ability.

According to Table 81.1, teaching methods I–II, foreign language teaching of young people I, education methodology II, education, teaching and textbook design, introduction of science of education, psychology of education, classroom management, language testing and assessment and the guidance are common courses of the majority of the universities. These teachers aim to provide a critical overview of the grammar translation method, direct method, audio-visual language, silent way, community language learning, suggestive method, communication method, the natural teaching method in historical method and way and the students and teachers integrate and apply this method into classroom teaching through the design and application of micro teaching related activities. Of course in the teaching process is also interspersed a number of class methods and

Table 81.1 Teachers' teaching experience in courses

	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	f
Teaching method I	*	*	*	*	*	*	*	*	*	*	10
Teaching method II	*	*	*	*	*		*	*	*	*	9
Foreign language teaching of young people I	*	*	*	*	*	*	*	*	*	*	10
Foreign language teaching of young people II	*	*	*	*			*	*		*	7
Language skills teaching I	*	*	*			*	*	*		*	7
Language skills teaching II	*	*	*				*	*		*	6
Education methodology I	*	*	*	*			*	*	*	*	8
Education methodology II	*	*	*	*	*	*	*	*		*	9
Evaluation and development of material	*			*	*	*	*	*			6
Textbook evaluation				*	*						2
Introduction of science of education	*	*	*	*	*	*	*	*		*	9
Psychology of education	*	*	*	*	*	*	*	*	*	*	10
Philosophy of education							*				1
Teaching principles and methods	*	*	*		*	*	*	*		*	8
Classroom management	*	*	*	*	*	*	*	*	*	*	10
F	20	19	19	15	14	13	20	20	10	18	

techniques, such as games, songs and the use of audio-visual materials, as well as the analysis of social and psychological factors affecting the behavior of students, regulating classroom atmosphere and interaction, thereby creating a positive and appropriate learning atmosphere, and effective response to problems in the classroom.

After a year of classroom teaching practice, the results show that: the hearing strategy training fusion to listening teaching in class produces major influence for students' listening scores, problem solving, use listening strategies consciousness and autonomous learning, self-confidence.

In the hearing achievements, the training of the class of CET-4 and CET-6 of the hearing test partial result is far higher than other not trained class's and grade's student. The percent of passing the test is 73, 46 % than the ratio. This shows that listening strategy training can improve students' listening scores.

On problem solving, through the analysis in the early training and training students' listening diary, the results showed that the number of students decreased significantly in listening comprehension and the influencing factors type and frequency than the early trained. This fully explains language learning strategy training students can solve the difficult hearing, which is of positive significance. It also showed that in English listening comprehension in the classroom listening strategies to strengthen training is to improve the students' ability to solve the problem by using effective means.

Table 81.2 Curriculum in the fields of discipline and teaching

	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	F
Short story analysis and teaching				*	*	*		*		*	5
Novel analysis and teaching				*	*	*		*		*5	
Poetry analysis and teaching				*	*			*			3
F				3	3	2		3		2	

Table 81.3 Teacher training in curriculum system

	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	f
Teaching practice II	*	*	*	*	*	*	*	*	*	*	10
Teaching practice I				*	*				*		3
Teaching experience	*	*	*	*	*	*	*	*	*	*	10
F	2	2	2	3	3	2	2	2	3	2	

Since the 1980s, with the second language acquisition theory and cognitive psychology development, people have realized the importance of hearing in foreign language learning. Hearing in the past is considered passive, but it changed now into an active process. The focus on hearing research turns from only the results in the past to the process now. Among them, the listening strategies and listening strategies teaching have become one of the hot spots in the research [1, 2].

According to the Table 81.2, in addition to the calculation course, other courses are not the most common courses of colleges and universities. And in elective courses, different universities have different elective courses [3]. But the survey found that the elective courses are biased towards the first index curriculum, such as grammar and composition, other foreign languages, semantics and so on.

The Table 81.3 shows, teaching practice II and teaching experience are the common basic conditions for higher education, and teaching experience is the commonest among the three. Teaching practice is designed to help students to carry out comprehensive teaching practice, providing a structured approach to teaching, which helps them to obtain teaching ability and improve teaching skills. Through observation and teaching practice, teaching experience requires candidates to consolidate the necessary skills, to further reading, research and classroom activities in order to establish professional perspective, to enhance individual teaching experience through critical analysis of previously acquired teaching knowledge and skills.

81.4 Conclusion

In the use of strategy of consciousness, by comparing the training class students with the untrained, the students' listening training class diary recorded in the frequency of use listening strategies is far higher than the training class. The training class forms the habit of hearing forecast and basic planning; Self-

monitoring listening process; Self-assessment of the listening task completion. It shows that the training class can activate meta-cognitive strategy to complete listening tasks, which raises the student learning initiative and consciousness.

In independent learning and self-confidence, through the interview with the students, 64.5 % of training class students think they improve self-confidence and said in the learning process they will actively select slightly difficult listening material to carry out listening practice and only 23.6 % of the untrained think that the confidence of the improved.

From the above data and through the analysis of the similarities and differences show that language teaching has diversification, especially in the following six areas: various disciplines, teaching experience, general information courses, elective courses, teacher training and curriculum schedule. College teaching can be improved according to their conditions in these six aspects in order to improve basic courses teaching, enhance characteristic discipline teaching, strengthen teaching methods integration and constantly improve college language teaching.

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Chapter 82
Evaluation and Analysis of Language Skill-Oriented English Teaching Program

Jing Jia

Abstract This paper mainly evaluates English teaching program from the perspective of language skills, and the design of this program uses an integrated approach to carry out exploratory research. The paper provides an internal reference, mainly in the form of interviews and questionnaires, to analyze, to assess the skills of each language, and to sort based on their performance, the importance, references, the difficulty of the course content and material skills. This paper reflects some positive aspects of the program as a whole, and draws a skills-based program plan to help students achieve the language skills of each strategy.

Keywords Evaluation · Language skills · Teaching methods · EPS

82.1 Introduction

The definition of the evaluation has changed from the negative and critical point to a major source of organized learning, lessons and experience, collaboration and utilization [1]. The value of evaluation is the value of various teaching programs, and the judgment of advantages and disadvantages. The evaluation service is an important tool in the process of improving education quality. Some scholars believe that the evaluation is: (1) the standards to measure quality, and used to decide whether these standards should be relative or absolute adoption. (2) to collect relevant information. (3) to apply these standards to determine value, quality, utility, effectiveness, or significance [2]. Evaluation applied in

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participation and collaboration can enhance organized learning, and improve quality. This English Language Teaching program evaluation mainly analyzes skills-based evaluation methods in the foreign language school design. Evaluation includes different results, measures and learning resources, curriculum development and organization, teaching methods, content, materials, assessment and so on. Evaluation studies are not only related to key employees such as skills coordinator, but their views on the collaborative process are necessary. Because they provide first-hand experience on activities planning and the organization, the most appropriate way should be adopted to strengthen the participation of the skills coordinator, and another way should be found to enhance the impact of the critical evaluation of the program and to strengthen learning in the process of evaluation. Similarly, students' views of evaluation and the sort of teaching needs can be used as a very important internal system benchmark of teaching program evaluation [3, 4]. Therefore, the second part of this paper is also about analyzing teaching program evaluation through the investigation of students' objective views and opinions [5].

82.2 Research Methods

The framework of the evaluation research of this article is an exploratory research of a case in which comprehensive analysis is applied in the process of evaluating skills-based methods and the quality of the program. The evaluation is primarily based on group interviews and questionnaires in two ways which can be carried out into two phases.

The first part of the evaluation carries out the survey by gathering experienced skilled coordinator in a suitable participating way. The more knowledgeable these personnel are, the better it will be to guide them to conduct internal assessment. And the participants need to see the evaluation as a dynamic process that requires them to actively participate. The purpose of the qualitative evaluation is to determine whether the objectives have the value of the program activities in the plan and whether these goals have been achieved. The first part of the evaluation interview is guided by skill coordinators, and this part of the evaluation can be thought as the enlightened focus mainly on qualitative analysis, sum-up analysis and survey.

In the second part, the evaluation's main purpose is to assess the quality of foreign languages-based teaching in foreign language schools. This part is designed to assess the results of the overall teaching, course content, materials and teaching methods, and to assess the effectiveness of teaching methods based on language skills in the teaching system. This part of the evaluation will make true assessment based on the students' point of view.

In this evaluation, students are the beneficiary or target group. Therefore, questionnaires are used to handle their views on skills-based teaching methods. Students will provide a true evaluation according to their school experience and

insights. It is worth mentioning that the questionnaire is part of the EPS quality assurance, especially the material to improve the curriculum, content, and every language skill. Students' evaluation serves as an effective standard of teaching and administrative decision-making. And their point of view in the teaching evaluation process can reflect their needs of teaching and learning. The main purpose of this assessment practice is to obtain the students' feedback on teaching quality and to understand whether teaching can meet the students' overall learning needs.

This paper takes the trade system of economic globalization as the research object. Takes trade network for research reference point and analyzes on the selected reference point [6].

82.2.1 Survey Methods and Data Collection

Education is very complex, difficult, and it needs a variety of ways of understanding, so the use of integrated educational setting is necessary. Further discussion sums up this view, and an integrated approach design can help improve efficiency and greater effectiveness [7]. These data will mainly come from skill coordinators and first-grade students. The first part of the study is designed to evaluate the curriculum, course content and materials quality, primarily through a qualitative approach to handle skills coordinator in the form of group interviews. The second part of the evaluation is about students' views on language skills-based teaching program in which more quantitative methods are adopted. This part of the evaluation study is mainly in the form of questionnaire to measure the effectiveness and quality of the teaching program plan in foreign language schools, and how much influence the skills-based English teaching program has in the teaching process.

82.2.2 Participants

In the second evaluation, the questionnaire is mainly for first-grade students. And the two most important areas are computer engineering and construction. Although this is a small-scale study, in order to have typical samples, a group of first-grade students in architecture and computer engineering are selected. Twenty students in computer engineering department are selected by group sampling as target group of the survey, and five skill coordinators in foreign language school participate in group interviews.

82.2.3 Survey and Group Interview

Group interviews mainly aim to strengthen discussion, share experience, cooperation and collaboration in decision-making with the skill coordinators. Group interviews can create opportunities for them to express their concerns and to learn from other skill coordinators. When they participate in the interviews of evaluators and participants, they can get richer, more in-depth information. Questionnaire is designed to explore the views of first-grade students' academic needs, and how effectively English teaching program plan meet their needs. The survey is mainly about the evaluation of language skills-based teaching methods in foreign language schools.

82.3 Data Analysis and Evaluation Results

In this section, evaluation results are discussed. Results and discussions can be divided into two parts. The first part provides an overall interview results-oriented approach. The second part uses a structural equation modeling to validate analysis. Firstly, five categories are included: course syllabus, course content, course content and course materials and coding scheme, each being marked by different codes, such as "satisfied" or "unsatisfactory". To study the students' cognition, five factors in applied teaching methods and structural equation model are used to analyze. Syllabus design is limited because of the time limit (20 h/week) and low-level students. Therefore, the syllabus and curriculum has been compressed.

Lack of available resources and equipment (video, listening) is always the problem. The curriculum and syllabus design should put more emphasis on learning skills and EPS. Although this project comes up with language skills oriented teaching, it ignores some aspects such as integration and skills complement. The quality of teaching and materials of teaching only evaluate the skills of the teachers. On the other hand, the students' opinions and feedback on the quality of the materials are rare. Their views and experience should be integrated to teaching program evaluation under system level. Learning environment such as class size, laboratory, computer and library resources are relatively poor.

All of the above problems reflect the economic constraints facing the development of universities. In group interviews, they reacted with the importance of departments regular meetings. A critical evaluation is like skilled teams moving forward respectively, without strong and active unity and communication between them. This is a very important issue needs to be re-evaluated and reflected on in order to implement the EPS program plan more effectively and more efficiently.

The Fig. 82.1 shows the students' views play an important role in the evaluation of language skills-based teaching in EPS. Students' assessments and opinions on language skills-based teaching show that those who think methods have an active role in teaching account for 55 %, no role 30 %, and some role 15 %.
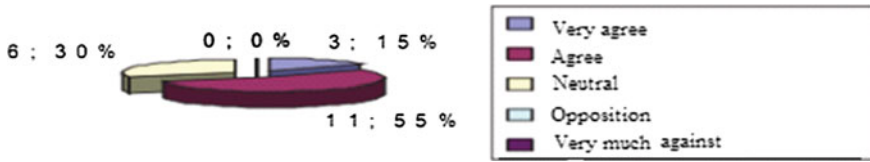
Fig. 82.1 Scale plan of view of language skills' role in EPS

Table 82.1 Performance of evaluation for academic ability: expression and the quality and capacity of expression

	Excellent poor people (%)	Excellent (%)	Good (%)	Satisfying (%)	Poor (%)
Reading	5	50	15	30	
Writing		42	42	16	
Speaking	15	35	25	25	
Listening	10	40	30	10	10
Major courses	5	40	30	25	

Totally agree, agree, neutral, against, strongly against.

The Table 82.1 reflects the results of the evaluation of English skills, and further points out that the performance of a variety of theoretical knowledge. The results show that to assess the satisfaction of the performance of each academic skills the quality of expression and skills content. Among them, hearing is the only skill showing poor performance.

Student evaluation also revealed every factor affecting academic skills, in turn, to prove the degree of concern and respond to English language skills, everyone can improve skills on the basis of these assessments. For instance, reading is rated as the most important skill. The results show that reading and speaking are the most important language skills of teachers.

Evaluation theory as a whole and each skill show that the EPS project does not fully meet the needs of students in their teaching and research. It may also be due to time constraints and low levels of language proficiency of the students, who can not adapt to this project. In fact, it is very challenging that academic language skill trying to improve the language proficiency of students from the basic level of survival in a limited time period to achieve the desired results. These are analyzed from the validity of structural equation model analyzing the skills of language teaching.

(1) The structure of measuring equation

Numbers $Xl \sim Xl6$ represent the 16 questions in the questionnaire respectively, meaning external observing variables. Combined with the content of the scale design and exploratory factor analysis, four external latent variables are constructed: {1 reading, 2 major courses, 3 writing, 4 listening, 5 speaking}. The ith observing variable is the loading factor in the kth external factor latent variable.

Fig. 82.2 The importance of each english language skill
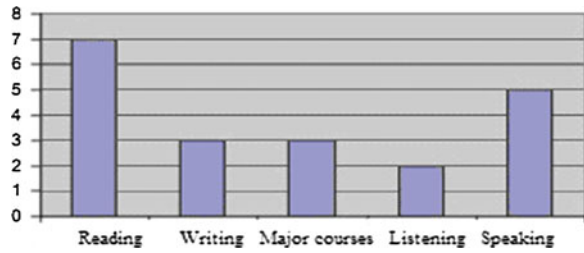
Table 82.2 Evaluation index and results of the overall model fit

Indicators	Absolute goodness of fit					Simple goodness of fit	Value-added goodness of fit			
	$\chi2$	$\chi2$/df	GFI	RMR	RMSEA	PNFI	PGFI	NFl	TFI	CFI
Evaluation standards	Not significant	<2	>0.9	<0.08	<0.06	>0.5	>0.5	>0.95	>0.95	>0.95

i = 1, 2, and 16 means measurement error. The measurement equations constructed are as follows: Fig. 82.2

$$\eta = B\eta + \Gamma\xi + \zeta \tag{82.1}$$

$$x = \Lambda_x\xi + \delta \tag{82.2}$$

$$y = \Lambda_y\eta + \varepsilon \tag{82.3}$$

The above equations show that the overall evaluation, limited academic ability have achieved the expected range and satisfaction, therefore, the project can reach the standards, especially some of the skills not exceeding a certain level, as shown in Table 82.2.

82.4 Conclusion

Evaluation practice provides a new evaluation program as the study of language skills. This has prompted some students to improve their learning of skills. In addition, the evaluation has also made some key assumptions in the teaching of language skills. First and foremost, it affects the skill-oriented method of measuring quality. It requires a long time to make validation and analysis. In fact, as this assessment recommends, the EPS course has taken a different approach to improve English learning skills. At the same time, the EPS has introduced measures to achieve better skill-oriented teaching methods.

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Chapter 83
Vocational English Listening Teaching Reform Based on Teaching Strategies of Listening

Yong Lin

Abstract English listening comprehension is a problem that many schools and students and parents concern, and in order to improve the students' comprehensive English listening, many applications were used in the its teaching, but the effect was not good enough. Therefore, this paper proposes a method of listening strategies to teach listening, which includes a one-year practical teaching. Through collecting the teaching effect data, the application of statistical methods and fuzzy mathematics calculation method of listening strategies application effect analysis, it is concluded that listening strategies training is an effective way to improve students' listening, and it should become an important part of English listening teaching class.

Keywords Listening strategies · Statistics · Fuzzy mathematics · Teaching reform

83.1 Introduction

How to carry out the effective English listening teaching and learning has always been the issue of concern in English classroom teaching of the college teachers and students. Listening comprehension is a complicated process. It involves the individual, cultural background, language scene, tactics, cross-cultural understanding, and other factors. Because hearing in language learning is of the special function, the ministry of education in 2007 promulgated "college English curriculum

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requirements", the teaching goal of which is "cultivating students' English competence, especially the ability of listening". Listening teaching reform is attached with great importance. Now, along with the promotion and spreading of modern information technology, English listening teaching has been relatively improved. But the teaching has long been without an effective model to improve the students' English listening teaching, and listening is still the weak link of the students' English learning. Therefore, how to carry on the English listening teaching reform, guide the student to carry on the effective English hearing study, and improve the students' listening level is still a problem to be solved.

83.2 Listening Strategies Teaching Research

Since the 1980s, with the second language acquisition theory and cognitive psychology development, people have realized the importance of hearing in foreign language learning. Hearing in the past is considered passive, but it changed now into an active process. The focus on hearing research turns from only the results in the past to the process now [1]. Among them, the listening strategies and listening strategies teaching have become one of the hot spots in the research [1, 2].

Vandergrift [3] approved the listening strategies, especially the use of meta-cognitive strategy which can effectively improve the students' listening. At the same time, he designed the classroom teaching steps which focus on using meta-cognitive strategy primarily. Until the beginning of this century, some studies prove [4–6] in the hearing teaching process that the application of listening strategies into the teaching in class, and teaching the students to master listening strategies contributes a lot in improving the students' listening [3]. Other researchers approve that listening strategies can improve the students' listening. At the same time, they have suggested that we should apply those strategies in the second language classroom listening course.

In the past 10 years, listening strategies and listening strategies teaching in China began to attract increasing attention [4]. Based on the implementation of the students classroom listening strategies training experiment, Wisconsin discovers that hearing teaching strategy can help strengthen training which is necessary to improve their listening and it is really a very effective way. The results show that the hearing training can improve students' listening scores; enhance students' consciousness of strategy use and confidence. Other researchers also think listening training helps improving the effect of the students' listening learning [5].

Although domestic listening strategies and listening strategies teaching have made great achievements, domestic listening strategies teaching and training focused mainly on theorized listening strategies teaching effect. Listening strategies on how to integrate into the hearing in the classroom teaching and test of listening teaching reform are rare to see. English classroom listening remain largely the traditional teaching mode of teachers playing taps and the students listening to give the answer [6]. Therefore, based on the foreign research and English

listening teaching in our country, how to implement the English listening class teaching strategies should be the common purpose of researchers and teachers.

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83.3 Listening Strategies Teaching Reform Implementation Process

Until now, listening strategy teaching does not have fixed, mature and effective teaching modes available for reference. The main way of hearing strategy training is confined to concentrated training, scattered training, and individual guidance. The author, in the hearing teaching reform in the process, with the reference to Chamot mode, integrates listening strategies teaching of Pre-listening Activities, listening Activities and Post-listening Activities. Trainees for our business English professional level are students from 3 classes of 09 international business English, a total of 118 people. Implementation process lasted for 1 year, 4 lessons per week. Based on the students' listening strategy mastery and use, we mainly monitor their training plans, monitoring and evaluation of the metacognitive strategies. There are other strategies such as forecasting, reasoning through context, cognitive strategies and emotions such as control, eliminating the uneasy and other social/emotional strategy.

1. Pre-listening. The main purpose of this stage is to make the student to make clear the listening tasks, and estimate the hearing process of possible difficulties, and improve the students' ability to use the consciousness of the listening strategies, and master the listening strategies to solve the problem by using methods and techniques. This stage includes strategy training in preparation and present stages. Specific implementation has the following steps:

   (a) Organize the students to discuss listening tasks and to activate students' cognitive books;
   (b) Let the students predict the emphasis and difficulties in hearing process;
   (c) Guide the student to do some plan;
   (d) Organize audition, and make strategies demonstration through the audio thinking (think-aloud) way;

(e) Guide the student to make clear the four "W" questions of the name of strategy use (What), When to use strategies (When) and How to use the strategy (How) and so on through brainstorming.

2. Listening activities, namely strategy practice stage. This link's main purpose is to let a student be under the guidance of teachers, combined with the hearing process, use strategy listening to complete tasks. Students are listening to the process, according to the determined emphasis and difficulties and the original plan, constantly adjust to understanding the information which has already been obtained and the decision on how to use strategies to achieve the purpose of listening tasks. Specific implementation process is as follows:

(a) In first playing, the students validate before forecast, and adjust the hearing plan;
(b) In the second playing, students use strategy listening to practice by considering the teacher's tip;
(c) I the third playing, students complete the task for the hearing.

3. Post-listening. In this link, the students have to complete tasks and hearing by using listening strategies and to reflect, evaluate and discuss the use of strategy which can be used in the new situation or listening tasks. Teachers provide students with the instant practice opportunities to consolidate the knowledge of listening strategies. This link includes strategy training evaluation and extension of two phases. Specific steps are:

(a) Students exchange listening tasks completion of strategy and strategy use effect;
(b) Students complete the hearing questionnaire (see appendix), and reflect on the hearing process and strategy use;
(c) Play materials related to listening activities, and let students consolidate the strategies;
(d) Give assignments to help students writing listening diary according to the hearing questionnaire.

83.4 Effect of Listening Strategies Teaching Reform

The aim of the training is classroom training strategy training, so the application of mathematical statistic method makes record of the listening strategies utilization rate and the average and different levels of toll percentage. Table 83.1 shows that all the three categories of average use is in 2.78 and 3.44.

Classification of grades based on the fuzzy mathematics method.

First of all, we should determine the evaluation factors. According to Table 83.2, there are three judge listening strategies factors consisting domains of:

Table 83.1 Listening strategy use average and grade ratio

	Average	Preparation (%)	Presentation (%)	Practice (%)	Evaluation (%)	Extension (%)
Pre-listening activities	3.44	0.87	5.42	51.35	39.19	3.48
Listening activities	2.89	3.28	18.91	54.05	20.96	2.68
Post-listening activities	2.78	2.02	29.06	53.37	14.87	0.68

U = {pre-listening activities (u1), listening activities (u2), post-listening activities (u3)};

Evaluation sets have five factors, thus the composition and evaluation theory for the domain is:

V = {preparation (v1), presentation (v2), practice (v3), evaluation (v4), extension (v5)}

Thus we can get to the comprehensive strategies stage:

$$B1 = A1R1 = (3.44 \, 2.89 \, 2.78) \begin{bmatrix} 0.87 \, 5.42 \, 51.35 \, 39.19 \, 3.48 \\ 3.28 \, 18.91 \, 54.05 \, 20.96 \, 2.68 \\ 2.02 \, 29.06 \, 53.37 \, 14.87 \, 0.68 \end{bmatrix} \tag{83.1}$$

$$= [1.0 \, 2.4 \, 3.4 \, 5.5]$$

Namely: (High: 3.5∼5.5; Middle: 2.5∼3.4; Low: 1.0∼2.4), as shown in Fig. 83.1, 69 people in the middle, accounting for 58.47 % of the total number which is very obvious, and the student overall strategy utilization rate is modest.

After a year of classroom teaching practice, the results show that: the hearing strategy training fusion to listening teaching in class produces major influence for students' listening scores, problem solving, use listening strategies consciousness and autonomous learning, self-confidence.

In the hearing achievements, the training of the class of CET-4 and CET-6 of the hearing test partial result is far higher than other not trained class's and grade's student. The percent of passing the test is 73, 46 % than the ratio. This shows that listening strategy training can improve students' listening scores.

On problem solving, through the analysis in the early training and training students' listening diary, the results showed that the number of students decreased significantly in listening comprehension and the influencing factors type and frequency than the early trained. This fully explains language learning strategy training students can solve the difficult hearing, which is of positive significance. It also showed that in English listening comprehension in the classroom listening strategies to strengthen training is to improve the students' ability to solve the problem by using effective means.

In the use of strategy of consciousness, by comparing the training class students with the untrained, the students' listening training class diary recorded in the

Table 83.2 Rate and percentage in strategy utilization rate

	Low: 1.0–2.4	Middle: 2.5–3.4	High: 3.5–5.5
Number	19	69	30
Percentage	16.10	58.47	25.42

Fig. 83.1 The proportion of the *five factors* in listening strategies training

frequency of use listening strategies is far higher than the training class. The training class forms the habit of hearing forecast and basic planning; Self-monitoring listening process; Self-assessment of the listening task completion. It shows that the training class can activate meta-cognitive strategy to complete listening tasks, which raises the student learning initiative and consciousness.

In independent learning and self-confidence, through the interview with the students, 64.5 % of training class students think they improve self-confidence and said in the learning process they will actively select slightly difficult listening material to carry out listening practice and only 23.6 % of the untrained think that the confidence of the improved.

83.5 Conclusion

Listening strategy training is the effective way to improve students' listening. If listening strategies are active measures and means when students are in the face of difficulties appearing in the process of listening comprehension, classroom teaching should guide students to learn to use English listening strategies, enhance the consciousness of students using strategies, and training students' initiative and independent learning ability. As the ancients said, "teach them to fish is better than give them fish". Listening strategies teaching should become an important part in English listening teaching.

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Chapter 84
Research on Translation of Gannan Tea-Picking Opera

Lingyan Xiong

Abstract An in-depth study of the translation strategies of Gannan Tea-Picking Opera, one of state-level intangible cultural heritages, is of great significance, because it is the living fossil to study Hakka language and culture. The translation of Gannan Tea-Picking Opera from Chinese into English greatly challenges translators for inclusive Hakka dialects, Ganzhou dialect as well as vivid tongue twisters in it. After introducing the international communication and artistic features of Gannan Tea-Picking Opera, the paper points out that translator should be able to transfer cultural image and reflect aesthetic functions through following the principle of collaborative translation.

Keywords Intangible cultural heritage · Gannan tea-picking opera · Cultural image · Aesthetic functions · Collaborative translation

84.1 Introduction

Gannan Tea-Picking Opera was announced as the first national intangible cultural heritage in May 2006, marking the global recognition of its historical and cultural value and bringing a significant opportunity for further protection and revitalization. Gannan Tea-Picking Opera, with a history of more than 400 years, is the ancestor of Chinese art of Tea-Picking opera, an ancient opera of native Ganzhou, praised as "a wonderful work of flowers in the garden of Chinese opera".

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Transmitted to Jiangxi, Fujian, Guangdong, Guangxi, Hunan, Yunnan, Guizhou, Sichuan, Hong Kong, Taiwan, Malaysia, Thailand, Indonesia and other areas inhabited by Hakka people, Gannan Tea-Picking Opera has become the art link uniting Hakka people and the living fossil to study Hakka language and the survival status of folklore groups. In the eye of either local opera art or Hakka culture, Hakka language and Hakka culture, Gannan Tea-Picking Opera has irreplaceable value of research and protection.

With rapid development of world economy and globalization, many intangible cultural heritages in the world are in danger of disappearing. How to protect their native verbal and non-material cultural heritage has attracted the attention of many people of insight. The world culture communication history tells us that introducing the nation's cultural heritage to the world is one of the effective ways to protect national culture. With this purpose, the paper tries to translate Gannan Tea-Picking Opera into English, hoping to introduce the "wonderful work of flowers in the garden of Chinese opera" to the world. It is surely believed that, in the near future, Gannan Tea-Picking Opera carrying the political, economic and cultural connotation will go abroad and participate in international exchanges.

84.2 Translation Studies of Gannan Tea-Picking Opera

The language of Gannan Tea-Picking Opera, different from other literary forms has the commonness of literary language as well as characteristics of opera art, so its translation is complex. Should the translations of Gannan Tea-Picking Opera serve for opera performances or for literary system, or both?

Famous French opera translation theorist Patrice Pavis put forward that there are two different points of view about opera translation today, written text translation and stage text translation. "Written text translation and stage text translation often involve different channels of communication, which determines the translation strategies they use". He said: "The characteristics of opera translation are determined by the dramatics of the opera itself. Opera translations differ from other literary styles because they serve for stage performance" [1].

Fang Ping, a famous translator of Shakespeare, pointed out that "the whole life of opera is the impressive performance on the stage. If an opera becomes works only for reading and lies quietly on the desk, it is hard to find the soul although the shell still exists" [2]. Opera translation mainly aims at serving for stage performance. Only through performance can opera texts become complete, because all the content of the text can be realized only in performance.

Plot development, character revelation and the evaluation of events and attitudes toward people in the opera mainly rely on the dialog between actors, namely, dialog between characters constitutes the main body of opera language. Although scripts are written, finally they are to stay away from texts, and achieve the communication with audience through the mouths of actors and in the form of stage performance. Therefore, opera translators must take into consideration the

requirements of both actors and audience. On the one hand, in order to facilitate actors to chant on the stage, the dialog should be considerably readable, consistent with the characteristics of spoken language. On the other hand, in order to facilitate audience to listen, appreciate and understand, the language of performing texts should be performable, different from written language for reading only.

"Readability" and "performability" are determinants to distinguish opera translation from translation in other forms, and the main factors opera translators must take into account. Translation language must be coordinated with actor's movements, while the rhythm of words with emotion, action, plot development and many other factors, to fit with actor's performance. Therefore, opera translation should not only focus on the interlingual transformation between two languages, but also take into account the poetry, colloquialism, rhetoricalness, implicitness, personalization and initialization of translation language, and even strive to achieve the equivalence of translated text in the target language culture and the cultural functions of the original. The ideal opera translation should be "eye-pleasing to readers, euphonious to audience and orotund to actors" [3].

Opera translators should seek for cooperation with directors and actors, and jointly study and explore the characteristics and laws of drama translation, to translate the opera works suitable for stage performance. Only with in-depth understanding of the art characteristics of Gannan Tea-Picking Opera can translators truly understand the soul of the opera, grasp the strategies and methods of opera translation, and translate the "readable" and "performable" texts.

84.3 Content to be Translated for International Communication

A new subject hotly debated in recent years, international communication, is the objective requirement and inevitable result of globalization and the information age. International communication usually refers to the cross-cultural information exchange and communication carried out with the nation and the country as main bodies. When it comes to "communication", we usually give the term the same meaning as "propaganda" or "output".

"Communication" refers to the spreading activities of mass media (such as news reports), personal activities (such as speaking, writing, travel visits), commercial activities (such as economic and trade relations) as well as cultural activities (artistic performing, communication) [4]. Film output is a cultural transmission. The film Gua Sha Treatment is about Xu Datong family emigrating from Beijing to America. Five-year-old Denis got stomach ache and a fever, so his grandfather used his own expertise in Chinese medicine, Gua Sha Treatment, to cure him. It was out of expectation that Denis had his forehead hurt. When his mother sent him to the emergency room of a hospital, the serious American doctor called the police abusing the child was abused by the family, so that the happy

family was trapped into an absurd lawsuit from then on. The film not only reveals the possible or inevitable misunderstanding and even conflicts of Chinese medicine in the west, but also introduces a traditional therapy of Chinese medicine to the west. Book translation is also a way of communication. The translation of the novel Bi Nu is also an output of classical culture. The Writer Su Tong reshaped the historical legend of "Meng Jiangnu's Bitter Weeping" with imagination, which deducting ancient Chinese mythology today to the west. It shows that the forms of international communication can be various. Communication can be seen as both the way of promoting international exchanges and drumbeating a certain thought as well as an objective or a measurement index. For a country, especially a developing country, it has achieved a certain purpose and can take this as indicators to measure its status in the international system, if it can transmit its voice to the world in many ways, and display the national image, to serve for the national interests.

In communication science, content is the central part of dissemination and the quality of transmission largely depends on the transmission content. The process of content distribution is the process of judging on and selecting a lot of materials, and then delivering to the audience after writing and editing. The control of the content involves six parts, who says that, what to said, whom to be said, how to say, what are the effects, and why [5]. "Who says that, what to be said" means that the content of dissemination should be representative, authoritative and rational; "whom to be said" indicates that the objectives of dissemination should be clear, namely, it should be analyzed what organizations and people the audience are; "how to say" indicates that communication should take strategies into consideration, including the means and methods of communication (external) and the expression and wording of communication (internal), which is key to effective communication; "what are the effects, why" refers to the analysis of communication effects, namely, to predict whether the communication content of certain means and expressions will have a positive effect or negative effect, analyze the reasons and intervene the previous several sections in return, so as to ensure the positive effects.

As for the translation of Gannan Tea-Picking Opera, the choice of what to translate is critical to its communication and output. There is also something in Gannan Tea-Picking Opera not accepted by modern value system, which will not be understood and accepted by the audience in the west. If they are blindly outputted as culture, they will lead to negative effects, which just violate the initial purpose of the international communication and output of Gannan Tea-Picking Opera.

84.4 Targets and Requirement in Translating Gannan Tea-Picking Opera

Gannan Tea-Picking Opera is made for the stage, so only opera language of specific stage shows charm, that is colloquial, personalized, and with both poetic beauty and rhetorical beauty, can give a real sense of "opera style" to translated text and not to lose the purpose of the original composer to "compose for the stage". In translating Gannan Tea-Picking Opera, translators should be able to transfer cultural image and reflect aesthetic functions with the principle of collaborative translation.

To transfer cultural image. Most of cultural images embody the crystal of each nation's wisdom, history and culture, with a relatively fixed, unique cultural meaning, and some also have a rich and far-reaching association [6]. Gannan Tea-Picking Opera, a kind of local opera, not only contains a profound traditional Chinese culture, but also reflects the rich Hakka culture. The cultural images connoted in extensive proverbs, twisters, harmonics and positive statements are hard to understand by the Chinese who are not fluent of Hakka culture, so they must be properly handled in the translation process, so as to correctly convey the meaning of opera composer.

Take Folk Song Love, a Gannan Tea-Picking Opera fashionable in China in 1990s, as an example. The names of characters are of rather cultural characteristics and meaning. "Zhenxiu" means both virtuous and beautiful; "Mingsheng" gives the image of a handsome young man; and "Mangcang" reflects the desire of farmers to have a harvest. Different name reveals different identity and personality. If they are simply transliterated, the deep meaning contained will be lost. Therefore, "Jennie" is used as the English name of "Zhenxiu", because it means "pure and good" and it is a two-syllable word starting with the same syllable as the Chinese pronunciation. "Handsome" is used as the English name of "Mingsheng", expressing the meaning as well as rhyming. "Barnfull" is used as the English name of "Mangcang", directly expressing the meaning and containing rich local flavor.

In addition, in traditional Gannan Tea-Picking Opera Mending Shoes, the myth "Cowherd and Weaver" appeared in the lyrics of Sister to Xiang. If foreign readers and audience do not understand the story, "cowherd", "weaver" and "Magpie Bridge" can not be transliterated. For stage performance, the lyrics are translated into "Wash in long-running water, dry the clothes on a long pole; lovers who care each other, live happily together". In translating, the myth of cowherd and weaver is weakened, but the aspiration of Xiang and Sister is transmitted and confided in detail, with the meaning that as long as we two are heart to heart, even if the mother of Sister is in the middle as the barrier, in the end we can be together. The cultural feature of drying clothes on bamboo spars in rural China is preserved.

84.4.1 To Reflect Aesthetic Functions

Gannan Tea-Picking Opera, integrating poetry, music, dance and arts as a whole, is a comprehensive performing art, in which lyrics take the art forms of both music and poetry. Only the opera translation integrating the beauty of content and form of the original opera can give readers an auditory and visual beauty, a higher artistic enjoyment. In the specific translation process, translators should actively mobilize thinking and their knowledge base, striving to reflect the aesthetic functions in sound, form and meaning. In case the three cannot be achieved together, beauty in meaning should firstly be taken into consideration, then the beauty in sound and beauty in form.

Beauty in sound requires translation to maintain beauty of rhythm in the original, which is often achieved by means of alliteration, assonance or rhyming, to ensure singing and musical lyrics. For example, in Mending Shoes, seeing Sister's mother sitting between his lover and him, Xiang compared his lovesickness to bitter gourd. It is translated into "Like melons in a garden, separated by a wall; Brother bitterly miss her, sister miss him full of tear", in which there are seven syllables per section with "her" and "tear" to end rhyme, relatively guarantee the neatness of rhyme.

Beauty in form requires that the translation should have the beauty in form of the original, to be in corresponding reference to the original in lines, the number of words per line and tonal patterns and different in the form of lyrics and narration. For example, in Folk Song Love, when Barnful raped Jennie under the pressure of his mother, Barnful Mum, Barnful and Jennie all felt painful and sang together a sentence, whose literal meaning is that the intestines are hung on the crossroad, and then the attached heart, lungs and livers are tearing apart. In fact, it describes the loss of three people and reflects the piercing pain in their hearts, so it is translated into "Wandering at the crossroad, my heart is tearing apart". In this way, the implicit idea is clearly expressed, and especially seven syllables in each sentence of English in reference to the original, to ensure a unified form.

Beauty in meaning means translated text should also have the image and logical artistic conception combined of images of the original. In the translation process, special attention should be paid to transmitting the image beauty of the original, especially the "implication" of two-part allegorical sayings and puns in Gannan Tea-Picking Opera. For example, in Go to Guangdong, there is a two-part allegorical saying, "a frog in December—how dare you open the mouth". In December of the lunar calendar in China, the coldest winter, most animals hibernate. Therefore, it is translated into "frog in chilly winter—how dare you open mouth", in which "December" is replace by "chilly winter", better reflecting the profound meaning. In particular, there are twelve syllables in English as in Chinese.

84.4.2 Collaborative Translation

The diversity of opera symbols determines that language is only one of many symbols constituting entire opera performance and the script is only one factor constituting the overall effect or significance of a performance. The transmission of the artistic appeal of an opera depends on the cooperation and response of various opera symbols. The unique "communication loop" of opera translation means that opera translators do not directly convey information to audience. The script must reach audience after the interpretation, understanding and performance of the director and actors. Script translation must go through the process of text conversion; stage transformation and opera exchange participated by translators, director, actors and audience.

The first step is the cooperation between translators and the director. Before translating, translators should understand the script interpretation of the director and listen to some actor's unique understanding of the script. Only in this way will translators not fall into the mistake of self-processing and can translated lines be able to pass the concise and implicit language of opera as well as equivalently reflect the rhetorical characteristics of the original script.

The second step is the cooperation between translators and actors. After having a clear understanding of the original script, translators must conduct the work that can withstand actors' inspection. Translators should explain the information in translated text, and then actors can have a better understanding of it and test its consistency with the original. Only in this way can dialog meet the identity and personification of characters and lines match actor's body movement, the rhythm of reading lines in accordance with actors' action and translated script easily expressed by opera actors.

The third step is the cooperation between translators and audience. Based on actor's understanding of the translated text, the first rehearsal of the performance must at first be reviewed by part of target language audience, to see whether the language of the translated text is in accordance with the norm of oral English and the performance can achieve the equivalent effect of the original script. Translators should replace the dialects of source language with the dialects of target language, create the equivalent language domain in the target language, and also may consciously omit part of chapters that are considered to be constrained by the culture and linguistic background of source language.

The fourth step is the twice cooperation between translators and director as well as actors. After considering audience, translators, director and actors should polish translation together. The well done part should be carried forward and the worse part should be corrected and improved, to achieve the perfect opera of the integrating Chinese and Western, and the dream of ancient and modern.

Collaborative translation has the advantage of combining translation process with a series of issues related to performances of opera texts, including problems caused by the different opera traditions between source language culture and target language culture as well as different performing styles.

84.5 Conclusions

After modern development, Gannan Tea-Picking Opera, the father of Jiangxi Tea-Picking Opera, is luxuriant and full of vitality. There are 40 million of Hakka people at home and abroad, providing the objective condition for the survival and development of Gannan Tea-Picking Opera, which is a cultural wealth of Hakka as well as Chinese nation.

The international communication of Hakka intangible cultural heritage Gannan Tea-Picking Opera is grand but difficult, with a far-reaching significance. The paper aims at throwing away a brick to get a jade. It is hoped that better cultural communication and cross-cultural communication can be achieved through more in-depth research on opera translation theories and mode detailed analysis of Gannan Tea-Picking Opera in the future.

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Chapter 85
Study of Teaching Mode on Higher Vocational English Teaching in Workintegrated Learning

Gehong Liu

Abstract In order to explore vocational English education mode and enhance students' career development capacity, this paper analyzes the status of vocational English education, and points out that English culture is the necessary tool of modern workplace communication, the essential quality of career development and the necessary capacity. Also it discusses the teaching objective, teaching mode, teaching method, evaluation mode, teachers training and other issues in the setting of Workintegrated Learning.

85.1 Introduction

With the needs of national economic construction and the vigorous development of vocational education, higher vocational talents are increasingly important for the society. But many vocational colleges ignored the basic direction of "being service-aimed, employment-oriented, and competency-based", and they are reflected in: the improvement of quality and the increasing number of higher vocational talents are incompatible; the current education concept, teaching system, training objective, and the needs of society are incompatible; the current teaching content, methods, evaluation methods and diversified students' learning needs are incompatible; teaching and employment are disjointed. So it is urgent for us to take English teaching reform.

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85.2 Establish a New Vocational English Teaching Concept, and Develop the Career Development Capacity

Higher vocational education is to develop advanced technology talents in production and service. Higher vocational education aims to train students' production skills. It works out teaching plans based on the needs of the post group; establishes the career-capacity-entered teaching system, and trains qualified workers with practical skills, entrepreneurship and the spirit of innovation. The comprehensive career capacity is mainly reflected in three aspects of being practical, being skilled, and being vocational.

Higher Vocational Education in English Curriculum points out that vocational English Teaching targets at developing students' basic English skills and workplace English language proficiency, which focuses on not only teaching English, but also training students' practical English, laying a solid foundation for career applications after graduation to serve for improving students' employability and adaptability to the society [1].

85.3 In the Setting of Workintegrated Learning, Develop Career Development Capacity and Explore Higher Vocational English Teaching Mode

Higher vocational education is different from undergraduate education, and it must be integrated with the industry factor, career factor, firm factor and practice factor to construct the development mode of vocational education with Chinese characteristics. Based on this positioning, vocational English education should get rid of the undergraduate "compressing" education and it is necessary to guarantee the properties of higher education, but also reflect the characteristics of vocational education, and adhere to the foreign language education as the main line, in the setting of Workintegrated Learning, merge career capacity into the foreign language learning to adapt to the needs of social development. We have explored in the following five areas:

85.3.1 Vocational English Teaching Objective

Basic English is a compulsory basic course of vocational students, and it is not only a skill class, but also cultural quality class. It is founded on the theory of English teaching and vocational education, and English language knowledge and skills learning strategies, and cross-cultural communication based on workplace are its main contents. Its teaching goal is to develop students' comprehensive ability to use English, especially listening and speaking. As vocational education

goal is to train skilled workers of the production, construction, service lines. Vocational English teaching should reflect the higher vocational students' future career development needs and the specific requirements for jobs. The basic direction it should adhere to is:

85.3.1.1 A Main Line

Training front-line talents English practical ability.

85.3.1.2 Two Combinations

Combination of the basic English teaching with comprehensive training of career capacity; combination of vocational post group, the typical tasks with English expertise.

85.3.1.3 Three Systems

Setting up language application system based on hearing and listening, a teaching system based on core skills training and lifelong learning system based on independent learning.

85.3.1.4 Four Requirements

The needs to enhance English proficiency, the needs of the student-centered career capacity, the needs of region economic and social development, and globe economized needs [2].

85.3.2 Teaching Mode

The starting point and ending point of English teaching is to enhance students' career capacity, so we adopt the superimposed teaching mode to integrate vocational English and career curriculum. English is a compulsory public basic program in vocational schools, so it must serve and subject to the profession teaching. The establishment of English teaching objective depends on the various career talents training objectives and workplace English needs. Basic English knowledge and skills such as listening, speaking, and reading, writing and translating are essential for career English and the related career knowledge is the basis of Workplace English teaching. So superposition teaching is to integrate career knowledge into the practical English, and the professional knowledge content is

taught in English. Higher vocational English teaching aim is to cultivate the students' communication ability of using English in the area of industry. It requires our English teachers to understand the requirements of different career English and works out the English teaching goals with different career systems and sets the Teaching Program. In the course of teaching, it is necessary to ensure the integrity of career content, and the right amount of English knowledge, realizing its true meaning of "superposition" [3].

85.3.3 Teaching Method

There are two kinds of students in higher vocational colleges: high school graduates and technical schools graduates. English learning of high school graduates in vocational school is coherent and complete, having certain level of speaking and listening. They can quickly adapt to the college English teaching and environment; for technical schools graduates it is inter-segment and discontinuous, and their English is weak and can hardly adapt to the starting point of the college English teaching.

Aiming at level difference and coordination of teaching at all levels, we adopt a hierarchical multiple teaching method. It is to make students of different levels achieve different study target in the same teaching content in the same teaching session; and teach the same course content in different teaching hours to achieve the same target. In another word, the intellectual content teaching objective can be realized through different paths and different teaching periods for different levels of students. This requires that each part of the teaching content should be carried out in the subsequent teaching period, thus making students of different levels achieve different levels of target migration. When selecting the teaching content and designing the teaching process, we will make knowledge content, which contain the same ability target, repeated in consecutive teaching periods, accumulated through the migration of ability target in various periods, and reach the overall training objective of English education [4]. The following chart shows that students of different levels in the same teaching period produce target migration at different speeds:

Teaching periods	t1	t2	t3	t4	t5
Level A	Understanding	Memorizing	Digesting	Ability	Quality
Level B	Understanding	Memorizing	Digesting	Ability	Quality
Level C	Understanding	Memorizing	Digesting	Ability	Quality
Level D	Understanding	Memorizing	Digesting	Ability	Quality

We can see that in different teaching periods, students of different levels achieve different learning goals, but by the continuous extension of teaching time, different levels of students can always migrate through successive targets (at different speeds) to achieve the goal of "understanding–memorizing–digesting–ability–quality" migration process. That is, the realization of the overall training objectives is by the continuous migration of the goal. Only levels are different, speeds of migration are different, and implementation time is different.

85.3.4 Evaluation Mode

To improve the evaluation system, we introduce the diversified assessment system of formative evaluation and summative combination evaluation. The improvement of students' language capability doesn't depend on the review of final examination, but gets through continuous hard study. Vocational English language teaching should focuses on the normal learning process; and the test should play a role of checking and supervising at ordinary times. Teachers can obtain continuous feedbacks through the formative evaluation in the teaching process to know students' learning results and to modify their teaching strategy at any time. Also, students can get the feedbacks from the formative evaluation to improve their own studying or training methods. Teachers should establish the students' study files, including: listening, speaking, reading, writing, and translation, completing the task of preview and review, class participation, teaching activities and phased test results. The summative evaluation mainly serves for the realization of the course target and provides feedbacks of completing course content and training. Therefore, to improve the vocational teaching evaluation system, we combined English language skills, English practicality and career capacity by the comprehensive assessment of final examination, the usual results and the practical ability (60–20–20 %), so that teachers can evaluate students' quality and capacity development level [5].

85.3.5 Teachers Training

Vocational education is different from basic education and higher education, and it aims to cultivate the technology-based, skilled talents, and pays greater attention to the combination of theory and practice in the teaching process, highlighting the students' career capacity. So it is necessary to build a more professional, more comprehensive in quality and high-level dual-qualified teachers team. Teachers are regularly encouraged to practice at the grass-roots training bases and experts are invited come to train teachers to improve teachers' overall quality. By both internal and external training, teachers ultimately achieve the diploma, certificates,

career qualifications and teachers' certificate [6]. They should have the following abilities:

Ability of teaching and managing students.
Ability of vocational skills and hands-on.
Ability to solve the practical problems of production and engineering.
Ability of teaching research and scientific research.

85.4 Conclusion

In the setting of Workintegrated Learning, vocational English education chiefly cultivate English application ability of applied talents and effectively combine the typical tasks of workplaces and English expertise. It tries to accommodate English teaching to career economy and social development, and trains the "dual-qualified teachers" to satisfy the needs of career capacity of vocational English education through hierarchical multiple teaching method and the superimposed teaching mode.

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Chapter 86
Authentic Material Research in English Reading Education

Jingmin Li

Abstract With the technology development, people increase their knowledge requirement. Reading is the main method for people to obtain the knowledge. The good reading ability has significant meaning for the industry development. Since our country joined into the WTO, we have close relationships with the foreign companies with the higher requirement for the English reading. At present, in order to adjust the period demand, we open English course in most colleges and universities for training the large amount of talents who can act on international convention. During the English study, the learning materials have the fictitious content and simple sentences that convenient for the teaching and explaining. The English interests training and level development is much depended on the reading material. If we use the factual materials during the English training, it will be easier to connect with the society for the college students. This has the positive function for the reading skill improvement.

Keywords Authentic material · English · Reading

86.1 Introduction

In our country, most colleges advocate to use the authentic materials during the students' English learning. However, during the practical education activities there use fewer authentic materials [1]. The most important reasons are in the following. At first, the teaching materials in colleges are lacked of authenticity research. The textbook compiling aims at the people, which have the weak English basement and

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bad reading ability. The compiling process excessively seeks for the vocabulary amount and grammar difficulty control [2]. Ceaseless modify the reading materials and change the original materials into the required sentences. In the second, the learning process pays too much attention to the form, especially in the sentence translation [3]. It requires the correctness between Chinese and English. This kind of translation is not fluent in the expression that cannot show the writer purpose. At present, there are so many English reading materials as well as the practice materials for the exams. In the reading materials' selection, some are from the foreign local conditions and customs. Students can have the foresight without completing read the material. The method has no function to improve the students' English reading. Some materials are modified from the English newspaper or evidence some vocabulary to fill by the readers. This method is not correct. There has only a few people will fill the vocabulary during the reading. The present English education in China, most students learn English for passing the CET-4 and CET-6. They do not care much about the detailed improvement of English level. In the materials from training institution, people use the technical training to guess the questions and answers or the intention of the question makers just for the high score. They care nothing about the material content. Not all the above can seriously control the students' learning and satisfy the English learning standard in our country, and it is adverse to improve the reading skill and the development of comprehensive quality [4].

86.2 The Research of Relative Theory

86.2.1 The Definition of Authentic Material

The authentic material applies in the communication at the earliest. In the late 70 s of last century, the authentic material obtained the widely application. Especially in the foreign language learning, it is very popular in the education field.

With the period development, people have deeper research in the authentic material theory. There still has no clear idea about the authentic material definition. Different scholars have the various emphasizes. Through the combination of the scholar at home and aboard, this article will define the authentic material. In the real mother language environment, we create the required reading material that not only for the education to form the virtual field and material.

Here we need to pay attention to the different concepts between authentic materials and the material authenticity. It is expressed in the relation between material and scholar. The authentic expresses in three parts.

(1) The environmental authenticity

During the English learning, we should learn in the real English environment instead of local surroundings. The reader has the real feeling. The reading material with local environment will has disadvantage for the learning.

(2) The content authenticity

The material content cannot modify the content based on surmise for seeking the grammar or vocabulary.

(3) The material dependence

The reading material must have the dependence that cannot put all sorts of things together in order to avoid the vault thinking. This method will lead the reading to a small development in the reading level although they read so many materials.

86.2.2 Reading

Reading is the best way to obtain knowledge and improve the English learning skill. However, there has no deepened thinking of what is reading. People believe reading the material is reading. This is too single—faceted to the reading comprehension.

At home and aboard, the research of reading has been always the emphasis and hotspot to the scholars. It includes linguistics, behaviorists, psychology, education, and other various fields. The early reading definition is the process of knowing the letters, vocabularies, form the sentence and the sentence understanding. In 1977, the American Rumelhart researches the artificiality intelligent to explain the definition. Reading is the process for comprehensive combine and resolves the vocabulary, grammar, semantics, and other relative knowledge that applied in the various language families.

The reading has two types of "from top to bottom" and "from bottom to top". "From top to bottom" means we learn English follow the sequence of letter, vocabulary, sentence from easy to complicated, from low level to the high level. "From bottom to top" means based on the knowledge accumulated, we extract the whole material, make pointed references to obtain the required information is the correct evaluation of the material pre-judgment, analysis, extraction and confirmation. In fact, in most time, people use alternation of the two methods.

86.2.3 The Research of Authentic Material Application during the Education

In the foreign countries, the authentic material has obtained the widely application and developed during the teaching process. The long-term exam-oriented education in our country only pays attention to the performance improvement but not pay close attention to the quality education. The decades of years' traditional education express our college students have shortage of English application in the
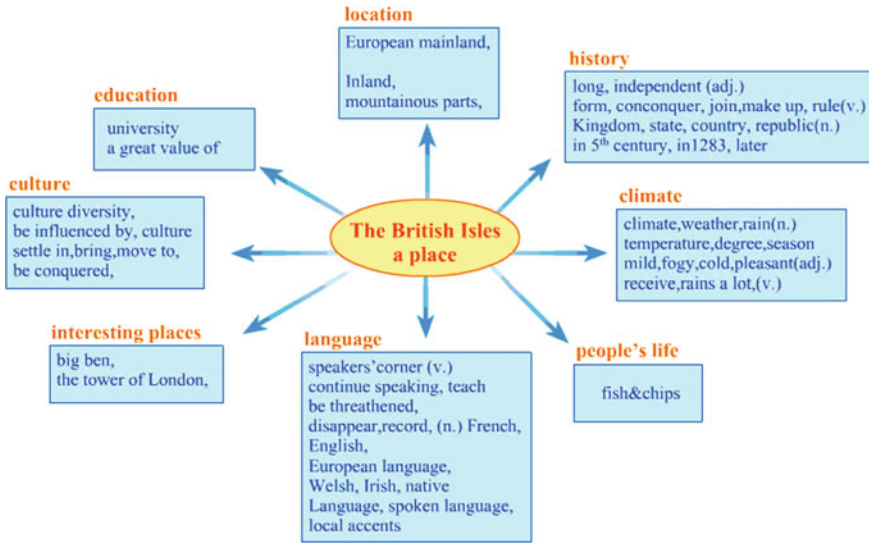
Fig. 86.1 Authentic material illustration

practical work after ten years' English learning. Most of them cannot meet the practical work requirement.

With the increase of international communication, people have more English requirement. Our English education has the relative reformation and regulation of the college reading materials. The materials must be suitable and combine with practice and readability. From the multiple aspects evaluation, Fig. 86.1 is the division description of the authentic material.

86.3 Research Design

86.3.1 Design Target

During the English study, most students limit their reading materials in the exam materials in order to increase the performance such as test questions, the real test in every year, and practice test. They think only the English major can read original edition. Therefore, the non-English major has shortage in the reading positivity.

We will select 20 students, which have different English levels in random. Through the non-English major reading, we set we can reach the following three targets.

(1) Increase the English reading level.
(2) Develop the reading strategies.
(3) Promote the reading interests and learning confidence.

86.3.2 Pre-Phase Analysis

Before the training of authentic material reading, we need to evaluate the students' present condition. Through the questionnaire survey, we can practically understand the condition by face-to-face communication.

Not matter the performance is good or bad, nearly all the students believe their English levels are low and cannot fit to the social requirement. In the exam, most students think they have no good English reading. Moreover, nearly half students think they lost much scores in the reading comprehension and will influence the performance. In the present English exam, reading comprehension places the huge scores. Most students have shortage on the reading and they are not interested in it. Although the authentic material is difficult, nearly two thirds of the students are interested in the authentic material. Through the practical condition evaluation, students have the following problems.

(1) Low English level and short of learning motive power.
(2) The lack of the urge demanded to increase the English reading.
(3) Incorrect English reading behavior and method.
(4) Not interested in reading materials.

86.3.3 Practice

In the learning process, make pointed references to select the authentic material for the students. Arrange the fixed time and organize students to read in everyday. Thirty minutes is the best average time to learn English. After that, students can communicate the materials in 10 min in order to express the idea and understanding.

Before reading, there needs to express a requirement. Increase the reading speed and read more materials as far as possible. When students communicate their understanding, the teacher cannot involve the personal opinion. Students' daily independent learning has no teacher participation.

At the same time, encourage students to read English novels, outside reading materials and make the reading notes. Moreover, write down one article of the learned note in each week. During the learning process, the teacher is just the visitor, it will be necessary that do not score or analyze the reading content or note details but only record their reading.

The material selection needs to consider about the appropriateness and difficulty. In ordinary, the new words in one's reading cannot exceed 5 % compared with the whole article vocabulary. Too many new words will influence the thinking ability and confidence. It is necessary to select the popular, informal, and authentic materials to instead of the professional materials.

We can select materials through the internet, newspapers, broadcast news, broadcast script, talk show, and the original materials of cultural geography, movie, and advertisement. Involve various parts of the society as far as possible and students will know about the English countries in different layers.

86.3.4 Effectiveness

The learning effectiveness will express in two approaches. The first is comparing with oneself. The student will test before and after the practice. Test the performance change through the similar difficult questions. The other method is compared with the same level students.

Through the comparison, students reading the authentic material in the first five weeks will have not much reading with the students that do not use the authentic material. Even there takes no differences. After five weeks, the students that read the authentic material will have higher performance. At the same time, the listening and writing level will increase obviously.

86.4 Effectiveness

86.4.1 Development in Reading Skill and Strategy

Through the training, especially after five weeks, most students express their interest in reading and they will search the English reading materials by themselves.

The good reading behaviour will form gradually. Most students are scared the new words in the old reading period. They will search the dictionary once the new words come out. Through the authentic material, it will improve the new words condition. With the material increase, students will grasp the foreign culture, they can use the background knowledge to deduce or image the writer's meaning. They can scan, skim, and overview read in order to understand the whole material.

86.4.2 Increase the Confidence

The most students cannot learn English well just for the fear during the learning process. After the long-term authentic material reading, they will find the English is not as hard as they used to think. They will change the negative into the positive thinking and increase their learning confidence.

86.5 Summary

This article evaluates the English reading education that aiming at the authentic materials in colleges and universities. In the first, this article introduces the theoretical knowledge research. It includes the research of authentic material and reading material during the education. In the second place, the article describes the research design from the target proposition, pre-phase analysis of students' condition, practice process, and summary. In the last, it roughly explains the research effectiveness. During the research process, select students from high, middle and low performance levels in random. The few selected people can make people to input more energy during the management. In the detailed application promotion, there needs the ceaseless exploration to find the method in order to make the authentic material popular. The interested reader can discuss and express the understanding on this basis of development together.

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Chapter 87
Research of Leisure Sports Culture of Fishermen

XinGong Han and Linfeng Bai

Abstract General Secretary Hu Jintao pointed out in Seventeenth Congress: The question of agriculture, rural areas and farmers concern the overall situation of building a prosperous society, must always be the most important task as a party [1]. Fishermen is a part of farmers, in order to build well-off society in China, through research of leisure sports culture of fishermen along the Bohai Sea area is a subject of very important and practical significance. This topic through documentary, questionnaire, observation, statistics, analysis and so on, the living conditions of fishermen in the Bohai region, the condition of fishermen participate leisure sports activities, the factors that affect the fishermen, Recreational fishermen in the form of physical culture and development of properties and so thorough and meticulous research, summed up the fishing village of fishermen along the Bohai Development of leisure and sports culture.

Keywords The bohai region · Fishermen · Leisure sports · Culture study

87.1 Introduction

Sport as a form of culture, it's not only a means to enhance the physical, but also to promote the health of the most active of a social practice [2]. General Secretary HU JIN TAO in his report 17 pointed that: Solving agriculture, rural areas and

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farmers is related to the overall situation of building a moderately prosperous society, must always be the most important task as a party. Good grasp of "farmers Fitness Project" to stimulate farmer's awareness of sports and improve the new rural development, which not only for rural sports development opportunities, and create the conditions, but also the construction of new rural sports will inject new vigor and vitality [3]. Associated with water as fishermen, according to the water for a living, we must also fight against natural disasters, with nature, in such a special living environment, the fishermen must master a variety of survival and life skills to get more production, to maintain life and thrive on. As fishermen for generations of living habits, formed a unique style of amphibious lifestyle, this traditional way of life and sports collide and fuse to form a sports culture fishermen. Sports fishermen and cultural formation need to carefully research and combing, and tap the resources of the fishermen sports culture, establish a sound management system, to promote the development of sports culture fishermen [4].

87.2 Subjects and Methods

87.2.1 Object of Study

Along the Bohai Sea region, including (Tangshan, Tanggu, Qinhuangdao, Dagang, Yantai, Jinzhou, Dalian, Dongying, Yingkou) fishermen in this study.

87.2.2 Research Methods

Survey method: Along the Bohai Sea region in China, Tangshan Tanggu, Qinhuangdao, Dagang, Yantai, Jinzhou, Dalian, Dongying, Yingkou fishermen for the survey, survey of 1,000 people. Understand the different levels of physical activity status of the fishermen, leisure sports, fishermen culture, sports culture, sports concept, behavior and other issues. Analysis of the fishermen to get the sports and cultural material.

Literature: access to the relevant monograph of sociology, theory and practice of sports books, papers, monographs foreign sports sociology.

Observation: In-depth to fish along the Tangshan Bohai Sea region, Tanggu, Qinhuangdao, port, Yantai, Jinzhou, Dalian, Dongying, Yingkou residential residence for field observations.

Logical analysis: Demonstrate conclusions and put forward corresponding countermeasures and suggestions by the use of induction, analogy, deduction, comprehensive logical analysis of a variety of information to conduct comprehensive analysis and discussion.

Mathematical statistics: statistics on survey data, sorting, and for the next fully prepared to do the analysis.

87.3 The Results

87.3.1 A Survey of the Living Conditions of Fishermen Along the Bohai Sea

With the decline of fishery resources, marine operations space become smaller and unemployment increased, revenues declined. With the industrialization and urbanization process accelerated, landless and unemployed people also will be a significant increase. Followed by social problem after another, along the Bohai Sea of China is not optimistic about the fishermen's living conditions. Main features:

Lack of growth potential of the income of fishermen, some fishermen into poverty.

Since reform and opening, the rapid development of China's fisheries, many fishermen, especially along the Bohai Sea fishermen first to get rich. But in recent years, the income of fishermen preached insufficient growth potential, low-level stagnant state of affairs, fishermen and urban income gap is widening, many fishermen into poverty.

Fishermen community development rights can not be guaranteed for the reason of weak competitiveness. Fisherman fishing in the community, whether to compete or participate in social competition divorced from fishing industry, the competitiveness is weak.

More external risk fisheries, fishermen weak ability to resist external risks.

Fishery is a high risk industry, to bear the risk from all sides. Decline of fisheries resources is one of the biggest risk fishermen.

Fishermen Production and living hard, lack of livelihood security.

Fishermen spend most of the time a year in the ocean far from land, offshore law day and night without rest, fresh water, vegetables and other necessities is difficult to meet, life monotony, lack of the necessary spiritual and cultural life. Fishing areas inaccessible, less communication with the outside world, it is difficult to equitable share external social resources.

87.3.2 A Survey of Current Situation on Residents Participate in Sports in China's Bohai Sea Area

The frequency and duration of fishermen to participate in sports activities

The number of times the length of time fishermen participate in sports activities are the premise of fishermen can get exercise. Through surveys, the frequency and duration of fishermen to participate in sports activities are clearly insufficient. The gap more obvious that woman than man. Through the survey showed that: 20.11 % of fishermen have never participated in sports, and fisherwomen never participate in sports activities to the proportion of 51.29 %. Statistics show that

most of fishermen are not aware of the importance of physical exercise to enhance physical fitness and promote production.

Sports programs

Judging from the survey of the fishermen preferred swimming physical education programs, which work with the fishermen in the wading, is essential for production and self-help skills, and the operation is simple. Chess programs, the participation of male and female fishers were high, but as a static nature of the educational entertainment sport, the effect of physical exercise is not good. There is a broad mass base on basketball, table tennis, badminton and other ball games in the city. But very few people are interested in it, which is greatly influenced by the subject to weather and site conditions, which limit the participation of the participation. The general characteristics of sports are less than normal and the content is relatively traditional and simple.

Fishermen to participate in sports sites and locations

Survey show: Sports site selection in their own homes who exercise more, which was the proportion of women than men opposite road activities. This is a relationship with the personality differences between men and women, most women do not want the spotlight, only willing to quietly exercise.

Fishing village public venues, equipment and facilities

Sports equipment is the carrier of sports, which is able to inspire and mobilize the active of fishermen participation in sports polarity. Through the survey found that a serious shortage of fishing village sports equipment. There are some ever cinder and dirt basketball court, as for long time falling into disrepair, or weeds, or filled with waste materials.

87.3.3 The Factors Influence Fishermen Along the Bohai Sea Area of China of Participating in Sports

The reason that led to this situation was investigated the labor replace sports activities, sports activities result physical exertion, the practical effect of physical exercise without a lot of factors listed in the first and second, third, respectively of the total number 55.31, 57.25, 48.24 %. Heavy manual labor, physical and mental fatigue that is human nature, but the point of view of labor replace sports activities and sports activities result physical exertion which is obviously wrong, which can only show that the understanding of the role and significance of sports is very shallow, which directly result physical sense of apathy, and it is the fundamental factors of restricting the implementation of the national fitness program in the fishing village. Lack of space equipment, production pressure, the inability to take into account factors and so on, which also results in an important proportion.

87.3.4 The Manifestations of China Along the Bohai Sea Region Fishermen Folk Sports and Cultural

Folk board sports culture is the non-sports activities occurred on board. It can be said that occurred only in the board. Ship, the great and wise creation that our ancestors conquered the water. The ship's invention lead a new leap forward of the development of fish culture. As a carrier of marine fish culture—fishing boats, the main tool that fisherman engaged in fishing within a larger area.

Climbing the mast is a skill that fishermen must learn. Whether the small wooden boat which the number of people operating, or a pair of medium-sized Sail Ships which dozens of people. Tall cabin center has a thick, as-liter peng fan's mainmast. If the race to climb masts on the same mast, time to watch or to incense and counting time, if at the same time on a different mast, you can directly determine speed. Commonly known as pull-liter canopy sail. Due to the sailing area is large and heavy the fishermen need everyone to participate and sail rise costly physical strength and upper body strength and master certain skills, in order to "rise sail" action characterized the project came into being on board folk sports competition. The grinder is Roll with the game, usually on a sampan, grinder mainly arm strength and athletic skills competition.

87.3.5 Maritime Folk Sports and Cultural Forms

Sea swimming class folk sports are diving, swimming, diving. Fishermen by the sea door, living from the sea, fishermen diving is not surprising, of which the diving skills formation and associated with a particular mode of production. Tony must adopt in order to sneak into the reef at the end of the collection, collect shellfish do not borrow tools just depend on ramping up its breath to gather mussels and mussels, commonly known as "attack mussels", Therefore, the diving skills is formatted with a specific mode of production associated with certain life-threatening. Swimming is charming and amazing wow. The most convincing is empty jars the head racing, swim the sea race. In the game, a few dozens of water or good man, head of the top of an empty wine jar in one hand and the altar fixed in the head, the other hands and legs swim across the water. Challenge Cup swimming confront, which is a form of armed forces to confront the Swimming Challenge race, swimming ring game can play against the number of people or as one of the dozens of people, both within the harbor to berth the vessel in the base camp, be the first to send one person to challenge the Other side to show their hands and splashing into the water, the other party has also sent a person to echo.

87.4 The Fishermen Folk Leisure Sports and Cultural Development Strategies

87.4.1 Develop Fishermen Scientific Literacy of Sports and Improves Fishermen to the Overall Physical

Sports Science literacy refers to people's sports knowledge, skills, attitudes and values of the sum [5]. High quality sports science helps people exercise their own sports participation and improves efficiency. The sense of fitness of fish farmers along the Bohai Sea deficient. Self-health evaluation and scientific exercise capacity is still relatively low, this low level of sports scientific literacy serious restricted the fishing village of sports development.

87.4.2 Increased Publicity to Raise Awareness of Sport Fishermen

Through various forms of publicity and launch a variety of channels, in the fishing village to create a range of fitness, to really reach household. Allow them to enjoy the fun and benefits which participation in the sports activities brings through improve the fishermen's physical fitness awareness and participation and stimulate their interest to participate in fitness activities and motivation.

87.4.3 Full Use of Marine Culture, and Tap the Potential of Folk Sports Fishermen

Fishing village of fishermen folk sports culture is an expression of marine culture, the contest is very rich [6]. Researches from geography, population distribution, economic development, lifestyle, traditions, and forms of activities in a bid to the fishing field trips, explore the collection of raw material. Screening projects by the research and formulating relevant rules and making a promotion.

87.4.4 Actively Organize the Fishermen to Carry Out a Variety of Sports Activities, a Rich Cultural Life in Rural Areas and Fisheries

Since reform and opening, the fishermen's living standards improved, their living conditions increased, the need for rich cultural, sports and entertainment events like city people to enhance physical and mental health [7].

87.4.5 *Multi-Channel Financing to Strengthen the Construction of Fishing Village Sports and Cultural Venues*

Increase the fishing village sports venues, facilities construction, and to basically meet the needs of fishermen, sports activities.

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Chapter 88
Research on Effectiveness of Bilingual Education Based on Element Analysis Method

Xiaohua Zhu

Abstract Bilingual education has played an important trance for social-economic development and transferring of information is the main point for study of bilingual education. But how bilingual education becomes effective and how to evaluate the effectiveness of bilingual education deserves our thinking. Scholars analyze from different levels of bilingual education, but most are based on the theories. This article makes analysis from the quantitative point of view, by means of element analysis of information to make the effectiveness of bilingual education research for students, and through a group controlled test a comparative analysis to better quantify the extent to reflect the effectiveness of bilingual education and to help students improve knowledge and capacity enhancement.

Keywords Element analysis method of infatuation · Bilingual education · Effectiveness · Comparative analysis

88.1 Introduction

In the stage of rapid development of economic globalization, Chinese education is with international standards from the basis of attention to education [1]. The means of education has always been of great concern to the community and the education. With such fierce social competition, we need to continue to recharge, but also continue to find and explore more beneficial and effective way to enhance students' knowledge and ability level. With the continuous improvement of information

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technology, education reform continuously push forward the improvement of the education curriculum, classroom integration, knowledge sharing and exchange, in order to provide a broader platform for students, teachers and bilingual education, and also to meet the growing demand of students and constantly enrich and personalized [2]. Bilingual education should encourage students to play the subjective initiative, constantly improve the content of classroom teaching and supplement and improve the efficiency of classroom teaching. The second is to enrich the classroom teaching, to cultivate the type of all-round development of society to society, international-type talent, but also for teachers and students of both self-knowledge and enhance the quality, and continuously meet the needs of the community. Academia for bilingual education is mostly limited to the analysis of the theoretical importance and necessity of bilingual education while making meta-analysis quantitative comparative analysis of the effectiveness of bilingual education, which provides more intuitive and more accurate comparative analysis of bilingual education help to help students improve their learning of knowledge.

88.2 Research Methods and Procedures

Element analysis method can also be referred to as the total analysis and meta-analysis, which is an approach to the analysis. This approach is about the scholars on the topic of research and analysis of literature and then statistics, then the process of synthesis and re-analysis, in order to achieve a more in-depth research on this topic and a more thorough understanding of and analysis. Meta-analysis methods in the education sector, the medical profession and the social sciences field range is a wide range of common applications.

Element analysis is converted to calculate the effect size index which is represented by d or r, also known as the Pearson correlation coefficient. The effect size formula is as follows (88.1) [3].

$$r = \frac{(M_E - M_C)}{S_C}, \; r = Z \Big/ \sqrt{N}, \tag{88.1}$$

It is the values obtained by the difference of test experimental control group and the control group divided by the control group to calculate the standard deviation. The standard deviation and mean, you can refer to significant test parameters z, t or F value, and to get the transformation of the formula to derive the value r.

The mean $\bar{r}$ of the effect size and the formula is as follows [4]:

$\bar{r} = \frac{\sum \omega r}{\sum \omega}$, $\bar{r}$ is the effect size after the weighted

$w = \frac{2N}{8 + r^2}$, w is the weights of each index.

Tests for Homogeneity effect size, and is shown in the following formula (88.2) [5]:

$$c^2 = \overset{\circ}{a}\,W(r - \bar{r})^2 \tag{88.2}$$

Element method is to retrieve literature for the theme of the first, and then filter the search results to retain the useful information and documents, data escrow and finishing the test results and quality assessment analysis. Finally, we make statistical analysis and evaluation. In this paper the experimental test to choose a university in the same grade students in two classes, bilingual education control group for a class students, and classes in the control group only mother-tongue teaching, and record the process of learning and performance results were analyzed. The prerequisite for carrying out the meta-analysis is as follows [6]:

In bilingual education courses, students should have similar students in the control group;

The difference between control groups and the control group should have statistical control and were randomly assigned to the control group and the control group;

The results must be based on standardized test scores in English;

The difference between the control groups should be determined by using appropriate statistical tests.

88.3 Test Experimental Results Analysis

Experimental tests were carried out under the two classes of students of the college the same year, selected 11 indicators to test research in order to meet the minimum standards of design quality. While carrying out bilingual teaching, at the same time, we carry out standardized tests [7]. The following English tests are English reading, English, mathematics teaching and Chinese test. The data list is in Table 88.1.

From the above table it can be seen that standard deviation and the rating scores of the Chinese test the effectiveness of bilingual education programs are ranked first, followed by an English test English reading than math scores in standard deviation score. But the standard deviation of the English tests and ratings are less than the reading of English, the Chinese test is much larger than the English test,

Table 88.1 Analysis results of bilingual education impact

	English test	Reading (English)	Mathematics (English)	Chinese test
Effectiveness standard deviation of bilingual curriculum	0.19	0.22	0.13	0.75
Z-score	2.42	2.47	1.66	3.54
p value <	0.05	0.05	0.1	0.01

Table 88.2 Element results analysis of bilingual education randomly assigned to control groups and normal groups

	English test	Reading (English)	Mathematics (English)	Chinese test
Effectiveness standard deviation of bilingual curriculum	0.27	0.42	0.16	0.93
Z-score	2.72	3.48	1.26	5.22
p value	0.01	0.01	0.20	0.01

and English reading is greater than the math. Less than 0.05 *p* value for the English test and English reading, English, mathematics teaching is less than 0.1, and the Chinese test is less than 0.01. Chinese test of the *p* value is the smallest, English; mathematics is the largest, which shows that bilingual education standardized tests have the standard deviation.

From the randomly assigned to study the valuation of benefits of bilingual education it can be seen that the standard deviation of the benefits of bilingual education programs and score are all showing the same ranking, the Chinese test in Table 88.2, followed by the reading of English, an English test came in third, and finally comes English and mathematics learning. P means English test reading in English and Chinese tests were 0.01, English, mathematics learning is 0.02. This has been changed relative to the test in Table 88.1.

It can be seen from Fig. 88.1 that the standard deviation of the control group and students were randomly assigned to have shown a clear upward trend, the largest increase in English reading, followed by the Chinese test, English test came in third, and finally is the English mathematics learning.

We can see from Fig. 88.2 that the students were randomly assigned to the control group and control group students' scores have shown significant changes, in addition to English, mathematics education scores showed a downward trend, several other upward trends, but the increase is substantial. The largest increase was the Chinese test, followed by the reading of English; English test is in the third place.

Fig. 88.1 Effectiveness standard deviation comparison before testing and after the random assignment
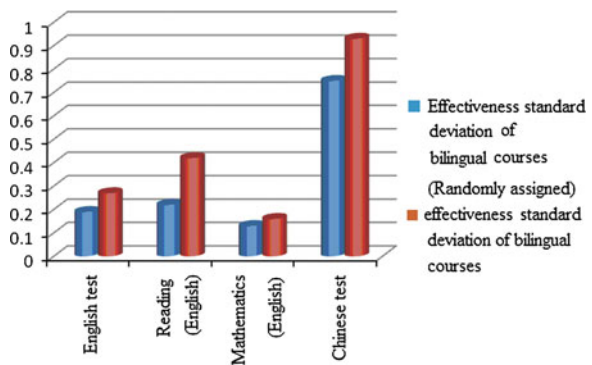
Fig. 88.2 Score comparison before test and after randomization
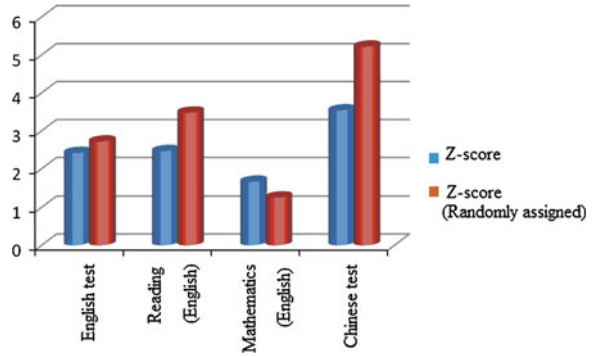
Fig. 88.3 *P* value comparison before test and after randomization
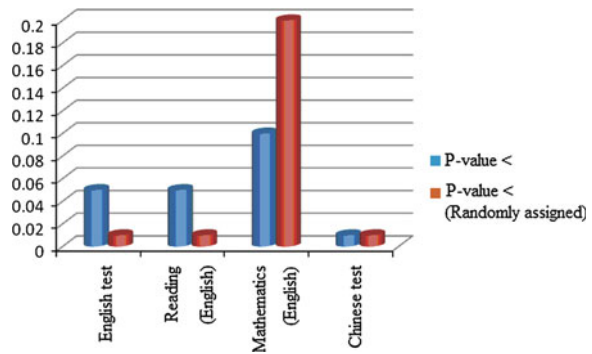
From Fig. 88.3 we know that the students were randomly assigned to the *p* value of the control group and students also have shown significant changes, in addition to English, mathematics education *p* value is an upward trend, several others showed a downward trend decline, and the decline of the *p* value is consistent with the *p* value.

It is obvious from the above three figures that the students were randomly assigned to the control group and control group students in bilingual education, and enhance confidence in learning, in addition to English, mathematics education changes inconsistent, reading achievement, the English test plays active role in this way, which is more conducive to bilingual education [8].

88.4 Conclusion

Bilingual education is generally the focus of attention of the community. Element analysis method has positive impact not only for these projects, but also can be widely expand the scope of the study, high-quality research design, and even greatly increased the confidence of the positive effects of bilingual education, and

education. From the test, we have come to the conclusion that bilingual education is in favor of mother-tongue teaching. Of course, multi-element analysis and element analysis are built on the basis of literature data extraction, the effective data extraction, analysis, and bias of serious flaws in study will lead to the results of the meta-analysis cannot predict or corrections. In addition, including research to meet minimum standards to identify deficiencies, we need further analysis and research.

Despite the relatively small number of studies, research intensity and the results are consistent, especially for high-quality randomized trials to increase the bilingual curriculum, additional English language standardized test scores to measure the effectiveness of education, education, and confidence. But how to design the curriculum of bilingual education, as well as a reasonable time, content and methods are difficult to resolve. They are important issues. The individual needs of the students are constantly changing, for the time being is not a simple ideal policy. However, if we want to learn more about how to solve the needs of students with limited development, the most effective way is to enhance the level of knowledge and English language proficiency. Thus, we need to conduct a series of experiments in which students were randomly assigned to different types of learning courses. These randomized trials produce clear and accurate information to help guide decision-making. The study is clearly from a few random experimental results showing that bilingual education is very useful. And we need further randomized trials to determine how best to design a bilingual curriculum to meet students' individual development needs as well as social and international demands for talents.

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Chapter 89
Culture Shock and Adaptation in Chinese Teaching

Xue Xiao

Abstract The economy and society of Liangshan Yi Autonomous Prefecture has been rapidly changing in the twenty first century. Owe to the policy of Western China Development, primary education of Liangshan faces more opportunities as well as challenges, but it is found that the particularity of Liangshan national education has suffered cultural shock. How to adapt to the changes of social culture and how to explore a better way to adapt Yi traditional culture are the keystones of developing Liangshan ethnic education. The paper mainly focuses on Chinese teaching in Yi rural schools to find sustainable developing ways of combining Yi traditional culture and modern teaching technology.

Keywords Yi people in Liangshan · Primary education · Culture shock · Culture adaptation · Countermeasures

89.1 Introduction

In new era, the Central Government made an important decision to vigorously implement the Western Development Strategy. It is a good opportunity for the west which has 6.8 million km^2 and many ethnic nationalities. However, the quantitative analysis for the quality of human resources of 30 provinces and regions in China showed that stoke of human capital in the rest provinces were lower than national average except Xinjiang and Shanxi [1]. Therefore, the key of western development is to develop ethnic education. But we have to face the fact

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that national living environments have changed over the years and their survival wisdoms inherited from their ancestors have faced great challenges. For education, various elements and conditions of the modern school education are extremely lacking in the national countryside. For example, the educational methods and innovation taken by many schools in Liangshan Autonomous Prefecture were on the basis of the educational theories and ways of west counties, and educational experience of China eastern cities. However, when learning and completing these theoretical approaches, they focused too much on the operation and formal level and tended to ignore the social and cultural values hided behind these theories and methods, which resulted in the embarrassments of Liangshan ethnic education. So the key to break through the bottleneck of Liangshan ethnic education is to explore how to adapt to social changes and how to find a local mode to adapt to Yi traditional culture. In view of the reality, the paper investigated Chinese teaching of a primary school of Dimo township of Zhaojue County to research for the development of Liangshan ethnic education.

89.2 Culture Shock and Cultural Adaptation

The concepts of culture shock and cultural adaptation must be made clear before we discuss about Liangshan ethnic education.

Culture shock means that travelers or local residents feel a special kind of anxiety and stress when they enter a different culture field or destination, or local residents contact with foreign culture. During World War II, a large number of immigrants left to a new county. They moved to a new cultural background. There were many cross-culturally social and psychological problems. And then, the word of "Culture shock" came into being.

Culture shock can be of various factors, such as climate, diet, language, dress, behavior, population density, political and economic environment and so on. There are both physical and mental factors [2].

Cultural adaptation originally referred to the harmonious development of human culture and the environment in a specific environment. Redfield and Herskovits (1936) thought that cultural adaptation would appear with a continuous contact with people of different cultural groups and the changes of the original culture type.

Berry, a cross-culture psychologist, thought that the attitudes of cultural adaptation always have changed in the range of agreement and rejection to a strong culture. He believed that there were four adaption strategies: assimilation, separation, integration and marginalization [3].

Therefore, the paper will pay more attention to the performances of culture shock and cultural adaptation in primary education in Liangshan. We need to know how to make a reform of educational culture and with what kind of cultural resources to fit national education, rather than demolishment and replacement. In

essence, the adjustment or reform of national education in Liangshan is a gradual process of cultural change.

89.3 Survey of Primary Education in Liangshan

89.3.1 Current Situation on Surveyed School

Liangshan Yi Autonomous Prefecture is the largest area of Yi people in China. It is located at the junction of Sichuan province and Yunnan province. There are 60,000 km^2 areas, 16 counties and more than 10 minorities, such as Yi, Tibetan, Mongolian, Naxi, Lisu, Hui and so on. In the end of 2010, the household population is 478.94 million including 236.63 million Yi people, about 49.41 % of the total population [4].

Zhaojue County is the largest Yi settlement in Liangshan. Dimo township is located in south of Zhaojue County and 32 km away from the county. It has 72.54 km^2 and 17 villages. It is a typical Yi inhabited township [5].

There are 16 full time teachers in Dimo Central School and all are Yi people. There are 6 grades and 8 classes. The total student number is 423, including 123 girls who account for 29 % of the total students. The dropout rate of girl students is very high. For example, there are 50 girls in the first grade, accounting for 41.6 % of the total students. However, there are only 5 girls in the 5th grade accounting for 11.1 % of the class. There are 20 students in the 6th grade and all are boys [6] (Table 89.1).

89.3.2 Current Situation of Chinese Teaching in Dimo Central School

Dimo Central School is a typically Yi primary school. Although the school attaches importance to Chinese teaching, the students' Chinese achievements are not good. We focus on Chinese teaching of the 4th grade. According to the survey, the

Table 89.1 Student numbers in each grade of Dimo central school

Grade	Class	Student number	Girl student
Grade one	2	120	50
Grade two	2	131	39
Grade three	1	46	9
Grade four	1	61	20
Grade five	1	45	5
Grade six	1	20	0

average score of Chinese is 63 at the first semester of 2009–2010. The highest score is 92 and the lowest is 34. The average score is 61 at the second semester. The highest score is 91 and the lowest is 46.

89.3.2.1 Students' Self-Diagnosis

Overall, most of the students think that Chinese is the most difficult subject to learn. As for Chinese, Math and English three subjects, 64 % of 61 students in the 4th grade like learning math, 22 % are Chinese and 16 % are English.

It is found that most of students have clearly known these specific difficulties. Although they had different opinions, there is an internal logic as the following: (Table 89.2).

It shows that the questions on the left are put from students' absorption and coherence perspective, and the questions on the right are from students' rumination and externalization of knowledge perspective [7]. In essence, students are confused with learning methods both inside and outside angles.

This phenomenon can be explained with Barry's "Cultural adaptation mode". These students as their culture chargers can use easily their mother tongue-Yi language. However, it is difficult to absorb Chinese and Chinese culture. Without the pressure from teachers and school, they might come back to their Yi language world. So, they are often in the conflicts of two educational cultures (Table 89.3).

89.3.2.2 Students' Learning Attitudes

It is also found that another feature in students' Chinese learning is they are not enthusiastic for learning. 151 students from grade three, four and five were investigated. The results of survey showed that only 33 % students had interest in Chinese, 58 % students learned it just only as a subject arranged by school, 9 % students believed leaning Chinese is no use because they can speak Chinese.

Table 89.2 Specific difficulties of students in learning Chinese (double counting)

Questions	Percent (%)
Don't know how to learn	34
Don't understand grammar	13
Phonetic transcription isn't good	13
Don't understand what teachers said	7
Don't write a composition	27
Don't understand exercise problems	3
Don't understand reading	7
Don't remember words	24

Table 89.3 Multiply reflection of learning attitudes

Attitudes	Percent (%)
Don't work hard	69
Learning methods are not good	39
Pay no attention to it	26
Foundation is no good	22
Having no interest	11
Too difficult	11
Teachers' teaching is no good	3
Spend little time	19

89.3.2.3 Teachers' Attitude Towards Teaching

The teachers generally have the following opinions:

Firstly, even though students are aware of the importance of learning Chinese on their minds, some students still emotionally perform the passive adaptation to Chinese and Chinese culture.

Secondly, it is very difficult to learn Chinese for the Yi pupils in Liangshan because their Chinese books are written with national unify and the Yi pupils didn't understand the content of these texts that do not meet Liangshan reality.

Thirdly, most students' parents do not attach importance to the teaching of Chinese because they cannot speak Chinese or only speak little Chinese. Therefore these students cannot get any guidance and practice relate to Chinese from their homes.

Fourthly, students are not enthusiastic for Chinese learning. Many students believe that it is enough to make a daily conversation in Chinese so that they are not interested in the Chinese grammar and syntactic construction.

At last, some students have the feelings of recession and resentment because they did learn well at the beginning of Chinese learning and then later they can not keep up with other classmates.

However, individual teachers also believe that schools and education departments do not consider the actual situation, rank blindly just by the final examinations scores and link between teachers' allowance and the students' achievements. These conducts would decrease teachers' working enthusiasm.

But we found a fact that was deliberately concealed by the teachers: for years, teachers have used the same curriculum standards and teaching methods to teaching Chinese. At the same time, different attitudes to the students with good scores and the students with poor grades have affected the students' learning enthusiasm.

Another reason may be not aware by the teachers: the teachers also face the culture shock and cultural adaptation. For these Yi teachers, the educational ideas, activities and evaluation needed by a new education culture are very different from the traditionally education philosophy and activities they have already had.

Many teaching staff and teachers have many puzzles in the teaching process. They don't understand clearly and grasp scientifically the characteristics of Chinese teaching after it was innovated.

89.4 Attribution Analysis on Low Achievements of Chinese Learning

89.4.1 Defects in Implementing Process of Educational Policies

With the implementation of the "10 years plan of education" in Sichuan province, 113 primary and middle schools were expanded and 34,000 new boarding students were increased in Liangshan [8]. However, we found there some problems existed behind these achievements: on one hand, teaching evaluation system was one piece. All of the courses in most urban and rural primary schools were judged by students' learning achievements. Schools and teachers paid more attention to the examination results rather than learning process. On the other hand, great difference between cities and villages were ignored. As well as educational culture conflict between Yi and Han were neglected.

89.4.2 External Environment

The students of Dimo Central Schools are Yi nationality. They are deeply affected by Yi language and culture and are familiar to learn Chinese with Yi's thoughts. Therefore, it is very difficult to teach for teachers and to learn for students.

Due to local economic conditions, the majority of students' families have less income and their parents are less educated. Many parents can only speak Yi language without understanding a word, which leads these students can not get more information and knowledge about Chinese from family.

Dimo Central School is located in remote village and has no enough funds to develop local education. The school is lack of language lab, computer room and other basic facilities to adapt to the educational reform.

The team of Chinese teachers is relatively weak. Parts of them were Yi language teachers previously and worked as Chinese teachers in a short time. They have no professional training so that there is a gap between these teachers' qualifications, knowledge structure and students' needs.

After the implementation of education reform, schools and teachers have too much emphasis on the teacher-student classroom behaviors, such as participatory study, cooperative learning, and independent study and so on. Certainly, there are some important standards to evaluate these classes, and even setting some rules about the teaching time for teachers and the self-learning for students.

89.4.3 Students' Own Factors

Chinese as a second language is very difficult to understand for Yi students. During the learning process, Yi students are mostly influenced by their mother language-Yi language. And then, culture conflict certainly appears. Therefore, time is needed for Yi students to adapt to Chinese and Chinese culture.

Some students do not find suitable methods to learn Chinese. Many students rigidly follow the teachers' instruction or blindly imitate other students. Certainly, their learning achievements are not good.

Some students dropped out of school and work outside the home because of economic pressure. Some students are affected both their study and their emotions although they are still at school.

89.5 Countermeasures and Suggestions

Respect for diversity and specificity. We must respect the diversity of national culture and specificity and flexibility of teaching approaches, take into account the improvement of external environment and the improvement of internal quality of Yi students, and pay attention to the details of teaching design. After all, our education reforms and curriculum reforms don't simply transplant the modes of western or urban education. We should make these reforms blended into the local education culture in Yi areas.

Local education department should improve the teaching conditions, strengthen the education investment. Schools should improve the students' living environment and the teaching facilities.

Increase the training of Chinese teachers, improve the treatment of teachers and establish a stable, high quality teaching team of Yi-Chinese bilingual teachers.

Improve Chinese teaching methods, strengthen communication of teachers and students, emphasize psychological counseling for Yi students, and stimulate students' intrinsic motivation to learn Chinese, cultivate their self-monitoring capabilities and enhance the guidance of Chinese practice.

Reform the single evaluation system and standard, work out a new multi-index system according to the current situation of Yi students and Yi areas.

Create a good environment for Yi students to speak Chinese. School should require all students and teachers to speak Chinese in the school, increase the opportunity of communication between teachers and students and create a good climate to speak Chinese.

89.6 Conclusion

It is a long way to teach Chinese in Yi areas for the diversity and national feature of ecological and cultural environment in Liangshan. So we should adhere to the new concept of development which emphasizes the integrity, internality and comprehensiveness of the development [9].

From a socio-cultural point of view, the essence of education reform is cultural integration and cultural changes based on the outstanding cultural elements, local culture and national culture. Therefore, we should not only follow the universal law of Chinese teaching but also explore a unique way of Yi education, not only consider Chinese' influence but also have to consider the adaptability of Yi culture, not only think about individual differences but also attach importance to the overall effects, not only pay attention to the results but also emphasize the process. Only in this way will Chinese teaching in Liangshan make a success, meet the developing needs of Liangshan society and economy, and sustainably develop the ethnic education of Liangshan and Yi traditional culture.

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Chapter 90
Research of College Chinese Language and Literature Curriculum Location and Reform

Yijie Wang, Hong Yan and Zhongzhi Han

Abstract With the increasing expansion of university enrolment and employment pressure, the university curriculum reform is imperative. College Chinese language and literature, as a non-Chinese major public course, plays an important role in improving the student's cultural cultivation and the humanistic spirit. But currently, many colleges don't pay enough attention to college Chinese language and literature. They divide the college Chinese college language and literature into brink curriculum. And these make the college Chinese language and literature locate inaccurately in the curriculum system. This article will locate the college Chinese language and literature correctly, and analyze the question and solutions of its reform. This is the problem the college Chinese language and literature must face, and also current academia research priorities and hot spots.

Keywords College Chinese language and literature · Curriculum location · Curriculum reform

90.1 Introduction

College Chinese language and literature is an important basic public course in the college curriculum system. And our country quite values the college Chinese language and literature. In 2006, the college Chinese language and literature was set as a required public course in the curriculum system. In 2007, the Division of Higher Education explicitly issued a document requiring all colleges to strengthen the college Chinese language and literature reform, in order to promote the current

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social needs [1]. However, in actual operation, there are still many difficulties, such as: too much disordered textbook, old-fashioned contents, the students' wide quality gap is and a range of issues. This requires schools pay enough attention college Chinese language and literature to make a solid backing to promote the reform of it [2].

90.2 College Chinese Language and Literature Curriculum Location

Since China's reform and opening up, college Chinese language and literature course had been offered in universities, but the specific location of college Chinese language course and the effect in the growth process of the students is the problem must be considered by the educator [3].

90.2.1 Location of College Chinese Language Course Nature

90.2.1.1 Basic

College Chinese language course characterized as a basic course is the foundation of learning other courses. Its play a very important role in developing students' potential and talent. For our daily life and work, Chinese language is ubiquitous; in every corner of society existing language's shadow. Chinese as the mother language of us, we need to have a solid literary foundation, and we cannot pay all our attentions on English, after all, in future work the probability of the use of Chinese is much greater than English [4].

90.2.1.2 Instrument

Secondly, we can say for College Chinese is the carrier of the study and work is one of the most commonly used tools. For university language courses, make the students to thinking in the learning process.

90.2.2 Humanity

Through the teaching of college Chinese language courses to let the students know the value and meanings of life, embodies the fundamental spirit (humanistic spirit) reflect by the human culture in the students' life and future work.

90.2.3 Aesthetic

China has 5,000 years of civilization; the Chinese culture is profound, students understood the artistic conception of Chinese poetry, novels, plays, essays and other outstanding works in Chinese learning process. Thus my heart branded on the imprinting of the Chinese culture, to deepen the love of the motherland.

90.2.4 Location of the Type of College Chinese Language and Literature Course

The type of the current university courses is mainly composed of three parts, namely: the theoretical foundation courses, professional skills courses and humanities courses. Of college Chinese course, it belongs to the theoretical foundation course is the requisite course of improving the students' artistic appreciation, at the same time college Chinese language course as the required course in the university course system.

90.2.5 College Chinese Language and Literature's Functions Location

The language is a nation's unique culture is the soul of a nation. Through Chinese courses learning to let the students to further sublimation of the spiritual life, broaden their horizons. The main function of universities open college Chinese language courses reflects in the following areas.

90.2.5.1 Cultural and Spiritual Continuity

The Chinese nation for thousands of years of development continues to this day, its excellent traditional culture through the language convey to students. Chinese combine the realm of life with social experience, the aesthetic realm and character, by the transformation of the language, you can see that a person's heart activity and psychological state. The Chinese language has become an effective bridge of cultural and spiritual continuity. The construction of socialist spiritual civilization requires the national people follow the guidance of the socialist theory to form a correct outlook on life and world view, to build China into a prosperous, democratic and civilized socialist power nation.

90.2.5.2 Culture Quality Exemplification

The person's culture quality is not only reflected in the high level of professional skill, operating skills, the most important in a person's body reflects the comprehensive ingredients of literature, history, philosophy and art. The college language course is such a comprehensive theory course.

90.2.5.3 Rational Think Ability

College language course learning, to enable students to understand the meaning and the purpose of life. Through thinking of excavating human nature, then formation of constant progress, the courage, it will pursue the perfect personality.

In China, in the learning process, from elementary school to junior high school, then high school, the Chinese language has been essential to the core curriculum; Chinese language scores directly determine a student's final ranking. But in the University, with the carrying out of professional courses and English, the emphasis on language is gradually weakened. Among students, a great part of them are considered the Chinese language is a non-essential course, especially in science and engineering professions, this phenomenon is more prominent. This is caused by many reasons; on the one hand, many people cannot find the indirect relationship between language and employment. Chinese languages good or bad, does not affect employment; on the other hand, school teachers and students unable to fixed college language accurate positioning, integrated a variety of reasons, resulting in the neglected of college Chinese Language.

90.3 Problems of College Chinese Language and Literature Curriculum Reform

A curriculum reform needs to go through a difficult process, the education sector forms a same ideology from top to bottom, and the current reform of the college language courses faces the following question.

90.3.1 Classes Arrangements is Still in Dispute

The teachers and students have approved college Chinese language as a compulsory public basic course, but class arrangements are still in dispute. Some people believe that student learning the language courses from elementary school to university already a dozen years, before the students come into university, they put a lot of energy into the language course study, and the foundation has been

quite solid. The university should focus on specialized courses and skills training. College Chinese only arrange few classes, to let students' ideological have time to relax. But some people believe that the reason why the students' overall quality is not higher is because the college Chinese class arrangement too little. Students can not well understand the content, and the purpose of teaching is not reached.

90.3.2 Vague Curriculum Location

For the college language courses teachers, they can only offer suggestions on curriculum reform, but they do not have the decision-making power of overall reform. In the current employment-oriented activities of university teaching, the school leadership is undoubtedly taking an indifferent attitude to the languages, the positioning of the college language courses is not clear.

Many universities not attach importance to the college Chinese language course; the attitude of the university language teaching workers has also undergone a transformation, not much communication between each other, teaching college Chinese is purely the tasks of a complete class, over time teaching effect can be imagined.

90.3.3 Messy Content

At present, the content of the university language courses, universities also do not have an unified standard, basically according to the situation of the school class-room teachers, taught their own teaching materials. The purpose of its teaching is not clear; the teaching of the content is relatively messy. After learning, the students do not know what the final purpose of the study is. For the teachers, many of them are based on their personal preferences, content is messy in class, and does not have an unified standard, is very difficult to improve the quality of students.

90.3.4 Evaluate System is Imperfect

At present, many schools after completing in the college Chinese language courses, the final examination is through an article or impressions of an assay to determine students' final results. Many students after the completion of college Chinese, to the contents of which do not have much feeling, and finally write their own treatise through a network or learn from someone else's paper, the results achieved good scores. Let usually do not study hard, or even absent, late students are exploit an advantage, but also to combat a studious hard student.

90.3.5 Single Teaching Mode

With the reform of professional courses, more and more professional teachers started to use the network, multimedia, and other modern tools, language teaching in a long time, our focus on reading, repeating and thinking, but the cause of the less lessons, most of the energy concentrated in the read and remember, so that in the teaching and learning activities teachers use spoon-fed education model, this single teaching mode, unable to mobilize the enthusiasm of students.

90.4 College Chinese Language and Literature Curriculum Reform

College Chinese courses are responsible, open and free courses. It is a discipline which provides special language skills and communicative competence for a career. In the process of learning the language should no regard as a separate course, should combine with student future life, learning and working. Enable students to understand the charm of the language, to stimulate the enthusiasm of learning. College Chinese combines with the current education to realize its own value. Reforming can start form following aspects.

90.4.1 Well Defining Goals

After Students entering the university, the college Chinese language and literature is brunt to culture students' humanistic quality. At present, China advocates the whole people humanities quality, and the college Chinese language and literature plays a key role. Therefore, the target of college Chinese language and literature teaching is to raise the students' humanistic quality level.

For the promotion of Chinese language in the world, the Chinese hot has formed a global scale. But in China where takes Chinese as mother tongue, we did not form a good and model language environment of Chinese which is impelled to say that is a big failure of the education. To the university, the students will ultimately enter society, if students in every school can be cultured to use a rich, subtle, elegant artistic expression to describe people and things around, then our society will become more beautiful.

Now, college Chinese language and literature doesn't get enough attention. The teachers as first-tier of language teaching must act firstly, and profoundly comprehend the training goals and plans of students in their teaching major, to penetrate the teaching program into them. To enable students to understand the role played by college Chinese language and literature course in their major area when learning college Chinese language and literature. In college Chinese language and

literature class, it also needs to let students understand the content of social knowledge, customs culture, and occupational culture, in order to have a clearer understanding of career planning and literacy.

90.4.2 Crossover Mechanism

In college Chinese language and literature teaching, many are bringing some classical or beautiful prose which did not be taught in high school to analyze directly. This model is separately for learning, and it is difficult to resonate among students. In many schools, such a phenomenon happens that teachers are enraptured above, when students following are drowsy. China's Academy of Engineering Lu Yuxiang considers: if a course depends on its own discipline knowledge only it won't go deep research. In the learning process, to make curriculums into crossover study, it can better find solutions to problems.

90.4.3 Building Knowledge Networks

In the learning process, we should not only see the point, but spend more focus on the surface, even the whole body. To understand the relevant knowledge as much as possible, we can have a more profound understanding of this course. Therefore, in the reform of university language courses, building the college Chinese language and literature knowledge network is a very important part.

90.4.4 Interactive Teaching

Allow students to participate in the curriculum, rather than just a listener or viewer, but to be the organizers and participants of the teaching activities. Change the teaching methods in the teaching process, teachers and students are an equal and collaborative relationship, students in the process of learning to express their opinions and views, to maximize the mobilization of the students' enthusiasm, thereby strengthening the enthusiasm for language learning.

90.4.5 Strengthen the Teaching Resource

Teachers of college Chinese language and literature should often actively communicate, Brainstorm for the development of college Chinese language and literature, and form a specialized research team of college Chinese language and

literature. They should strengthen their own training and improve their standard of teaching and business by holidays training, study and discussion, and lectures.

90.5 Summary

This paper studied the college Chinese language and literature courses. Firstly, it amply analyzed the current status of college Chinese language and literature courses from three aspects of nature, type and function to locate it; secondary, analyzed and described the problems of the current reform of college Chinese language and literature course; finally, gave the college Chinese language and literature direction of the reform and some specific solutions. Due to the length of the article and the level of myself, the problems encountered in the reform and solutions for college Chinese language and literature courses are not perfect. The majority of the college Chinese language and literature teaching workers please give criticism and correction. I hope we work together, to make college Chinese language and literature course reform more comprehensive, do something for our country's higher vocational education, and train more talents.

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Chapter 91
Research on English Autonomous Learning Ability Training of Vocational Students

Qizheng Mao and Jing Lu

Abstract At present, Chinese-foreign cooperatively-run schools projects are increasing, but students' English comprehensive ability in the projects fail to meet the demand. Especially the students' initiative, such as learning motivation, learning effectiveness, and learning methods and so on, can't be fully used to improve their English learning ability. Therefore, this paper studies the status quo of these projects, makes investigation and analysis on the problems in the process, establishes related mathematical model and analyzes through mathematical statistics law to improve students' English proficiency, in order to provide reasonable methods to improve students' English autonomous learning, and to further improve the developing capacity of the Chinese-foreign cooperatively-run schools.

Keywords Chinese-foreign cooperatively-run schools · English ability · Independent study

91.1 Introduction

Now, along with the more frequent international cooperation, the trend of the Chinese-foreign cooperation in running schools becomes more and more compact. Utilizing overseas high-quality teaching resources, learning foreign university teaching and good management experience, training more excellent talents for our country and increasing students' future working ability have great significance.

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Now many researchers didn't agree on the learners' autonomous learning ability. Some people think autonomous learning ability is independent learning, including learning plan, perseverance control and evaluating their learning effect [1]. They also should bear the responsibility, such as knowing what to learn and how to learn. Therefore, autonomous learning is a kind of behavior ability, with which learners must have strong and spontaneous learning goals and use the right learning methods and strategies [2].

91.2 Model Design and Research Methods

We conduct the analysis by establishing mathematical model of vocational students' English autonomous learning ability in Chinese-foreign cooperation in running schools and using the mathematical statistics method. And through investigation and analysis of the cultivation of students' autonomous learning ability from several aspects, such as intrinsic motivation, learning motivation and the external efficiency and learning strategies of the learning ability. And the learning strategies contain three categories: cognitive strategy, metacognitive strategy and resource management strategy [3].

Therefore, in the established survey data model, we made further analysis on vocational students. First, we visit and build each student's English learning levels database among vocational students. Their English test scores have three categories: high group, low group and ordinary group, used to represent each student's English level. And then use the mathematical statistics method, the analysis of variance, correlation analysis and T test methods to investigate of the students' data (Fig. 91.1 and Table 91.1).

91.3 Data Analysis

According to investigation analysis, we found that vocational institute students' English level has the correlation with their own autonomous learning ability, and at the same time, students in different English levels' autonomous learning ability

Fig. 91.1 Vocational students' learning factors proportion
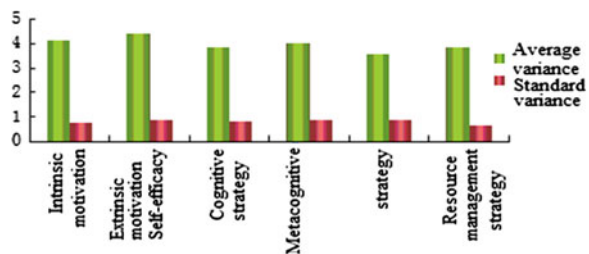
Table 91.1 Vocational students' learning specific parameters

	Intrinsic motivation	Extrinsic motivation	Self efficacy	Cognitive strategy	Metacognitive strategy	Resource management strategy
Average variance	4.1532	4.3933	3.8649	4.04	3.56	3.84
Standard variance	0.783	0.866	0.833	0.879	0.889	0.666

Table 91.2 Correlation between English level and autonomous learning ability

		Autonomy learning	Learning motivation	Learning strategies	Language level
Peel sun related index (r values)	Autonomy learning	1	0.883	0.953	0.560
	Learning motivation	0.883	1	0.716	0.484
	Learning strategies	0.953	0.716	1	0.549
	Language level	0.560	0.484	0.549	1

Fig. 91.2 Trend of learning motivation, learning strategies and language level of students' autonomous learning
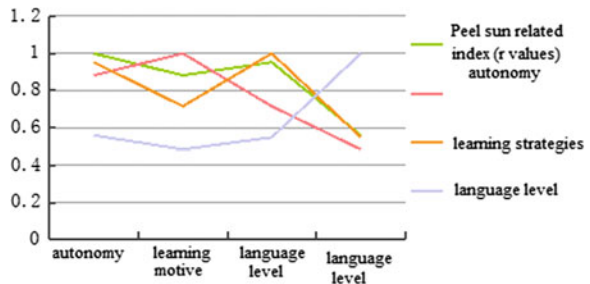
are different. Then we will make an analysis of the factors of all the students' autonomous learning English ability [4].

Table 91.2 and Fig. 91.2 obviously show that vocational students' independent learning ability is affected by English level, learning strategies and motivation.

From Table 91.3 we can see that the high group and low group students' autonomous learning index have very big difference: high group student's independency, learning motivation and learning strategies are around 3.5 in average, showing a strong independent learning ability, but low group students' learning motivation is 2.8, showing the students have a strong motivation, but the corresponding autonomy and learning strategies is 2.4, meaning that these wrong learning methods and strategies correspondingly restricted the enthusiasm of study, which leads that these students are not very willing to actively participate in the study [5] (Fig. 91.3).

Table 91.3 Students' autonomous learning difference in high group and low group

1 = high group 2 = low group		Average value	Standard deviation	T value	P value
Autonomy	1	3.4729	0.5743	6.564	0.000
	2	2.4536	0.4356		
Learning motivation	1	3.5435	0.5879	5.434	0.000
	2	2.8654	0.4536		
Learning strategies	1	3.5436	0.6543	6.436	0.000
	2	2.4356	0.5357		
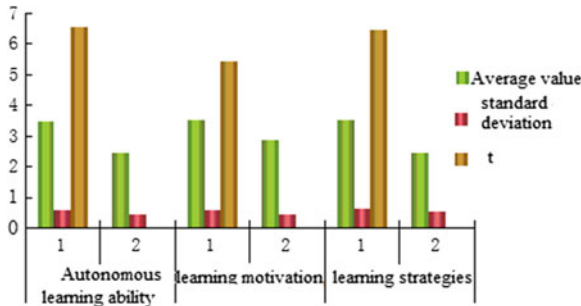
Fig. 91.3 Descriptive statistics value of the students' autonomous learning ability, learning motivation, and learning strategies

Table 91.4 Learning motivation differences in high group and low group

1 = high group 2 = low group		Average value	Standard deviation	T value	P value
Intrinsic motivation	1	4.4739	0.5744	4.424	0.000
	2	3.4546	0.4456		
Extrinsic motivation	1	4.5445	0.5879	3.354	0.000
	2	3.8654	0.4546		
Self-efficacy	1	4.5446	0.6544	5.356	0.000
	2	3.4456	0.5457		

From Table 91.4, high group and low grouping students' motivation indexes of study have great differences: high group students' internal and external motivation and self-efficacy strategy were in the average around 4.5, which means these students are with a strong learning motivation, and have high efficiency in the learning. Although low group index was significantly lower than the average of these high group students, these indicators were all above 3.4, and it shows that these students have strong learning motivation and self-efficacy [6] (Fig. 91.4).

From the Table 91.5 we know that there exists significant difference among cognitive strategy, metacognitive strategy and resource management strategy in the high group and low group: the index of the high group is more than 3.0 in average, and cognitive strategies have the highest average, but it's only 3.4838,
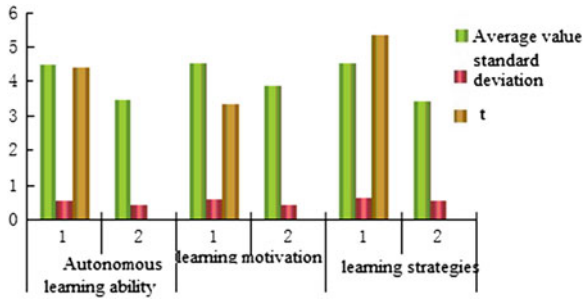
Fig. 91.4 Descriptive statistics value of students' learning motivation and self-efficacy

Table 91.5 Learning strategy differences in high group and low group

1 = high group 2 = low group		Average value	Standard deviation	T value	P value
Cognitive strategy	1	3.4838	0.6354	4.620	0.000
	2	2.5536	0.9356		
Metacognitive strategy	1	3.4375	0.7372	6.467	0.000
	2	2.1653	0.7543		
Resource management strategy	1	3.0444	0.6245	3.563	0.000
	2	2.5452	0.5259		

Table 91.6 Correlation between gender and study background and the ability of autonomous learning

		Autonomy	Language level
Study background	Peer sun related index (r values)	−0.053	−0.104
	P value	0.000	0.000
Gender	Peer sun related index (r values)	0.236	0.393
	P value	0.012	0.000

and low group is between 2.0 and 2.5, which reflects either high or low study group, the cognitive strategies strategy, metacognitive strategy and resource management strategy were not strong, and it also fully explain the students need further strengthening in learning strategies, improving their cognition, metacognition, and resource management strategies, and constantly improving their learning strategy, effectively improving their study method and learning level.

From Table 91.6 we can see the correlation between vocational students' learning study background, gender and the ability of autonomous learning autonomy and language level index factors is not obvious. This also shows the

Fig. 91.5 Descriptive statistics value of students' learning motivation factors
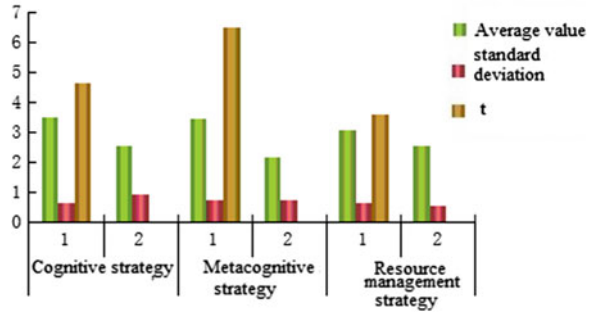
students' autonomous learning ability is mainly relying on their own learning method and constantly trying to learn on their own (Fig. 91.5).

91.4 Conclusion

With the continuous development of internationalization, in today's competitive society, we need to constantly strengthen our own English autonomous learning ability, so that we can go out of the country and realize internationalization development. And for higher vocational students, they should have enough learning power, strengthened self-efficacy, cognition, metacognition, and resource management strategy of learning strategies, so that they can keep enough power to actively raise the consciousness, strengthen English autonomous learning, to make full use of the existing Chinese-foreign cooperation in running schools project, and they can be involved in the project, practice learning in consciousness and action to strengthen independent English learning, so as to realize the aim of Chinese-foreign cooperation in running schools, and also can constantly cultivate the students' English self-learning ability, improve the English of vocational students.

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Chapter 92
Study on University Literature Teaching Based on Multimedia Technology

Yanhui Zhang

Abstract Currently, the multimedia language teaching has gradually entered the university, the old and the young program, and gradually plays a great charm, and gradually influence and change the traditional language teaching. Multimedia is a new technology lived in a simple or synthesized form shown by the text, the graphics, the images, the animation as well as audio, video and other information, which processed through the computer's software and hardware. I apply this new technology in teaching that's the multimedia teaching.

92.1 Background

The multimedia teaching system includes two major components: the hardware and software, the hardware including multimedia computer large screen LCD projector, slider DVD video camera, video display, wireless amplification equipment; Software, including courseware and multimedia network support software, etc.

When we use the multimedia technology optimization university language teaching, we need to need teaching and learning model, give full play to the advantages of multimedia, in order to achieve the teaching process optimization. Next, the many years of experience in language teaching, the use of language, to discuss their college teaching of multimedia teaching in some feelings and

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experiences. Literature has its logic structure, such as "evidence/conclusion/ hypothesis", "necessary/fully", etc.

Grasping the knowledge of logic laws, especially the logical Reasoning laws, is an effective way to understand the literature, to defend what is true and to attack what is false, and we must Try our best to grasp it and use it freely. Many scholars have studied this problem and proposed some theories [1–4]. These studies have significance for the literature teaching and studying. But, we have a long way to go. In order to find an effective way to understand the literature, seven logic laws used in high frequency were analyzed and their functions were pointed. The rest of the paper is organized as follows. First, the importance of logic reasoning was analyzed. And then, seven laws of logic reasoning were pointed out. Finally, the significance of the study was introduced. If the major premise and the minor premise are true, the inference, or conclusion, has got to be true, for the inference is logically valid. Logical validity, however, is not the same thing as empirical truth [5]. Syllogistic reasoning, in short, is no sounder than the premises upon which it rests. It is not hard to make mistakes—called fallacies—in getting from premise to conclusion. In most arguments the rigid form of the syllogism will be replaced by a more fluid prose, and here and there a premise or an inference may be omitted for economy [6]. Under these conditions fallacies are especially easy to commit. Finding these fallacies is an effective way of attacking the ideas of others in reading. It is a fundamental law of logic that if a is true, a cannot be non-true. All this seems very obvious; yet in more subtle matters a writer can easily contradict himself without realizing it. To be sure that he has not, he must examine, not only his argument itself, but also all the assumptions while lie beneath it and all the implications, which lie within. For reader, this theory provides an effective way of attacking the author's ideas.

92.2 Choice of Courses Contents According to the Multimedia Characteristics

At present the multimedia teaching is not the variation of the classroom, also imitate books, it is just a auxiliary teaching method. Therefore, we should choose content, is abstract, is far from student's life, also not familiar with the students also not easy to understand. For example, when I teach China fourth volume five unit "art appreciation", based on the traditional teaching mode, and even if the teacher in his mouth, can't make these achievements, engineering students lack the art (I teach of mechanical engineering students understand the calligraphy, painting, sculpture, music, elegant the essence of art. So I have to use the multimedia teaching, lets the student increased vivid visual image (such as: master of calligraphy, painting, sculpture, painting, the famous dance, video, etc.) superb moving melody (such as broadcasting the world classic VCD, CD, magnetic tape, etc.) trundle blackboard writing [7], broadcast design convenient nature Chinese

calligraphy and paintings of the art world, the connotation of clear feel art, to a certain extent, to appreciate.

In the process of teaching, teaching content play a very important role in the whole course, so the final results of the theme of the water.

92.3 Selecting the Instruction Media for Class Teaching

The content of the course is built, should choose appropriate teaching media carefully, the optimization of the multimedia group formation. Generally speaking, besides computer aided infusion (CAI) can't do without a computer and LCD projector, but not all of the multimedia course need computers to the projector and other important strength, sometimes only one or two instruments, still can obtain a multiplier effect. When to first volume fourth class in college Chinese language and literature "very happy", in this paper the language features artistic characteristics and art in the string of simple, I to make the students like the horse of debris recorder snail crosstalk. The students think laughter comic art charm, obtained the appropriate teaching effect. Be like again, in the fourth volume "thunderstorm" unit of the game, because the time is far work reflects our, choose to enter text is also central (act two games). With the main body of work represents the abyss script itself, and very complex characters relations, therefore, students can't find the feeling of a kind of, began to don't know where to begin. I borrowed movie "thunderstorm" VCD, radio, and make students understand the complexity of the relationship, usually scripts mission scenarios, help students to analyze and understand the text.

92.4 Fully Relying on the Media and Optimize Teaching

If we use the advanced equipment unreasonable, are not careful designs each multimedia teaching courseware, after entering the multimedia classrooms, is only demonstrates each kind of equipment for the student. Just to show students for a variety of devices. One class gets down, probably scramble command of a large number of classroom machines, the students had a handful of dazzling high-tech to addiction, the results of key and difficult points unknown, hard to achieve their teaching. Therefore the teacher should strengthen self-cultivation, we must have a strong solid foundation of traditional language teaching, but should also master the multimedia technologies, understood fully each same equipment's superiority, so as to compose a vivid effective multimedia teaching class.

For instance, when I taught "Butterfly Lovers Elegy on the Strings-Violin Concert" (Book IV lesson V units), and after careful preparation, to understand the meaning of this general basis, first, I used the Power Point software manufacture teaching flow chart, mainly include (1) music appreciation knowledge, characteristics, process;

(2) The key. Point the difficulty of this article; (3) the structure level of this article; (4) the artistic feature of this article; (5) violin concerto artistic feature and so on. To the above entered into the computer, to prepare for the teaching of this lesson. In the class, I first play the movie "Butterfly lovers" clip, and accompanied by concise explanations, to enhance the students understanding of musical themes. Then, broadcast "Butterfly Lovers" MTV, to enable students to appreciate the delightful music and watching the vivid images, launches the imagination to enter the chilly beautiful artistic boundary which gradually music describes. Then, play the tape reading the text, under the author's guidance, enter the appreciation phase. Finally, flow charts, summarize the text, and play a track once more, tell the students to close their eyes and their own songs to savor the artistic charm of the song.

The emotional from the perceptual to rational then repeated the process, coupled with vision, hearting and other senses of participation, after one class, this music's layman, some will even have used.

The technical expression to carry on music appreciation, and I have achieved this teaching goal.

92.5 Design the After-School Exercise Clearly, Consolidate the Teaching Effect

After each lesson if we do not design in a certain practice, theory and practice are not linked; the knowledge could not be consolidated and migrated well. The relation way has many kinds.

92.5.1 Use of Multimedia Technology to Display Text of the Exercises

If according to the text content, good design practice, enter the computer, the students completed on the computer directly, right and wrong and scored immediately by the computer evaluation, after the passing statistics for teachers, the teacher may act according to student's work situation with the common problem of collective teaching, or the excellent job feedback to other students as an example.

92.5.2 Use of Multimedia Video Technology Assignments

If the unit on drama in "The Merchant of Venice", you can play the drama "The Merchant of Venice" video clip (turn off the original voice), so that students fully understand the characters at the same time, according to typical characters of the

typical character to the voice; in the University Language Unit I Volume II "Introduction and Commentary" the video can be played on campus news, While schoolmates appreciate the campus scenery, lets them carry on the introduction and the illustration to the school.

92.5.3 Uses the Multimedia Video Technique Arrangement Work

For instance after completing finishing attending the fourth volume of music work connoisseurship may broadcast Beethoven "Pastoral Symphony" for students with a beautiful lyrical melody that, to enjoy the first charm of the great works of art, and then try to just learn the appreciation of ways to write a musical composition appreciation.

92.6 Rational Use to Choose the Multimedia Education

Multimedia teaching is not only conducive to the creation of vivid teaching situation, to strengthen the appeal of teaching, to inspire students interested in language learning; but also to compress the time writing on the blackboard and expand the knowledge capacity, improve the pace and efficiency of classroom teaching. However, not every section of the language lessons are suitable for teaching, If teachers blind pursuit of novel, fashion, blindly use of multimedia teaching, may be counter-productive. The following is not suitable for the use of multimedia to talk about several teaching situation.

92.6.1 Multimedia is Not Suitable for Part of the Ideological Content of the Deep Ancient Poetry, Classical and the Novel

Such as Qu Yuan's "Lament", Chuang Tzu's "Escape", Yuan Hongdao's "Xu long pass", Menglong's "Du Anger treasure chest", Lao She's "Lethal Gun", Wu Zu xiang "memo Chushan room", Tolstoi's "After The Ball", Maupassant "Story of the rope", and other works, they reflect the thoughts and feelings are often implicit in Massive section of the text description, If it is divided mechanically by a courseware, will affect the students read and understand the text as a whole. For students, there are some difficulties in reading classical, if coupled with too much sound, pictures and other multimedia tools, will distract the attention of students, there may even enable students to forest for the trees, and more difficult to enter text and into the writer's heart, is difficult to perceive, comprehend the article circulated by the charm. Therefore, teachers must be considerate fully when use multimedia.

92.6.2 Hold Time, the Courseware Should Not Bite Off More than Comprehensive

The teaching is humanist, the oversized classroom information and the excessively quickly teaching rhythm are violating the student cognition rule, and the result is difficult to highlight the teaching points, affect the final quality of teaching. Therefore, the information contained in the language courseware content must be appropriate, keep the space to the student reading and the ponder. The text should not be content with all relevant materials (background, author, text, word, translation, training, etc.) unavoidably, exhaustively list. If we bite off more than demand perfection when the production of courseware, exhaustive, limited by class, class teachers can only accelerate the speed of transmission of information. The bombing of the type of information transmission, that makes the Students have difficulty viewing your courseware and have no time to think. Thus, the courseware as "electronic blackboard", teachers become "machine manipulator", the students become "television audience". It lack of emotional exchange between teachers and students, "teaching" and "learning" lost the interaction and cooperation. This approach is not helping students to digest and absorb knowledge, teaching effectiveness is not good, and the truth is that "Haste makes waste".

92.6.3 It Cannot Make Multi-Media Audio-Visual Language Instead of the Imagination of Students

Appreciation of the language text, it is the image to the abstract, from the emotional to the rational process. If the images described in the text is limited to some specific images. According to the text content of the students could have conceived and free stuff will be gone, then a thousand Readers can only have a "Lindaiyu". The biggest advantage of multimedia technology is the image of nature which with intuitive, vivid features can provide students with various forms of emotional material. Multimedia is changing the image of the abstract, instead of the visual imagination. However, the imagination of the students but has been limited.

Language is called the university language, it is very important to be, it involves the depth and the breadth. University foreign language teaching thought teaches the student to study, abstract learning, innovation learning, not just your senses to learn, visual learning. If students is in the audio and visual effect multimedia demo box thinking, imagine life, not the text on the divergent thinking, then ask and speculation. There is no doubt that the failure of the college Chinese teaching, this does not favor the student thought and innovation training.

In short, in short in university language teaching, we should be in the inheritance and development of the traditional language teaching art, scientific and reasonable introduction and using multimedia technology, let language classes and multimedia married, and inherit two national characteristics and The Times characteristic university has made great language teaching art purpose.

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Chapter 93
Interactive Peer Learning in an English Immersion Context

Xiaohua Liang

Abstract English immersion in the mainland of China has started in Xi'an since the late 1990s, and extended into other cities in the mainland of China. This study reported the findings of the students' interactive peer learning model in the immersion programs, such as peer prompting and waiting; non-verbal expressions; correcting errors and modulating speaking volume; translation; attending to the peer interlocutor's needs; and reciprocating peer assistance.

93.1 Introduction

The late 1990s saw the advocacy of English immersion in the mainland of China. In this learning model, the learners learned some of the content subject through the medium of English. It aimed to enhance learners' English proficiency level, at the same time maintain their Chinese language proficiency. English immersion originated from Canada in the mid-1960s due to the pressure from parents' dissatisfaction with their children bilingual level [1, 2]. The Canadian immersion succeeded and was regarded as a successful bilingual model which could be used in other contexts such as learning English in Germany, Hungary, Singapore and Japan [3, 4]. Immersion varied from total immersion (for the entire curriculum except the mother tongue as a timetable subject) to different degrees of partial immersion, to beginning at kindergarten or various primary levels, and including

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heritage language programs, but all the programs aimed at achieving the bilingual level as well as mastering the content knowledge [5].

In China, immersion programs were not simply for bilingual goals; they also implied a change in the common culture of learning such as classroom interaction between teacher and students and among students in much newer ways [6]. This means a great challenge to both teachers and students who have much traditional ways of teaching such as teacher-fronted, text-centered [7, 8].

The first and the most influential immersion model in China is the China-Canada Collaborative English Immersion (CCEI) program [9], which was renamed China-Canada-United States Collaborative English Immersion (CCUEI) program in 2002 [10]. As the names indicate there was collaborative expertise from Canada and the US. Led by Prof. Qiang of South China Normal University (who had been a key initiator of another immersion program in Xi'an) and Prof. Siegel of the University of British Columbia, Canada, the CCUEI (then called the CCEI) was first introduced in Xi'an in 1997 [11]. The CCUEI is modeled on the Canadian immersion pattern, which was a second language situation, and contextualized into the Chinese context [12], which was a fully foreign language context. English is thus both the teaching content and the teaching medium. The students are immersed in English for about half of their school time or less in such subjects as social science, living science, etc.

The immersion programs differed from the mainstream schools in both curriculum and pedagogy. In the CCUEI curriculum, some content subjects were taught in English instead of in Chinese, while mainstream schools were bound to the all-Chinese government-guided local curriculum. In addition, while mainstream classroom teaching of English, constrained by its focus on linguistic aspects, (or more narrowly on lexical items and syntax) was characterized by teacher-dominated, knowledge-transmitting, whole class interaction [9], pedagogy in English immersion classes was featured with students actively participating in the learning activities, which showed the attempts at integration of linguistic and social cultural elements with educational elements (e.g., needs, goals, motivation, learners, teaching materials and teaching methods).

The program marked a departure in English instruction in the Chinese context (where English is usually taught as a foreign language for at most a few hours each week) and also showed autonomy in education given to the region by the Central Government. In English immersion programs in China, English, as the medium of instruction, is taught through integrating it into other content subjects. The aim is to develop fully students' English language skills, increase their confidence in English language learning, enhance their written and spoken English proficiency, ensure satisfactory development in content-based learning, and improve their understanding of Western culture without sacrificing their knowledge of and appreciation for Chinese culture and identity. The CCUEI programs in Xi'an were both effective and successful, and English immersion programs were soon introduced into other cities in mainland China. However, nearly all the research studies focused on the effectiveness of immersion with an outcome-orientation. Besides

researchers such as Pei, very few researchers took a process-oriented approach to investigate the learning process in the CCUEI.

Rather than focusing on the macro-level effectiveness of immersion programs in the mainland of China, this study reports a case study in one school which examined the students' interaction at micro-level in the learning process, as revealed by data from the classroom. Implications can be drawn from the study for ELT in mainland China in general and English-immersion programs specifically. The findings offer insights into activities and classroom interaction.

93.2 Methodologies

This was a case study based on a privately-funded primary English immersion boarding school in Guangdong Province, which was the first school to adopt English immersion at the school level, not just an experiment with an experimental class and a control class. The school has offered its English immersion program since 2004 and the school in focus here implemented its English immersion program in all five of its Grade 1 classes, beginning in September, 2004. English immersion subjects were limited to social science, living science, P.E., and fine arts. In the spring of 2008 (when data gathering commenced), the primary school had 21 English immersion classes and a total of about 800 immersion students. The selected class had 37 students, 25 boys and 12 girls, aged around 11 years old in 2008. Data were collected through observations of whole-class instruction which were audio- and video-recorded, and transcribed, with interviews conducted for clarification, as well as field notes which recorded additional information. The dataset contained over 120 h of observations. The classes observed were English immersion classes, regular English language classes, evening self-study classes (since this is a boarding school, students do self-study at school), morning reading classes, and extracurricular activities. In addition, some school events were also observed, such as the school Science and Culture Festival and the opening ceremony of the school sports games. Data on a total of 110 student activities were transcribed in detail and analyzed through techniques of spoken discourse analysis. Student activities were calculated based on Spada and Frohlich's criterion: "The beginning or end of an activity is typically marked by a change in the overall theme or content." Thick description such as multiple data sources and multiple methods ensures the trustworthiness of the study.

93.3 Findings

In the current study, interactive peer learning assistance occurred in nearly all of the collaborative activities, and seems to be a part of the classroom culture.

The students assisted their peer interlocutors in the activities through peer prompting and waiting; non-verbal expressions; correcting errors and modulating speaking volume; translation; attending to the peer interlocutor's needs; and reciprocating peer assistance.

93.3.1 Peer Prompting and Waiting

Extract 1 Talking about butterfly by Pair S6 and S4.

1. S6: This is a butterfly.
2. S4: Is this a living things?
3. S6: Yes.
4. S4: Why.
5. S6: Because (..)
6. S4: It can (prompting in a low voice).
7. S6: It (..)
8. S4: can (prompting).
9. S6: it can (0.6) fly.

(13-32008, Grade 4, from Activity "Living things or non-living things?")

In this extract, S4 and S6 were trying to reason why a butterfly was a living thing (in lines 1–4). When S6 hesitated and paused as he could not formulate and articulate the reason (in line 5), S4 prompted in a low voice (in line 6) with the two words needed "it can" in S6's utterance. S6 picked up the prompted word "it" (in line 7), but got stuck there and still had difficulty to continue. S4 prompted again (in line 8) with the word "can". S6 at this moment picked up the prompt and articulated the reason (in line 9) with a pause of 6 s. From this extract, we see that when S6 had some difficulty with the reasoning, S4 patiently assisted him through prompts. When S6 picked up on the prompts, S4 gave him enough time to talk. Peer prompting and waiting mediated their activity.

The following three extracts involve S2, S8 and S3 talking about a butterfly, a robot and summarizing what they had talked about.

93.3.2 Assisting Each Other Through Non-Verbal Expressions

Extract 2 Talking about butterfly by Group S2, S3 and S8

1. S2: Is this a (..) living thing?
2. S8: No, it isn't.
3. It's a living thing.
4. S2: (giggling, indicating he is wrong)
5. S8: Yes, it is.

6. It's a living thing because it can fly.
7. It can- it can
8. S2: Move (prompting)
9. S8: Move.
10. It can reproduce babies.

(13-3-2008, Grade 4, from Activity "Living things or non-living things?")

In this extract, when S2 asked S8 whether the butterfly was a living thing or not (in line 1), S8 gave a contradictory answer: first stating that "No, it isn't" (in line 2), later stating that "it is a living thing" (in line 3). S2's giggling (in line 4) led S8 to confirm that the butterfly is a living thing (in line 5). Following that, S8 continued to give reasons for his statement (in line 6) that "it can fly." He repeated the phrase and tried to find out what he wants to express (line line 7). S2 prompted him (in line 8) and S8 picked up the prompts (in line 9). In addition, he gave another reason (in line 10) that "it can reproduce babies." This extract shows that, in the peer talk, peer students' non-verbal expressions (such as S2's giggling) function as assistance by indicating an error, and lead to their peer interlocutor's self-repair. According to the seven students (interview, 15-11-2008), they regularly handed over turns through non-verbal expressions, such as eye movements or hand gestures. For example, S1 said, "shi ge yan se" (Give him a hint with our eyes); S6 told me, "shou shi." (Gestures); S3 said, "tui ta yi xia." (Give him a push); S2 said, "nie ta yi ba". (Pinch him); S3 added, "deng ta yi yan." (Stare at him).

93.3.3 Using Low Voice Volume in Prompting and Correcting Their Peer Interlocutors

Extract 3 Talking about robot by Group S2, S3 and S8

1. S8: Is this a living thing?
2. S2: No, it isn't.
3. S8: en (…)
4. S3: Why, why, why, why (prompting in a low voice).
5. S8: Why.
6. S2: Because it (..) it can (…) en (…) produce ba- he can (..) don't
7. S8: Reproduce (prompting)
8. S2: It don't produce baby:
9. S8: Isn't this a living thing?
10. S3: No, it is.
11. S8: No, it ISN'T (correcting and prompting in a very low voice).
12. S3: No, it isn't.

(13-3-2008, Grade 4, from Activity "Living things or non-living things?", continued)

Peers assisted each other a great deal in the activities and low voice volume was used in their assistance. In this extract, the first part from line 14 to line 21 is mainly between S2 and S8; however, S3 actively engaged himself in the talk (in line 17) prompting S8 with "why" in a low voice when he found S8 stuttering with difficulty by the pause (in line 16). S8 picked up (in line 18) and S2 explained the reason (in line 19), where she showed difficulty in articulating the reason of "reproducing babies." S8 prompted her with the word, and S2 picked up although she felt confused with the words "produce" and "reproduce". S8 projected the talk to S3 (in line 22) and asked him whether the robot was a living thing or not. S3, influenced by the L1 in mixing that answer of negative and positive, gave the erroneous answer to the question with "No, it is" (in line 23). S8 corrected him and laid emphatic stress on the word "isn't" in order to direct S3's attention to the form, but still in a very low voice. S3 immediately picked up the prompt (in line 25).

Using low voice volume to assist their peer interlocutors was observed to be a common practice in the student activities in groups. As shown in the extract above, both S3 was prompting S8 in a low voice (in line 17), and S8 (in line 24) was correcting S3 and prompting S3 with the correct answer in a very low voice. I asked them why (Interview, 15-11-2008). S6 said, "if he is thinking about it, he will be interrupted by you when you speak out loud your sentence. He himself can work it out, but if you interrupt, though he gives the answer, the teacher will believe that it is you who tell him the answer but not that student himself can give the answer) (S2)."

Interactive peer learning occurred in the activities under several circumstances: when the peer interlocutors directly asked each other for assistance; indirectly showed they were having difficulty through pauses, the use of fillers or lengthening of vowels, code-switching, private speech or non-verbal language; or, made an error. Peers used numerous techniques to assist their interlocutors, including repeating, translating, exemplifying, explaining, clarification, and challenging. Peers assisted each other in language manipulation, task administration, content selection, behavior monitoring, and affective support in language-, task-, content-, behavior- and affect-related aspects. When assistance was offered, the peer interlocutors might pick up the prompt or the answer directly, pick up and reformulate, ask for clarification/repetition, ignore the prompts and continue to talk, challenge and disagree with the reasoning, negotiate with an alternative answer, or defend their answer.

93.4 Conclusion

Interactive peer learning emerged in the students' activities, where the students tried to understand and handle their learning difficulties and social relations through interaction. Activities provided a platform for the students to build up rapport, to learn from each other and to support each other emotionally. This represents a considerable change in a classroom culture when this class is

compared to other primary classrooms in China. In the interactive learning, peers helped each other not only cognitively, in the language and learning subject content but also help each other in the strategy to use such as task monitoring and behavior monitoring, encouraging, supporting and praising. Interactive learning built up the supporting culture and enhanced the students' learning.

Appendix: Conventions of Transcription

- Symbols Meaning
- Ss Students
- [ ] Researcher's comments
- Uncertain hearing
- (???) Indecipherable utterances
- . Falling intonation followed by noticeable pause (as at the end of the declarative sentence)
- (..) Short pause
- (…) Medium pause of up to 5 s
- (0.6/7/8…) For wait time longer than 5 s, the pause will be represented by figures showing the number of seconds involved. Wait time longer than one minutes will become (1.0) and so on
- , Continuing intonation
- ? Rising intonation, usually a question
- ! High falling pitch showing exclamations
- : Lengthened syllable (usually attached to vowels); extra colon indicates longer elongation
- Self-halting, or abrupt cutoff
- CAPS Emphatic and strongly stressed utterances
- = Contiguous utterances or latching
- //Overlapping
- <xxx > Utterances made with a greater voice volume compared with that of the preceding and following ones
- A-B–C-D Sounding out the letter names of a word
- {….} untranscribed section of the excerpt
- ( ) Explanation of gestures or tone changes like smiling or laughing and so on
- Italics Putonghua (code-switching)
- Bold Cantonese (code-switching)
- {} Translation of the code-switching
- > < Speech in a faster pace.
- ___ text provided (by the teacher or in the textbooks or other materials)
- (The last five items are s added by me)

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Chapter 94
Improved Scheme of CET4 Test

Xin Wan

Abstract College English Test Band IV has aroused argument among students and English teachers, especially about its validity and reliability. The key problem of CET4 lies in that it lack of validity and its shortcoming results in some negative influence on language teaching. In order to improve the positive backwash of CET4, we must first make clearly six questions concerning validity of test. At the same time we should consider other factors when we reform the CET4.

Keywords Validity · Test · Language teaching · CET4

94.1 Introduction

The nationwide English test, namely China College English Test, Band 4(CET4) for non-English majors, is so important to Chinese undergraduate students that they have become a part of their life at university and in some universities students even cannot get graduation diplomas without passing the CET4. In China, the full-time undergraduate students have to finish an obligatory English course named College English band 1,2,3 and band 4 continuously for two years before they can take part in the CET4. Each year there are about two million test-takers for CET4 [1]. Nowadays, the certificate of CET4 has been considered as a basic prerequisite of employment. So not only college students but also people outside campus are keen on this test. Some linguists and language teachers also argue that as CET4

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can't measure English proficiency efficiently, and that it does more to hinder education of the language than to promote it, it should be banned.

94.2 The Problems of CET4 in China

94.2.1 Negative Influence of CET4

This Chinese type of nationwide College English assessment is motivated by the desire to determine what the undergraduate students have learned from the course of "College English" [2]. Therefore, CET4 is also intended in a sense for the assessment of the English instructional quality in China's universities. While, the fact is that these English testing instruments have produced more and more negative influences on the students learning English as a foreign language. The negative influence of CET4 are found as follows:

Quite a number of students focus on CET4 model tests instead of their English text-books in order to pass CET4. As a result, they have made no improvement in their English language ability during English class practice being only familiar with CET4 formats.

English language instructors have to spend over 30 % of their course-scheduled time guiding students how to perform well on CET4 by instructing them to do lots of test-concerned exercises. As a result, normal course instructions and practice are often put aside. Required teaching tasks are never finished.

The university or department administration, instructors' English teaching arrangement, and students' learning English as a foreign language, are all CET4 test-driven. This is against the China's Educational Goal of English Teaching prescribed by the National Educational Commission of China—to train the students to have a basic English communicative ability in listening, speaking, reading and writing.

With an average eight years' English learning experience, most holders of the CET4 certificates are not capable of communicating well with English speaker. Some holders of CET4 certificates even can neither pronounce daily-used English words correctly nor aptly utilize the six commonly used tenses in English.

94.3 Reason

We find that CET4, mainly derived from TOEFL [3], doesn't help us fully assess what the students have learned or should have learned from their English language courses. This English assessment instrument, consisting of Guided Writing, Fast Reading, Listening Comprehension, Depth Reading, Cloze Test and Translation, is inadequate to provide useful feedback for learners and teachers of English. Those

students who work hard on the College English course often fail to perform well on CET4, while those focusing on model tests without following College English course requirements can pass the test easily.

A language test must have validity to ensure that the testing instrument actually measures what it purports to measure. The CET4 test in China as an English language achievement test should measure what the Chinese undergraduate students know or have learned from the nationwide united course "College English" which is claimed to be the largest course in terms of the student numbers in China. Therefore, the validity of CET4 directly determines the usefulness or their intended purposes of such assessment instruments in evaluating students' English language ability. Although some students can get higher scores in the CET4, which doesn't mean that they have the higher level of using the language in the communication, it only means that they have the higher level of recognizing the language in the test after a period of exercising. We should know there really exists distinct difference between using language and recognizing language.

The purpose of learning a foreign language for most college students is to make use of the knowledge of the language learnt to communicate with native speakers or others being able to speak this kind of language. Therefore, test should serve this purpose, and then serve language teaching. CET, as one of the most popular language test in China, should follow the principle to become an effective test. The real intention of CET is to evaluate the level of test takers' mastering English in the real situation. CET must measure what it wants to measure—the ability of using language in the communication, we can say that it reaches its validity. However, the present CET doesn't work very well in this factor, which has been proved by many facts that the result of the test doesn't represent the comprehensive level and ability of using language. Many students got high scores in CET while in reality they can't freely utilize English to reach the goal of communication, even some students with high scores don't dare to open mouth before foreigners. From this we should say CET somewhat lack of validity.

94.4 How to Strengthen the Validity and Reliability of CET4

Validity and reliability, we know, are two major considerations in designing a test. Validity refers to the extent to which a test measures what it intends to [2]. The validity of a language test therefore is established by the extent to which it succeeds in providing an accurate concrete representation of an abstract concept. Reliability refers to its "consistency of measurement", which simply means the agreement between the result of the test and test itself or other tests. An ideal test, whether objective or subjective, should be both reliable and valid [4]. However, it is generally understood that reliability and validity are in constant conflict with each other. "The greater the reliability of a test, the less validity it usually has" [1], and vice versa. The problem of the present CET lies in reliable enough while valid

inadequate. Obviously tests organizers want to keep the balance between them, but in fact the process of exertion transfers the direction of the real intention.

Realizing that CET4 is not valid enough as English achievement tests, many English professors and test organizers try to find the best way to achieve the balance between valid and reliable to improve CET4. It is believed that reliability is a necessary but not a sufficient quality of a test. Reliability concentrates on the empirical aspects of the measurement process, while validity pays attention to the theoretical aspects and finds out the balance between these concepts with the empirical ones. Before we take some action to reform CET4, we must make clear the following questions concerning the reliability and validity of the test.

Purpose: The test for what purpose? This is the basic factor in designing a test because it determines of other factors. As long as we know the purpose or intention of the test—admission of college, promotion or quantifications of some occupations etc., we should know what kind of abilities of testees well be evaluated.

Ability: What language abilities would we like to assess? Are different skill areas—reading comprehension, listening comprehension, speaking and written expression—evaluated as a whole or separately? And why are we choosing to measure these language abilities instead of others? What is our rationale for taking this approach and techniques?

Construction: How will we construct and validate our assessment measures? Assessment measures that are neither reliable nor valid will be of questionable educational value.

Time: How often will the language assessment take place? The frequency of assessment is really quite important in that there is a delicate line between so little assessment that the language learners wonder how they are doing and so much assessment that they wonder when they will just be allowed to learn being assessed.

Environment: What are the characteristics of the physical environments in which the language test will take place? The characteristics of the physical environments have evident effects on administering standardized tests to large groups of respondents.

Test taker: Who are our intended respondents? How might they be described in terms of their personal characteristics? What is their socio-cultural background? The respondents' characteristics and their socio-cultural background may influence their performance on language assessment measures.

If we make clearly the questions above the CET4 test will produces results commensurate with our testing objectives. The test designer should not only understand the effects of individual characteristics on language test performance, but also know the necessity of designing test items specially to cater to Chinese students with certain characteristics.

94.5 The Improvement of CET4

The reformed CET4 test should really function as a measure that we can interpret as an indicator of Chinese students' English language ability. Therefore, in the development of an English achievement test with Chinese undergraduate students as test takers should cover positive backwash and characteristics of individuals.

94.5.1 Positive Backwash

Testing and testing strategies have the following positive backwash on language teaching and learning.

Testing and testing strategies have positive backwash on language teaching and learning.

By constructing a test and taking a test scientifically, teacher' teaching and students learning can thus be greatly promoted, no longer to be as blindly as they used to be.

By test strategies developing, students can be well armed with language competence, testing strategies and so that they can easily and clearly realize the test points and efficiently deal with the testing items and apply what they learned into practice, thus to enhance their language use ability.

The reformed English achievement test should have evident positive effects on teaching and learning College English as an obligatory course. This test as a means of pushing English teaching and learning in our high education can best be considered to have effects on individual Chinese undergraduate students, China's high educational system, and Chinese society at large. The impact of testing, or backwash, in the reformed English test may help test developers and test users in China efficiently investigate and review the specific areas of College English Teaching such as content of teaching, teaching methodology, current ways of assessing students' English achievements. The test takers improved and consolidate their English language knowledge from the College English course either while taking the test or from the feedback received.

Meanwhile, impact on instruction, as implemented by classroom teachers, becomes positive backwash beneficial to those teachers teaching the College English course instead of spending class time teaching the test. The current English test is often incompatible with the language teachers' values and goals of the instructional program. The teachers should feel that what they teach according to textbooks is exactly relevant to the test and how we choose for testing satisfies both teachers and students so that the characteristics of the reformed CET4 test and test tasks correspond more closely to the characteristics of the college English instructional program.

94.5.2 Characteristics of Individuals Should Be Considered

The four sets of individual characteristics understood to affect language test performance are also considered in our way of designing, developing and using the reformed CET4 test. One obvious personal characteristic of Chinese undergraduate students in comparison with those of North American students is that they are rather conservative in expressing their ideas in class. They refrain from speaking English or joining in an English conversation actively in class, resulting in their low English speaking ability up to the CET4 test even though they have learnt English for eight years.

The current CET4 has no items or subtests for inducing the students to improve their English speaking ability. Therefore, a new item or subtest for assessing students' English speaking ability should be designed on the basis of reading passages in College English textbooks. Both teachers and students of this course are spurred on to better performance on English speaking item.

Another individual characteristic of CET4 test takers is the test takers' topical knowledge. A test task that requires a test taker to relate the topical content of the test input to his own topical knowledge is likely to be more interactive than one that does not.

The topical knowledge that Chinese undergraduate students are familiar with provides the information base that enables English use with reference to their lives. The test task that presupposes cultural or topical knowledge on the part of Chinese test takers is more interesting and familiar to those Chinese students.

A writing task that requires a great deal of information specific to Christianity might be extremely difficult for Chinese undergraduate students who possess very little western religious knowledge, no matter how good the Chinese students' writing skills are. Therefore, the reformed CET4 should basically follow the Chinese students' knowledge structures in long memory.

For a long time, people have talked about the difference between receptive skill and productive skill. If we go further to divide the language abilities into listening, reading, speaking and writing, then listening and reading are receptive skills while speaking and writing are productive skills. Test design of CET4 should pay more attention to the productive skills; these skills should occupy a large part in the whole paper. In the English tests assessing a foreign speaking ability of students in China, the assessment of English speaking ability should be given larger proportion instead of the zero proportion in the present CET4. In recent years, testees who score more than 80 in CET4 can be registered for the related oral test. As this threshold is high, only a small number of testees can have such a chance. Since it is a separate test from the written one, and concerning only small numbers of tests, it is unlikely to solve the problem completely. Most Chinese students need a greater incentive to improve their English speaking ability.

94.6 Conclusion

Basic theoretical knowledge of language testing is the first step to the relevant research on evaluating the reliability, validity of a language test, as well as on designing and developing a language test for specific purposes. In the design and development of the new CET4 for assessing Chinese undergraduates' English language ability, the special factors arising from the characteristics of Chinese students of English should be given fairly enough consideration. My research on a suitable framework of CET4 is correspondent with the desire of those English test developers in relevant authorities for the improvement of the current problematic CET4.

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Chapter 95
Analysis on Misuse of English Verbs

Changhong Guo

Abstract In the course of college English teaching, English teachers may find some errors made by the non-English majors. Errors made when they are using English verbs are analyzed from the aspect of the similarities and differences between English verbs and Chinese verbs in this thesis. We can conclude that the most obvious cause of the misuse seems to be the interference of the first language (L1), that is, interlingual errors affect the English output of Chinese students. At last, the author calls for more input of the difference between L1 and L2 in L2 teaching and acquisition so that the same mistakes can be avoided.

Keywords Misuse · Interference · Language transfer · Incorporation

95.1 Introduction

As an English teacher for non-English major college students, I've always noticed that students may make errors in using English verbs. "Borrow" and "lend" are mixed up. "Retrieve" may be translated into "fetch back". And the same error is committed with expressions like "still remain", "repeat again", "and connect together", "return back" and so on. Chinese students' writing may also be filled with causative sentences. The following two sentences are cited from students' CET6 writing.

Firecrackers might cause the fire, make the eyes blind, and even kill somebody, so they must be banned.

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Firecrackers are good things, but when they make people dangerous they become bad things [1].

The above-listed expressions and sentences are grammatically correct, but they are not native English. Why does this phenomenon take place? Why do students make such errors again and again? And how can we English teachers improve the situation?

In college non-major English teaching and learning, much of daily work has aimed to cope with CET-band 4/6. Little research has been done on the performance of students' language output. But just as in the development of a country, foundation of economy should be solid and strong, the basic language competence of students must be emphasized in the first place. Verbs are the grammatical center of predicates, which are the essential part of sentences. And Jue [9] thinks phrasal verbs used by Chinese English learners share such mistakes as misuse of verbs or particles, collocational deviations, syntactic problem and simplified use. Therefore, we should have a comprehensive understanding of English verbs or phrasal verbs and their Chinese equivalents to consolidate our foundation of English learning.

95.2 Analysis of the Misuse

The above-mentioned errors are interlingual errors which result from language transfer, caused by the learners' native language, i.e., mother tongue interference in second language acquisition accounts for these errors [2] English verbs, although similar in many aspects, have subtle but significant difference in semantic composition, causing misuse by Chinese students in using English verbs. Thus, in order to analyze this kind of misuse and then avoid it, let's study how language transfer has an effect on learning English verbs.

95.2.1 The Similarities of English Verbs and Chinese Verbs

A verb is "a word or phrase indicating an action, an event or a state". From this we can see that the semantic function of a verb is to describe a motion, which can be an action, an event or a state. A motion is expressed by a verb or a phrasal verb, which is the case in both English and Chinese.

E.g. He stood there.
The rock slid/rolled down the hill.
We worked on into the night.
Look somebody up and down [3]

In these sentences, the linguistic expressions of motions are in correspondence in both English and Chinese. Sometimes, a motion is realized by a single verb. In other cases, particles are used in conjunction with the head verb to indicate direction, aspect, manner, etc. Under these circumstances, it's easy for Chinese students to find correspondent English expressions.

95.2.2 The Differences of English Verbs and Chinese Verbs

For the different morphological features of lexicon, language in the world can be divided into two types-incorporating language and isolating language. English belongs to the former one [4]. According to Oxford Concise Dictionary of Linguistics, an incorporating language is one in which incorporations are systematic [5]. Incorporation means a regular process by which lexical units, which are syntactically components of verbs, can also be realized as elements within the verb itself. So incorporation is quite common with English verbs, whereas in Chinese-an isolating language, the exact equivalents to these incorporation verbs cannot always be found. In other words, single Chinese verbs cannot express complex semantic content, and other sentence elements like adverbial and complement are added to achieve this. Influenced by Chinese expressions, Chinese students may misuse English incorporation verbs. The author is going to analyze these errors from the aspect of the types of incorporations.

95.2.2.1 Incorporations from Conversion

Conversion is a productive means of word formation in English. A noun, when converted into a verb without any change of form, can convey a more complex meaning. Examples can be found just in our textbooks, College English Intensive Reading [6].

Some priest, nuns and researchers spend a great deal of time shepherding or observing shopping-bag ladies

shepherd: n. someone who keeps the sheep together in a flock

vt. take care of, guide or direct (people) like sheep

(Lady Hermits Who Are Down but Not Out Unit 4, Book 3)

who attach such great importance to staying alive that they claw their neighbors to death just for the privilege.

claw: n. sharp curved horny process on the toe of a bird or some mammals or reptiles

vt. tear, seize, pull with claws or hands

(Rod Serling, The Shelter Unit 7, Book 3)

the requirements of honesty often seem dwarfed by greater needs

dwarf n. a person who is abnormally small

vt. cause to appear small by comparison.

(Sissela Bok, To Lie or Not To Lie—The Doctor's Dilemma Unit 5, Book 4).

While in Chinese, this is not the case. Thus, Chinese students seldom use nouns to express motions, but rely on analytic method, i.e., using phrases, not words. Just like sentence 1 in the introduction part [7]. Actually if we use "blind the eyes" instead of "make" phrase, that sentence will become more native. Take another sentence as an example:

I try to hide my inner fear with a mask of showing confidence.

This is a sentence made up by analytic method, which is marked with Chinese traces. In order to make a native English sentence, we can use the verb "mask" instead of the noun "mask":

I try to mask my inner fear by a show of confidence.

95.2.2.2 Incorporation from Derivations

The most important characteristics of English, an incorporating language, are that abundant affixes are used to distinguish parts of speech and to indicate different meanings of words. For instance:

The new problem deepened the economic crisis.

The soldiers are encamped in the forest.

The complex concepts can be delivered by adding affixes to root words in English, which, in Chinese, can only be achieved by phrases [8]. This also explains why Chinese students produce so many causative sentences with "make" instead of using derivations to work out more concise sentences. Chinese is characteristic of using analytical method to denote causative relation, so Chinese students are inclined to analogize the structure "make + object + complement" when making up an English sentence. For example:

Doing part-time job could make them draw near the society.

It could be better improved as "Doing part-time job could shorten the distance between society and campus." Just like sentence 2 in the introduction part, it can be changed into "endanger human life".

95.2.2.3 Incorporations from Single Root Verbs

When taking examinations, students may be required to fill in the blanks like this:

The teacher _____ her fingers on the desk impatiently.

A. struck B. hit C. tapped D. knocked

Later, mother _____ into the children's room to make sure they are all asleep.

A. burst B. slipped C. floated D. entered

These choices are synonyms [9]. In sentence 1, "tap" is the proper choice, which means "to knock gently on somebody or something". In sentence 2, "slip" means "to go somewhere quietly or quickly, e.g., in order not to be noticed, or without being noticed". The complex meanings of these two incorporation words cannot be conveyed by specific words of this kind in Chinese, but usually by

general verbs with adverbials. Affected by this phenomenon, students may always work out sentences like this:

Usually I will read the newspaper very quickly and try to find some interesting stories.

John went to the window and looked at the crowd outside.

Please go and fetch me a chair.

These are all misuse of incorporation verbs in English. "Flip through", "tip-toed", "stared" and "fetch" are the better choice.

95.3 Conclusion

Until now, we have better understood the similarities and differences of English verbs and Chinese verbs, which contributes to the Chinese students' misuse of English verbs. But how can we reduce Chinese interference in teaching and learning English verbs and how can we improve students' language output?

First, students should be informed that L2 learning is different from their L1 learning, which could be inevitably affected by negative or positive interference from their previous knowledge of language and learning strategies. As for the vocabulary, students should be advised to read through the English meaning and to remember one or two example sentences to make sure of its exact meaning.

Then, teachers should pay greater attention to the semantic property when explaining verbs and encourage students to use specific verbs in daily expression. To achieve this, a componential analysis would be of importance. For instance, giggle = laugh + silly + repeatedly + uncontrollably. Through this, students may know when they should use "giggle" instead of the general word "laugh".

Also, more comparison between English and Chinese should be carried out in our daily teaching and learning. Students should be notified of the type and source of errors made by themselves. Only when they get to know the reasons why they make errors in these aspects, will they be able to avoid such errors.

Attention should also be drawn to the differences of culture and thinking mode between West and East. Language is the tool for thinking and also the representation of thinking. So, different thinking modes will produce different language expressions.

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Chapter 96
Study on English Immersion in China

Xiaohua Liang

Abstract Launched in the late 1990s in Xi'an, the first and the most influential English immersion programs CCUEI were carried out in some big cities in the mainland of China. Fifteen years of implementation witnessed the success as well as the challenges, which need reflect and draw the implications for pedagogy and teacher education.

Keywords English immersion · CCUEI · Activity

96.1 Introduction

The first and the most influential English immersion started in Xi'an in the late 1990s, was CCEI (the China-Canada Collaborative English Immersion Program), which was later joined by researchers from the US and renamed CCUEI (the China-Canada-United States Collaborative English Immersion Program) since 2002.

This signed as an innovation of English teaching and learning in the mainland of China [1]. The goal of CCUEI was to enhance the student English proficiency through the content-based learning and to better the students' understanding of cultures, while at the same time developing the student L1 [2, 3]. The English immersion programs seemed to be successful, which developed to some big cities of the mainland such as Beijing, Shanghai, Wuhan, Guangzhou and Shenzhen [4, 5]. Fifteen years of implementation witnessed the success as well as the

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challenges, and implication could be drawn for pedagogy and English teaching and learning in the mainland of China through the reflections.

96.2 The Development of the CCUEI Programs

Since the launch of CCUEI in 1997 in Xi'an, researchers carried out a great many studies on it [6]. Reports concerning positive findings included students' mastery of language usage and language use, the curriculum, the pedagogy.

Some work reported students word-reading, vocabulary and phonetic awareness through their comparative study in a kindergarten in Beijing where three groups of children experimented over international phonetic reading, whole-word reading and natural letter-word reading and the results showed that the immersion children's early word-reading ability was the best among these three groups. Qiang and Zhao [12] found the fast development of students' vocabulary and better comprehension of English stories. Recent research showed the immersion students' better phonetic awareness and a good mastery of vocabulary. English immersion students showed their good listening and speaking development, which showed the immersion student smooth communication with English native teachers. Zhao and the others conducted an experiment in Shanghai and found the immersion students' greater quantity and better quality in answering the questions independently through English. English immersion experiments in kindergartens in Xi'an showed that children tried to use English to communicate spontaneously. Liang's [5] research on English immersion in Wuhan found that immersion children were more active, attentive and interested. Knell, Qiang and others [2] found in their research in Xi'an that students were better developed in word identification, phonological awareness, vocabulary, letter naming and oral proficiency. In addition, researchers gained positive results in curriculum design and teaching strategies in the CCUEI [7].

96.3 The Implication for Pedagogy and Teacher Education

The CCUEI programs in the mainland China aims to promote student ability to use English and cultivate a greater understanding of cultures. It was guided by the Canadian immersion education. The Canadian immersion education was documented by many research studies (Lapkin and others [3]), and its success led to an expansion of immersion programs into other parts of the world such as French immersion programs in Australia, immersion schools for immigrants and refugees in Thailand and the United States, English immersion programs in Hungary, in Finland, in the United States, in Hong Kong, and in Singapore (Met and Lorenz [7]). Immersion varied from partial immersion to full immersion and with the age stage varied from early immersion to late immersion. The typical characteristic of

Canadian immersion is teaching the language through content subjects without the use of the students' first language and stressing on the language use for meaningful communication in appropriate contexts in the language classroom. Through authentic and meaningful learning context and process, student language competence can "co-occur". The English immersion in China models after the Canadian immersion pattern by contextualizing it into the Chinese context, where Mandarin is the home language and English is taught as a subject in a somewhat traditional way. According to Qiang and Zhao [13], immersion in China refers to the language learning model of using the second language English as the teaching instrument to both the English language arts and some other content-based subjects. Children in immersion schools or immersion kindergartens are half or partially immersed in this second language English. The teacher speaks only the second language to the students. English is both the teaching content and the teaching medium for some other subjects, such as social science, living science, and fine arts. According Qiang and Zhao [13], immersion is supposed to offer students more opportunities for communication which may lead to high level of language proficiency.

In addition, team networking characterized the CCUEI programs. Teachers from the ELT and professors, researchers and educators in pedagogy worked closely together. The researchers gave the teachers regular theoretical training through comments and feedbacks as to how to improve the teaching. The blending of both the teachers' view from their teaching experience and the researchers' theoretical guidance benefit the English language teaching and learning in the immersion programs [8]. Furthermore, in the CCUEI programs English language learning is integrated with the subject content learning. In class the focus is the learners and learning, and the subject contents provide the students with rich chances of communication through different activities. Through participating in these activities achieve the integration of linguistic aspects and social cultural aspects and the integration of the educational elements such as needs, goals, motivation, learners, teaching materials and teaching methods [9], while the mainstream classroom teaching focused more on linguistic aspects with teacher-fronted, whole-class interaction. Still, the immersion teachers got trained annually in such fields as English knowledge, speaking skills and theories on teaching and learning. Annual assessment evaluation of the immersion classes and the immersion teachers were conducted.

96.4 The Challenges for Pedagogy and Teacher Education

Some researchers contend that immersion may not be effective in developing the students' linguistic competence. Through case studies and error analysis of the students 'compositions, examined the linguistic competence of secondary school students in English immersion courses in Hong Kong through composition writing. The results showed that the majority of the students scored below average in English composition writing and got average grades in Chinese composition writing.

It is also found in research that immersion students' language proficiency has not reached the proficiency level of the native speakers. Immersion students were found to be less accurate in vocabulary and grammar than the students taught in the traditional model, and their listening, speaking and writing ability had not reached the level of the native speakers of the same age which is contradictory to what has been reported in the English immersion programs in the mainland [10].

Besides, there is a concern about the identity of the immersion students. Some researchers express their concern about the Chinese immersion students' identity, claiming that bilingualism may weaken the status of L1. "L1 is not only the tool to transmit knowledge and information, but the symbol of recognition, the carrier of its national culture and the support for the national affection" [11]. They are worried that immersion may make the immersion students lose or get confused about their identity and their own culture.

Lack of qualified teachers and teaching resources may be a great challenge for the implementation of immersion. Liang [6] found that immersion teachers worked more efficiently with favorable school policy, better teaching and teacher resources and regular teacher training. Pei [9] stated in their studies that immersion teachers played key roles in the immersion programs. But lack of qualified bilingual teachers, lack of the resources for instruction and lack of effective ways to assessing the immersion students' proficiency in their English language learning put the CCUEI in a difficult situation, as they are taking the same public examination as the mainstream students [12, 13].

96.5 The Direction for Future Research

The effectiveness of the English immersion within the CCUEI programs were reported in most studies, which were mostly based on tests and students' academic achievement in the experiments. Pei's study seems to be among the first to adopt a process-orientation, with the focus on classroom teacher-student interaction and the scaffolding teachers offered to the students. Furthering Pei's study, Liang [6] researched on student-student interaction focusing on activities more from an insider's perspective. Further research could be done on with a combination of outcome-oriented and the process-oriented learner, and on the teaching and learning strategies used in the successful programs.

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Chapter 97
Analysis on Cross-Cultural Factors on English Translation

Zhaoyang Guo

Abstract Language is a tool that is used by human beings for communication with each other. In general, there is a great difference among linguistic forms of different countries. As a commonly-used language in the whole world, English language has been extensively applied in a variety of international exchange activities. Along with the arrival of the economic globalization, the intercourse activities between China and developed countries have proved to be more and more frequent within the past few years. In the mean time, the translations from Chinese-to-English and English-to-Chinese appear especially important. Because there are a great number of differences among different countries in cultural factors, it is natural for their English translation methods and literal meanings to be different to some extent. With regard to this point, by taking western and eastern cultures for an example, the author carries out an analysis on the influences of the cross-cultural factors on the translations from Chinese-to-English and English-to-Chinese in this paper.

97.1 Introduction

The reasons why the differences between western and eastern cultures are in existence can be analyzed from multiple aspects.

First of all, the civilization in the eastern world is traditional conservative, but the civilization in the western world is open and wide [1].

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Second, there is a difference between western and eastern cultures in the goals that they pursue: high importance is attached by the eastern culture to the molding of the humanistic spirit, but a high stress is laid by the western culture on reform and innovation [2].

"Cross-culture" has proven to an issue that is not unavoidable for people in today's international exchange, and simultaneously it has exerted a very profound influence on the translation of English language. The essential meaning of English language will suffer a distortion if the skills in translation are not known well by translators.

97.2 Development of English Translation

Since the emergence of English language, such a kind of expression activities is always conducted in human society, plays an influence on the developments of culture and language of English-speaking countries and other language-speaking countries, and promotes not only the exchanges and conversions between English language and other languages, but also the developments of English and other languages [3].

In English translation, it is necessary for translators to get a real understanding of not only both historical and cultural backgrounds of English language and other languages, but also the writing and reading habits of the different reading groups during the same period, etc.

In recent years, increasingly high attention has been attached by people to the cultural problems in translation. The reason why the cultural problems in translation are taken seriously by people sources from people's correct understanding of the roles of historical and cultural backgrounds.

In the practices of translation, the cases of mistranslation and wrong translation which are caused by people's little knowledge and misunderstanding of culture have proven to be a common occurrence in translation.

Just as famous American translation theorist Eugene Nida said, "For translations successful in a real sense, the bicultural foundation of a translator is even more important than his bilingual foundation, because words can only make sense under the cultural context that plays a real role".

It is not a difficult task for English translation. However, the most difficult point in English translation lies in translating semantics with accuracy, and an expression can be given to the real information only if the cultural backgrounds of different countries can be taken into account and English word meanings can be considered by careful study [4].

Therefore, paying high attention to the training of Chinese language and English language abilities is an ability, which is necessary for every translator to make an improvement, as shown in Fig. 97.1.
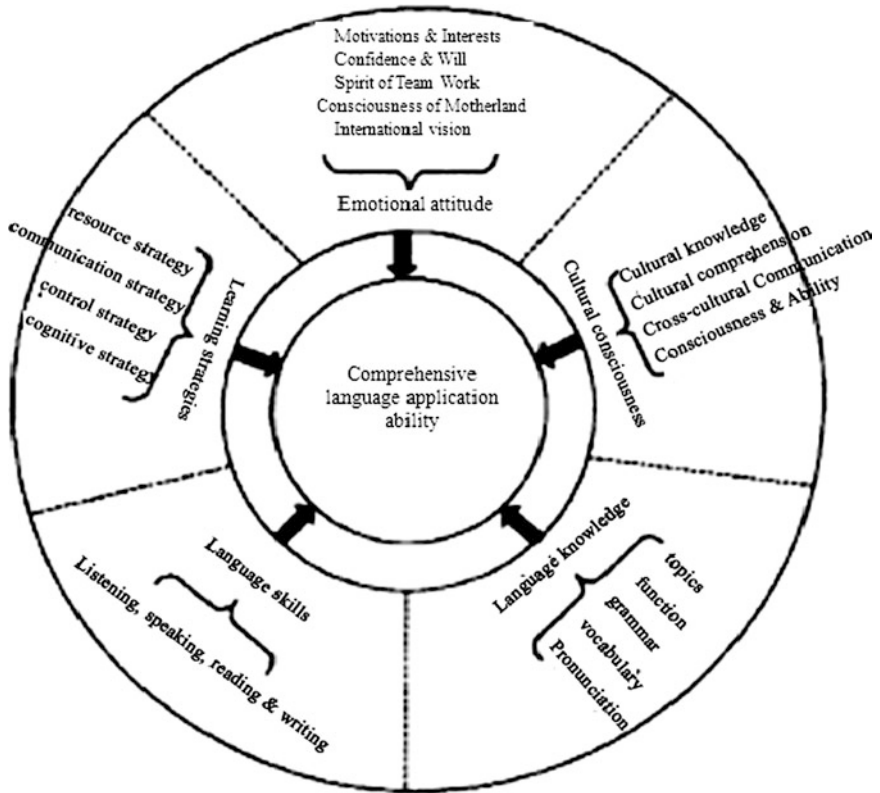
Fig. 97.1 Chinese language and English language abilities

97.3 Influences of Cross-Cultural Factors on English Translation

"Cross-culture" has to be a culture sourcing from two different areas, and also can refer to the cultural differences between different nations.

Analyzed from a wide range of perspective, cross-culture usually refers to not only the cultural differences between two different countries but also an inevitable "paradox", which exists in the process of language exchange.

As a special communicative language, English will also suffer the influences of cross-cultural factors in the actual process of translation, thus giving rise to the obscured expression to word meaning and imposing obstacles to the improvement of the communication skills of people from different countries [5]. The influences of the cross-cultural factors on English translation are as shown in Fig 97.2.

Fig. 97.2 Influences of
cross-culture on translation
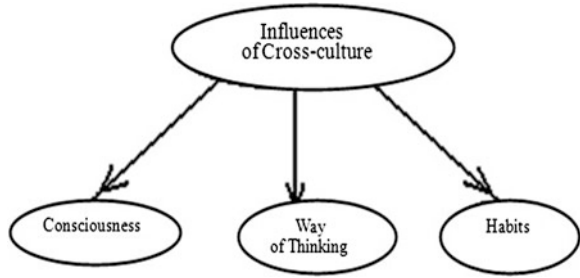
97.3.1 Influences on the Way of Thinking in Translation

Thinking plays a decisive role in the practice activities of human beings (namely,
the way of thinking that human beings have, the practices they will create), and
also can directly influence on the social activities of human beings.

The influences that cultural difference exerts on the way of thinking in trans-
lation are very great. This is because the different directions are chosen by people
who are in pursuit of different cultures in the construction of way of thinking,
eventually making them think from a different angle.

The slogan (BEI JING HUAN YING NING) of Beijing Olympic Games 2008 is
here taken as an example: profound translation learning is actually contained in
these short five words. From the perspective of the western countries, the five
Chinese words are often translated into "Beijing is welcome you", but such a
statement-oriented sentence can only give a significant expression to the meaning
of sentence, but not in tone and intonation of language. However, from the per-
spective of Chinese civilization, Chinese people have adhered to the traditional
culture of hospitality since the ancient times. Therefore, as host of Olympic Games
2008, it was necessary for China to treat visitors from all different countries with a
more enthusiastic attitude, and therefore the slogan (BEI JING HUAN YING
NING) was translated into "Welcome to Beijing!", which made an enhancement
to the warmth, decorous feeling and enthusiasm of language, and simultaneously
gave a manifestation to the information that society paid the highest attention to at
that time.

97.3.2 Influences on the Consciousness of Translation

Because a large number of translators have little knowledge of the cultural
background of some country and do not get real recognition on that language
meaning will change along with the change of environment in English translation,
the expressions to language information are ultimately far from being succinct and
accurate.

"Religion" is a cultural element which should never not neglected in the development course of culture in the western world, and also is a consciousness belief that people of the western world persevere in for a long time, thus laying a solid foundation on the thoughts and values of western people.

In the translation from Chinese language to English language, it is necessary for translator to give consideration to the conceptual role of the religious culture of the western world, and try to prevent the deviation of word meaning, which is caused by the backward consciousness of Chinese English, etc.

For example, English sentence "Being a teacher is being present at the creation when the clay beginning to breathe" can be understood as "teachers are making creations at every moment, especially when the earth begins to breathe" in accordance with the most direct translation method of Chinese language. It is very obvious that consideration is not given to the religious cultural background of the western world in such a translation. The accurate Chinese meaning of English sentence above is that teachers are witnesses of creations, witnessing the breath and growth of students.

97.3.3 Influences on Habits of Translation

In addition to the conventional English language translations, the translations of some brief and short Chinese idioms will also be influenced by the cultural factors. In Chinese language, high importance is attached to "simple and refining"; more specifically, several long Chinese sentences can be replaced with certain word or phrase.

In English translations, translators are in shortage of the understanding of the eastern civilization, and therefore the people of the western world can't get a real understanding of true meaning if translators are still required to carry out translations only according to the standards of Chinese language.

For example, in the translation of Chinese idiom "Qian Lv Ji Qiong", translators are used to translating it into "at one's wits end".

In such a translation, the language structure is very simple, and its meaning can be grasped by Chinese people immediately.

However, the people in the western world are still in shortage of the understanding of Chinese culture, and therefore can translate Chinese idiom above into "The proverbial donkey in ancient Guizhou has exhausted its tricks, and it can do nothing more".

Through such a translation, the meanings of "Qian Lv Ji Qiong" (four Chinese words) get an explanation respectively, thus adapting to the habits of people of the western world in reading and writing and making them understand the essential meaning of Chinese idiom as soon as possible.

97.4 Conclusion

From above analysis, although there are large differences between different countries in the cultural backgrounds, English remains the first language in the world.

For this reason, knowing well the skills of English translation has proven to be a necessary ability of any people from any country.

In consideration of the influences of the cross-cultural factors on English translation, it is necessary for translators to give consideration to the characteristics of both Chinese and western cultures in a comprehensive way, making translation and conversion between English language and Chinese language detail by detail by establishing a connection between actual cultural backgrounds, and ultimately convey the most authentic language information to the other side.

In addition, translators shall never make a distortion on the real historical and cultural backgrounds of other countries, but it is highly necessary for them to get an in-depth understanding of the characteristics of cross-cultural elements, and then making an improvement to their own English translation in an all-round way according to national background, cultural background and social background, etc.

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Chapter 98
On the Content-Based Instruction of EFL for Chinese Undergraduates

Min Yu

Abstract Content-based instruction has been gaining widespread popularity in the teaching of both ESL and EFL. Despite its reported and recognized advantages, however, many English teachers fail to make full use of its content and benefits of language learning. In addition, there are comparatively few studies which offer theoretical foundation for content-based teaching and constructive suggestions for its integration in the settings of EFL. This article aims to connect theory with practice and help teachers of EFL in China to maximize the potential of content-based instruction. To achieve this goal, it first presents a short literature review on project-based instruction, followed by a summary of its advantages and beneficial outcomes of using the internet in order to implement it. It then proposes an eight-step process for the sequencing of project work and finally demonstrate a real-world project specially designed for Chinese EFL students. Both the design and the teaching activities proposed can be easily transferred to other settings.

Keywords Content-based instruction · Project-based learning · Internet

98.1 Introduction

Content-based instruction has become increasingly popular in general education as well as in the teaching of ESL/EFL (English as second/foreign language). It has plenty of features which make it particularly effective in language instruction. For

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instance, within the frame of content-based instruction, students are required to read authentic materials, to interpret and evaluate the information included in it. Besides, they have to cooperate with each other so that they are able to respond either orally or by means of writing. Such a teaching approach takes it for granted that writing follows listening and then reading, thus requiring students to synthesize facts and ideas from multiple sources as preparation for writing [1]. In addition, meaningful information or a principal feature of content-based teaching, may lead to deeper processing and content-based classes stimulate students' interest and engagement, thus leading to stronger learning motivation.

The integration of project-based learning into the teaching of ESL/EFL is believed to be a natural extension of content-based instruction. Originally it came from Dewey and Kilpatrick's work and has often been regarded as an effective approach which may promote student-centered learning [2]. The core of project-based learning lies in its "wholehearted purposeful activity on the part of the learner" since it involves students' coping with real-life problems and engaging in purposeful, real-world tasks and activities in authentic contexts. The philosophy that underpins project-based learning may be found in the concept of "experiential learning" based on the close relationship between learning and experience. "Experiential learning" can be interpreted as "the sense-making process of active engagement between the inner world of the person and the outer world of the environment" [3]. In the process of experiential learning, learner's active involvement proves to be important and the point of departure for the experience is learner's personal experience. Hence, scholars describe this kind of learning as "a rubric that conveniently captures the active and experiential nature of the process is 'learning by doing'", which is in sharp contrast with "a 'transmission' approach to education in which learners obtains knowledge passively from the teacher" [4].

Despite the known advantages of content-based learning which incorporates project work, many a teachers of EFL hesitate to exploit them. In addition, there is a lack of studies which may not only provide teachers with a theoretical foundation for project-based learning in the context of content-based teaching, but also propose constructive suggestions for applying project-based learning to their own teaching curricula.

This article aims to connect theory with practice and help EFL teachers maximize the potential of project work. To accomplish this goal, we first offer a definition or interpretation of the term project-based instruction, followed by a summary of the reported advantages of project work in relevant literature and also the positive outcomes of exploiting the internet to implement project work.

98.2 Definition and Advantages of Project-Based Instruction

Projects are "assignments that incorporate student's input, with content deriving from real second language use through extensive contact with native speakers and texts, integrating language skills, and extending over several weeks or more" [5].

In relevant literature several scholars have given labels to classroom approaches which exploit projects. The typical examples of the labels include "project-based approach" and "project work" [6]. Whatever the term people use, project-based learning has the following five characteristics:

a. It involves multi-skill activities which focus on specific topics rather than on language targets; While students concentrate on solving a problem, they have plenty of opportunities to "recycle known language and skills in a relatively natural context" [7];
b. It is an activity that "involves a variety of individual or cooperative tasks such as developing a research plan and questions and implementing the plan through empirical or document research, including collecting, analyzing, and reporting data orally or in writing" [3];
c. It is an approach "in which learners investigate a question, solve a problem, plan an event or develop a product" [1];
d. It emphasizes content over form, promotes individual activities, and combines student input in goal setting and evaluation and group work [3].

Besides, it should also be structured in such a way that skill integration is natural, makes students work both on their own and in group, requires learners to take responsibility for their own learning in the process of gathering, selecting, processing and reporting information obtained from various sources such as the internet and school library, resulting in a tangible end product such as multimedia presentation, and concludes with an assessment of the process.

Advantages for project-based instruction are listed in the literature. A review of them indicates that most researchers believe that this kind of instruction provides opportunities "for intrinsically motivating students to learn, to foster problem-solving and develop independent and cooperative skills". It has often been closely associated with beneficial outcomes such as improving critical thinking and decision-making skills and also helps learners take ownership of their own learning. Another benefit frequently reported is authenticity of experience and language, since when students participate in project work; they share authentic tasks for authentic purposes-both conditions absent from many language classrooms.

Project-based learning is said to be an effective way to simultaneously promote the acquisition of language, content and skills, since it creates a direct link between language learning and application. Another advantage is that when students work in groups they have more opportunities to enhance their independence, confidence and self-esteem. And as a result, students reveal increased motivation and engagement, positive attitude toward language learning and less anxiety. Another advantage involves students' increased social skills, autonomy and group cooperation.

Furthermore, by integrating project work into content-based classroom, vibrant learning environments are created which require students' active involvement,

improve thinking skills, and give them responsibility for their own learning. When combining project work with content-based classroom, teachers keep themselves away from teacher-dominated instruction and move towards creating a student community of inquiry which involves cooperative learning, authentic communication, collaboration and problem-solving.

98.3 Beneficial Outcomes of Using the Internet to Implement Project Work

There are numerous features of the internet that make it an appealing tool in the design of project work, an established medium for language learning and teaching. The internet can be used to access resources and enable communication between individuals and groups. As a result, it constitutes a useful and inexhaustible source of authentic materials which presupposes the capability to interpret and assess its contents.

Previously it has been argued that authentic materials help students develop skills of critical thinking and problem-solving, since they are life-long and transferable skills to settings outside classrooms. Moreover, due to their ability to provide access and interaction with the outside world, the internet-based materials constitute a versatile vehicle for purposeful communication and can enhance language use in a more natural context. They may promote participation in meaningful activities and lead to improved language skills, motivation and cultural understanding. Meaningful authentic materials and activities provide students opportunities to examine the task from various points of view, strengthen cooperation and reflection and provide learners with "access to a whole wealth of cultural material which can stimulate learning".

In addition, the process of gathering information from the internet is a motivating and challenging one. Materials found on it cope with real-world concerns and allow activities to reflect real life tasks leading to authentic combination of language skills and student-centered teaching.

98.4 Developing a Project

Based on the above, we propose the following process which constitutes an adapted version advocated by Alan and Stoller [1]. The following eight steps provide a practical guide for the sequencing of project activities which can maximize the potential advantages of project work.

Step 1 Students and teacher agree on a topic for the project

This stage includes choosing the topic, arousing students' interest and helping them develop a sense of responsibility. Topic is chosen after a conversation and negotiation.

Step 2 Students and teacher decide the final outcome of the project
Step 3 Students and teacher structure the project

Students and teacher agree on information that needs gathering, analyzing and compiling, and also how and where to collect data, student roles and timing for the project.

Step 4 Teacher prepares students for the need of information gathering
Step 5 Students gather information
Step 6 Students compile and analyze the information
Step 7 Students present the final outcome on the basis of what has been determined in step 2
Step 8 Students assess the project

Students reflect on the language and the theme obtained during the process and make recommendations concerning future projects. Teacher provides students with feedback regarding language and content learning whenever necessary.

98.5 A Sample Project

98.5.1 Participants

In this paper we present a real-world project designed for Chinese EFL students. It is a month long semi-structured project which are designed and organized by both teacher and students. After its completion, students will improve their skills of language, data collection and synthesis abilities, thus becoming more confident in the use of English language using.

98.5.2 Goals of Project Work

The aim is to implement project work so as to make students aware of the geography of the local area, use it as a mechanism for cross-curricular work and exploit new technologies. The following are the specific aims:

98.5.2.1 Cognitive Aims

To acquaint students with environmental problems.

To help students realize the importance of the historical and natural environment concerning the sustainable development of the local area.

To enlarge students vocabulary and improve their four skills of English language.

98.5.2.2 Emotional Aims

To sensitize students about the environmental problems.

To foster their respect about the collaborative efforts of the local people.

98.5.2.3 Psychomotor Aims

To get students familiar with observation and research methods.

To arouse students' curiosity and develop their collaborative skills.

98.5.3 Sequence of Project Activities

The first step includes choosing the topic of the project which is "Fish of the local river are in danger of becoming extinct". The details will be decided by both teacher and students, as it is a semi-structured project. Teacher designs a lesson so as to raise students' awareness and elicit their attitude towards the topic. Choice of topic will be based on the following criteria: (a) the topic is part of students' direct experiences; (b) it is associated with their interests or needs; (c) it creates the conditions necessary for investigating and analyzing the issue in a critical way.

The second step involves agreeing on the final outcomes. The results will be reported by means of oral presentation, a letter which aims to convince authorities to take necessary measures, and creation of brochure about the importance of protecting the local ecosystem.

The third step involves project structuring. Data is to be collected through the internet and school library. Furthermore, interviews are to be conducted with members of the local environmental organization to collect information about: (a) the current condition of the local river; (b) fish which live in it and are in danger of extinction; (c) In what way pollution and global warming affect the quality of the water and the fish living in it. Roles will be assigned according to students' interests and abilities. As for group formation, each group and group member will be assigned specific responsibilities, goal and motivation to work

toward it. Teacher is to monitor the progress of groups at regular intervals and provide help and feedback when necessary.

During the fourth step teacher has to prepare the students for the needs of information gathering. S/he designs a lesson and trains students to conduct interviews. For students who will collect information on the internet teacher can design a lesson to acquaint students with techniques of exploiting reliable internet information sources.

In the fifth step students engage in information gathering, as designed previously. Teacher monitors them and is ready to offer help and feedback when necessary.

During step six students compile and analyze the information. After data has been collected, the students discuss the value of the information gathered, get rid of inappropriate information, and organize what is useful and important.

In step seven, students present the final outcome and an open discussion as well.

The final stage involves assessment of the project. It should be expressed positively.

98.6 Conclusion

The purpose of this article is to contribute to the project-based learning literature, address the paucity of empirical studies focusing on language learning settings and link theory to practice. We have not only presented a theoretical background for the integration of project work in ESL/EFL teaching, but also demonstrate a real-world project, the basic features of the project proposed are transferable to other settings. Hence the project design and the activities suggested can be adapted in accordance with teaching setting and language demands of their students. And they may lead to an effective approach of project-based instruction and maximize its positive outcomes include (but not limited to) the following ([1]): Projects should be designed with consideration of students' interests, preferences and language needs; Students should be provided with real choices concerning all aspects of the project; Students should be engaged in plenty of challenging tasks and given opportunities to practice language skills in a comparatively natural context; Students need to be provided with feedback from beginning to the end.

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Chapter 99
Measuring Language Attitudes Based on Matched-Guise Technique

Huaying Chen and Huaizhou Mao

Abstract This paper is about the language attitudes that Uyghur University students in Xinjiang have towards Uyghur-their mother tongue, Chinese-their second language, and English-their foreign and third language. The language attitudes of 236 Uyghur undergraduate students from three universities in Urumqi were investigated using the matched-guise technique. This study finds that although there are statistically significant differences between their attitudes towards Uyghur, Chinese and English, Uyghur university students hold overall favorable and positive attitudes towards all the three languages, and they give Uyghur the highest rating.

99.1 Introduction

Xinjiang lies in the northwest part of China. It has over 20 ethnic minorities, among which, Uyghur has the largest population. Both Chinese and Uyghur are the official languages used in the region of Xinjiang. In the past 20 or so years, minority language-Chinese bilingual education for ethnic minority students has been greatly enhanced here. So Uyghur university students are all bilinguals of

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Uyghur and Chinese. English is not a required subject for the ethnic minority schools, but in some universities in Xinjiang the ethnic minority students have started to learn English as a foreign and third language in very recent years.

Attitudes can be viewed as comprising three components: cognitive, affective, and behavioral [1]. As summarized by Garrett, Coupland, and Williams, this view posits language attitudes are cognitive in that they comprise beliefs about the world (e.g. proficiency in English will lead to better jobs and upward social mobility) [2]. They are affective in that they involve feelings about the language. They are also 'systematically linked to behavior, because they predispose us to act in a certain way': for example, to learn a particular language. Because of the dominance of the official discourse in shaping how and what people think about language, our analysis also takes into consideration the language policy in Xinjiang and China, with a particular focus on the language attitudes of Uyghur university students [3].

The methods used in past studies for measuring language attitudes can be broadly classified into three groups: content analysis of societal treatment, direct measurement and indirect measurement. Each inevitably has its own strengths and weaknesses. One of the best illustrations of the type of approach of content analysis is Fishman's language loyalty in the United States in which trends in the maintenance and shift of ethnic languages are examined in terms of detailed analyses of laws/policies regarding language use, the numbers of language users and the proportions of language use in various domains [4]. The direct method requires respondents to respond to a questionnaire or interview questions that simply ask their opinion about certain languages, speakers of a particular language or a language-planning program.

When indirect methods are used, the respondents are not aware that their language attitudes are being investigated. The most frequently used indirect method in investigating language attitude is the "matched-guise technique" developed by Wallace Lambert and his associates [5].

The procedure of matched-guise technique was summarized by Fasold [6]. A number of bilingual speakers who are fluent in the two languages under investigation are asked to read exactly the same passage in different languages. The reading is tape-recorded and the passage is arranged in such a way that each passage seems to be read by a different individual. Bilingual listeners are asked to judge the recordings on the basis of voice cues alone and rate the speakers on various characteristics, such as intelligence, social class, and likeability. Since each person has provided samples of the two languages, if the same person is rated differently in different "guises", one can possibly conclude that it is the different attitudes towards languages that account for it.

In Lambert's original matched-guise study [5], his subjects produced more positive social ratings for reading with standard pronunciation or upper class speech than for readings with lower class or ethnic varieties. Lambert conducted a series of such experiments in North America [5]. The results led him to conclude that the stereotyped impressions that members of an ethno linguistic group held for another group could be revealed by speech cues alone. According to Lambert,

people unconsciously translate their social attitude towards languages (language varieties) into differential judgments of a speaker's personality or status. This technique appears to reveal more valid reactions than direct questionnaires do.

The rating scale most often used with the matched-guise technique is a semantic differential scale. In these scales, the opposite extremes of a trait (friendly vs. unfriendly; intelligent vs. unintelligent) are designated at either end and there are a number of blank spaces between them. If the listener feels the sound on the tape is extremely unfriendly, s/he would place a mark on the line closest to the word "unfriendly".

In this paper, we address the following question: What are the attitudes of Uyghur university students towards a speaker using their mother tongue, a speaker using Chinese, and a speaker using English?

99.2 Methodology

99.2.1 Subjects

The subjects consisted of 236 Uyghur university students from three universities in Urumqi, the capital city of Xinjiang. There were 80 male students and 156 female students. They ranged in age from 19 to 22.

According to their self-reporting, around 22 % of them passed Band 9 of HSK (HSK is a Chinese proficiency test which is designed to test those people whose native language is not Chinese) or above level, 41 % of them passed Band 8 of HSK, 26 % of them passed Band 7 and 10.7 % of them passed Band 5 and Band 6. So from the figures we know that most of the subjects' Chinese level lies in the medium level.

Among these subjects, 68 % of them stated that they were exposed to English after they came into university; about 19 % of them stated that they started to learn English from secondary school; 13 % of them started to learn English from primary school.

99.2.2 Stimulus Speech Samples

The study used the standard matched-guise technique. One female speaker was used to provide the stimulus for the study (Table 99.1). Subjects were asked to

Table 99.1 Stimulus speakers

Gender	Ethnicity	Age	Occupation	Educational background
Female	Uyghur	44	Academic	Postgraduate

evaluate three recorded speech samples of the same speaker, but they were not informed that the same speaker was used in all three recordings.

The stimulus speaker is a native of Uyghur. She was born and had her primary and secondary education in Xinjiang, and had her university education in Shanghai with the major of English. She is now teaching English in a university in Xinjiang. So she is a qualified speaker for all the three languages.

The stimulus speaker was asked to make three recordings with Pratt software: one recording in Uyghur, one in Chinese and the third one in English. The material was a humorous English short story, which was abstracted from Mini English published by Oxford University. The short story contains 74 English words, the translated Chinese version contains 124 Chinese words, and the translated Uyghur version contains 62 Uyghur words. It took about 40s to read this story. This short story was simple and easy to understand. It was so humorous that the subjects would not be bored even though it was read three times respectively in Chinese, English and Uyghur.

99.2.3 Traits

The subjects listened to Speaker A (Chinese) first and then rated the speaker on eight different personality traits using a 7-point Likert scale as follows, where (1) represented the lower end (e.g. Not friendly) and (7) represented the higher end (e.g. Friendly): Friendly—Not friendly, Cordial—Not cordial, Passionate—Not passionate, Polite—Not polite, Trustworthy—Not trustworthy, Educated—Not educated, Respectable—Not Respectable, Humorous—Not humorous.

The subjects then did the same to Speaker B (English) and Speaker C (Uyghur).

The results were analyzed statistically by using software SPSS14.0.

99.3 Results and Discussion

As can be seen in Table 99.2, there are statistically significant differences between evaluations of the three guised speakers with respect to these eight traits ($p = 0.000 < 0.05$). In order to explore further, we conducted the multiple comparisons between these three guises, as is shown in Table 99.3.

From Table 99.3, it can be clearly seen that significant differences ($p < 0.05$) are found between the evaluation of the Uyghur guise speaker and the evaluation of the Chinese guise speaker in terms of all the rated traits. There is also significant differences between evaluation of the guised Uyghur speaker and evaluation of the guised English speaker in terms of all the rated traits ($p < 0.05$). The Uyghur guised speaker is rated the highest among the three guised speakers.

There are significant differences between the evaluation of the guised Chinese speaker and the evaluation of the guised English speaker in regard to the traits of

Table 99.2 Overall differentiations of evaluations on the three guises (one-way anova)

Traits	F	P value
Friendly	18.303	0.000
Cordial	23.396	0.000
Passionate	12.397	0.000
Polite	24.389	0.000
Trustworthy	29.904	0.000
Educated	11.571	0.000
Respectable	21.640	0.000
Humorous	29.970	0.000

Table 99.3 Overall differentiations of evaluations on the three guises (multiple comparisons)

Traits	F	P value
Friendly	18.303	0.000
Cordial	23.396	0.000
Passionate	12.397	0.000
Polite	24.389	0.000
Trustworthy	29.904	0.000
Educated	11.571	0.000
Respectable	21.640	0.000
Humorous	29.970	0.000

being polite ($p = 0.020 < 0.05$) and being humorous ($p = 0.000 < 0.05$). The students rate the guised Chinese speaker more polite than the guised English speaker, and they evaluate the guised English speaker more humorous than the guised Chinese speaker. No significant differences are found between Chinese and English in terms of other traits ($p > 0.05$).

Figure 99.1 indicates the subjects' ratings on the three guises, in which the horizontal axis represents the eight rating items; the vertical axis represents the mean scores. The three curves represent the results of rating on Uyghur, Chinese

Fig. 99.1 General evaluation on the eight traits among Uyghur, Chinese and English
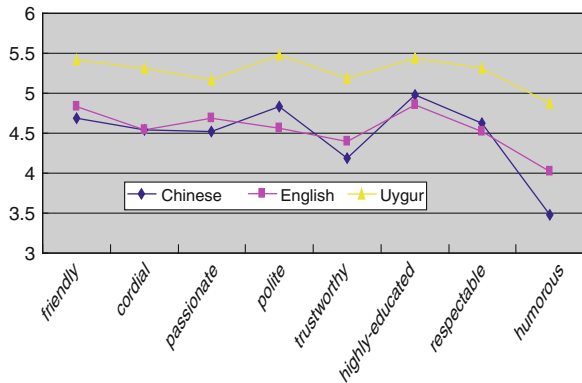
and English guise speaker respectively. The means for all the traits of the three guises are higher than or equal 3.5, the middle point of the 7-point Likert scale.

For all eight traits evaluated, there is a striking trend of higher evaluation of the traits in the Uyghur guise speaker. The evaluation to Uyghur guise speaker is on the top of the whole chart. The matched-guise test documents subconscious language attitudes. Uyghur students' reactions to the speech of Uyghur guise speaker show their attitude towards Uyghur language. The subjects rate Uyghur high not only from the affective aspect but also from the status aspect. They demonstrate strong in-group loyalty to Uyghur language and cultural identity. Uyghur people are proud of their language and their ethnicity.

The rating trends of evaluation to Chinese guise speaker and to English guise speaker are similar. The evaluations of these two guised speakers are all under the evaluation to Uyghur guise speaker. Uyghur is their mother tongue and their language of instruction in primary and secondary schools. Chinese is taught as a subject at schools. Uyghur use Chinese when they communicate with non-Uyghur people. It is understandable that the evaluation to Chinese is lower than to Uyghur. English is taught as a foreign language for the students. Most Uyghur university students are exposed to English only after they have entered the universities. They seldom use it in their daily life.

There exists crossing patterns between the rating of Chinese and English at some points. Chinese speaker is slightly higher than English speaker in traits of being polite, highly educated and respectable. The rating of English guise speaker is slightly higher than the guised Chinese speaker in traits of being friendly, passionate, trustworthy and humorous. With the opening of our country and Xinjiang to the world, the students are accessible to English movies. They get to know about English-speaking people mostly from movies and TV. They are impressed mostly by English-speaking people's humor. Therefore, they evaluate English guise speaker more humorous than Chinese guise speaker.

On the whole, it can be said that the subjects in general have overall positive attitudes towards all the three languages.

99.4 Conclusion

Significant differences are found between the evaluation of the Uyghur guise speaker and the evaluation of the Chinese guise speaker, and between the evaluation of the guised Uyghur speaker and the evaluation of the guised English speaker in terms of all the rated traits. The Uyghur guised speaker is rated the highest among the three guised speakers. This demonstrates that the subjects have strong affection for the Uyghur language. There are significant differences between the evaluation of the guised Chinese speaker and the evaluation of the guised English speaker in regard to the traits of being polite and being humorous. The students rate the guised Chinese speaker more polite than the guised English speaker, and they evaluate the guised English speaker more humorous than the

guised Chinese speaker. No significant differences are found between Chinese and English in terms of other traits.

The subjects have overall positive attitudes towards all the three languages. The Uyghur students have more positive attitudes towards Uyghur than Chinese and English respectively, which shows their emotional identification with their mother tongue and the language group. The Uyghur students are also attached to Chinese because Chinese is an important national language in China and another official language in Xinjiang and they have learned the Chinese as a subject in schools since their childhood. Although they are learning English as a foreign language, the Uyghur students show their favorable and positive attitude also towards English. We witness in Xinjiang that Uygur students have a great interest in the language of English because of its international status, and the enthusiasm for learning English among Uyghur people is increasing recently.

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Chapter 100
Research on Black Humor in Slaughterhouse Five

Shichao Yuan

Abstract Kurt Vonnegut and Joseph Heller are well-known writers in America. Their representative works Slaughterhouse-Five and Catch 22 are the important works in 1960s', which have strong features of black humor. The author makes comparison between these two novels from several aspects, such as, background, narrative manner, language logic and character making. In this way, the author wants to show the black humor features in these two works.

Keywords Black humor · Narrative method · Language logic · Character making

100.1 Foreword: Black Humor

Black humor first appeared in the literature filed at 1940s and matured in 1950 and 1960s. Slaughterhouse-five and Catch 22 are the representative works among them. So what is black humor? No matter in West or in East, black means oppression, sadness, hopeless and death. Black humor is the way that people could show tragedy in the form of eerie comedy [1]. In this way can we expose freaky society and screwy human nature? Black humor often mixes with traditional humor to describe a hateful, terrible, and absurd world in the novel.

The black humor theory of Freud is release theory. According to him, the secret of black humor is when someone meets serious threat; he or she has the ability or possibility to change himself or herself from self-centered to super-self. It means when someone meets threat, if he infatuated with himself, he would make a

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compromise with reality in order to reserve himself [2]. On the contrary, if he didn't infatuated with himself, he would look down upon reality; even take absurd action to change the danger in to a chance of joking. Freud took a classical joke as an example: a criminal was sent to scaffold on Monday morning, he looked around and said, "It's a good beginning." The story tells us, black humor has the function of releasing blues and super realism.

Vonnegut concluded the functions of black humor when he was asked by reporter of Playboy, he said "black humor describe people's laughter when they are hopeless in the political struggle… they are the people of no force and weight. Black humor is the only way for them to face frustration… black humor is a kind of humor for insignificant but wise people was in oppression." Heller gives us a farce by his transcendental talent, and proposes a new way of reflecting life: "Laugh at first, then look back what you laughed with terror".

100.2 Backgrounds

Joseph Heller, (1923) and Kurt Vonnegut Jr. (1922–1997) are the most famous American black-humor-works writer in the contemporary era [3]. Catch 22, 1961 and Slaughterhouse Five, 1969 are their classical works which has the same backgrounds and idealistic root. In this sense it is important to anatomize the differences and similarities between them. In this way can we understand more about America at 1960s' and the black humor literature?

American society is in chaos at 1960s. World War II, Korean War and Vietnam War not only disturbed American society, but also disordered people's consciousness. American people faced sadness of losing family member and mental persecution of McCarthy's government [4]. This kind of special political environment resulted in fission of traditional value conception and culture regulation. At the same time, "inhuman" status made by highly developed industrialization let people realize the non-rational, out-of-order, absurd and ridiculous world. In this kind of background, Catch-22 was produced.

Slaughter-house Five was produced by Kurt Vonnegut who experienced extremely cruel Dresden Air Raid. Because of government's distorting of the reality, Vonnegut was angry and wrote Dresden Air Raid in to his representative work Slaughter-house Five [5]. American government never mentioned about this most destructive slaughter in Europe battle field; Air Force set it as blank in history, too. For this well-designed Dresden atrocity had little meaning and cost too much, American government evaded to talk about it in order to avoid defacing its image. At 1967, Vonnegut returned to German with Guggenheim Fellowships. The slaughter fastened on his mind as a ghost. So this Slaughter-house Five was produced at this background.

100.3 Narrative Method

Fragment is the most significant character of after-modernization novel. In after-modernization novels, the world is made of confused and disordered fragments. As for the structure and content, narration is broke into different fragments. This kind of narrative way is just like Montage in the film which produces absurd effect by the way of flashback, intertwining and foresees. Heller once said, "I choose simple topic, process it by the way of distortion, expanding, and development. If I write it in annalistic way, it's meaningless." Catch-22 has three clues, they are three air raid task. There are 42 chapters in Catch-22, most of them are titled by the character names, and some of them are named by place. So many critics try to sort order for this novel, I also try to do this job. But at last I think may be the self-contradiction, non-logical time are made by the author intentionally. Critic Jean Solomon think: there are two time order in Catch-22. One is set around Yossarian. The story runs forward or backward around the point when Yossarian hided in hospital after his air raid task was increased to 45 times. The second time order is centered on Milo. In this order, the story just goes forward chronically. Each time order is reasonably alone, but if we mix the two together, we find that the time order is impossible. But the impossibility of time order strengthens the nonsense and absurdity of the air raid task. "Billy was out of control of time." "When he slept, he was a widower, while after he waked up, he was at his wedding. He came into a door at 1955, but went out of a door at 1941, and then he went back again from this door to find he was at 1936. He said he had seen his birth and death for so many times, and he could go into any event that happened during his lifetime." Billy's different life periods (war time, after war time, aged time, and Tralafa-amadore life) help readers to understand Billy. Story changed among different periods with no logic, no control. In the novel, the past, the present, and the future were divided in to fragments. In the fragment time, Billy described his experience on one hand; on the other hand, he reflected his life. The author talked about characters' fate in the forewords, described terrible war spectacle in the way of flashback, and portrayed his journey and other non-warfare scene by narrative imposed method. In this way, traditional narrative ways disappeared, such as suspense, conflict, and climax and come-off. Though the time is confused, we can order the times and spaces in the novel, that is—birth, graduating from senior high school, enrollment, serving in the army, being taken captive by Germen, returning to hometown, marriage, getting schiz, talking about his experience of being kid-napped by a flying saucer from the Tralafaamadore in the TV program.

The most common narrative way of black-humor works is the relater talks about horrid things humorlessly, which results in distance between relater and the content he talks. As a result, the absurd affair and world are described impersonal and the reader can be calm when they are reading.

100.4 Anti-Logical Languages

Anti-logical language is another feature of black-humor novels. Both of the two novels were written in the way of symbol, reputation, language game and so on. In this manner, the works formed a highly concentrated and metaphorical world with no system, truth, justness, and humanism.

100.4.1 Symbol

There are special meaning of the names in Catch-22, such as Scheisskopf means fool and anoia; Major Major Major whose name is his military rank, too. Vonnegut gave his hero a name of "Billy Pilgrim" in order to make contrast with a poem The Pilgrim's Progress written by John Banyond. In The Pilgrim's Progress, Christian had a journey for Zion, but in Slaughter-house Five, Billy have a ridiculous and cruel journey to death. In the Bible, there is destruction of two cities Sodom and Gomorrah, which is caused by the evil of citizens; while in Slaughter-house Five, there is destroy of Dresden–a city with thousands of innocent people.

100.4.2 Reputation

There are many reputations in two novels, for example, when Snowden is dying, he repeated: "I'm cold." Yossirian mumbled: "There, there." for several times, which shows Snowden's despair and Yossirian's helplessness.

An example in Slaughterhouse Five:

> When a Tralfamadorian sees a corpse, all he thinks is that the dead person is in bad condition in that particular moment, but that the same person is just fine in plenty of other moments. Now, when I myself hear that somebody is dead, I simply shrug and say what the Tralfamadorians say about dead people, which is so it goes

He knew, too, that most of the people watching him would soon be dead. So it goes.

There is a common topic in the two paragraphs above_ death. Death is a serious topic, but in Slaughterhouse Five, "so it goes" appeared more than 100 times to describe death. In this way, the tone seems very easy, the description is humoristic. All above of is typical feature of black humor works, that is showing tragedy in the way of comedy.

The meaning is deeper when "so it goes" appear more and more. The first time when we heard of it, we feel funny, and then we are tired of it. Why? If we anatomize it, we find when "so it goes" appears, a person would die. So "so it goes" is a screech owl, when we see it, we see death. In the novel, there are deaths of Kennedy, Martin Luther King, young soldier in Vietnam battle, Edgar Derby,

which are all described by just one sentence "so it goes". Vonnegut shows his undesirable distress and disappointment in the form of mocking and cynicism.

Slaughterhouse Five ended in bird's twitter "Poo-tee-weet". People are perplexed by this repeating sound, and think it represents the incomprehensibility of life. In fact, the author explained for it, he said, "I wonder sometimes what the meaning of art is. The best answer I could find is canary in colliery theory. In this theory, the function of artists depends on their sensitivity. Because of their transcendental sensitivity, they could feel the danger before those physically strong people. They are just like the canary which falls in a faint in colliery full of gas." "Poo-tee-weet" represents an author's precognition for threat, and his warning for all people in the world.

100.4.3 Language Game

Cicero divided joke in to two kinds: one is because of funny thing, another is depends on language. In Catch-22, there are so many jokes like this. Apparently, Heller is more skillful than Vonnegut in this sense. In Heller's novel, there are so many kinds of rhetoric method, such as antinomy, parallelism, reputation, contrast, apposition, which have alienated effect. There are three kinds of language games in Catch-22:

100.4.3.1 Antinomy

"I still don't get it," Yossarian protested. "is Doc Daneeka right or isn't he?"

"How many did he say?"
"Forty."
"Daneeka was telling the truth," ex-P.F.C Wintergreen admitted. "Forty missions is all you have to fly as far as Twenty-seventh Air Force Headquarters is concerned."

Yossarian was jubilant. "Then I can go home, right? I've got forty-eight."

"No, you can't go home," ex-P.F.C Wintergreen corrected him. "Are you crazy or something?"

"Why not?"
"Catch-22."

"Catch-22?" Yossarian was stunned. "What the hell has Catch-22 got to do with me?"

"Catch-22,"… "Says you have always got to do what your commanding officer tells you to."

"But they don't say you have to go home. And regulations do say you have to obey a Twenty-seven Air Force order by making you fly more missions, you'd still have to fly them, or you'd be guilty or disobeying an order of his…"

In this part, there are two propositions. The latter one denies and counteracts the former one. The former proposition said 40 times of air raid is enough, while the latter one said soldier must obey orders, but the order is increasing air raid times with no end. By the way of antinomy, Heller pricks a bubble of autocratically government which makes ordinary people up a stump. The readers can taste strong absurdity and conflict between reality and ideal world.

100.4.3.2 Dilemmatic

Dilemmatic means there are only two choices, no matter we choose any one, the result is unacceptable, that is crag-fast or being in a quandary. In order to do B, we must finish A first, but if we finish A, we can't complete B forever. In this way, the author showed people's intrapersonal confusion and contradiction.

"Don't sir me!"

"Yes, sir"

"And say "sir" when you don't," ordered Major Mecalf.

By this magic idealistic cage, the author sets people in the crack with no air firmly, makes them struggle in vain.

100.4.3.3 Arguing in a Circle

Arguing in a circle means in an argument, the proof depends on the fault of proposition indirectly or directly, which is also called vicious circle. For example, Yossarian loves Lucy, and he wants to know whether Lucy loves him or not:

"Why am I crazy?" he asked.

"Perche non posso sposare" (because I can't get married)

"Why can't you get married?"

"Because I am not a virgin," she answered.

"What has that got to do with it?"

"Who will marry me? No one wants a girl who is not a virgin."

"I will. I'll marry you."

"Ma non posso sposarti" (you are crazy)

"Why can't you marry me?"

"Perche vuoi sposarmi" (because you are crazy)

Here is an indirect form of arguing in a circle, which is more deceptive than the direct form. It is just like a volition which twists all the love, dignity and happiness of the little in the novel. It also trapped the reader's thought before they find break. By the method of rough-and-tumble logic the author oppugns the value and ethical opinions that accepted by most of the people and shows different sensibility logic and the complex and disorder world.

Heller's novel is full of repeating dialogue. These dialogues are foolish and incredible outwardly, but can't be rebutted; they are full of sound but meaningless. These dialogues deny the normal and significant takings among people, reflect

jumbled and nonsensical world. For in this kind of world, this kind of communication could exist. In this way, there is strong tension formed between people's natural will and mainstreamed consciousness.

100.5 Images

For absurdity is the tone of novel, we can't expect a normal hero to save people from a jumbled and choking world. Most of the dramatis personae are the nobodies who are at the bottom of society. They are wise but footy. The critic Wes D. Gehring once said, "The anti-hero is not participator but the stander-by of life, which is the absurdity of black humor works." The protagonists in Catch-22 and Slaughterhouse-Five are this kind of people. They are dominated by power, politician, system and fate, just like a leaf waved in wind. They are helpless, aimless, sadness and pessimistic. The nobodies become captives of system inexplicably. They suffer both physical and psychic pain in the dark society. Black humor works let us understand meaningful theme and cruel reality by the ridiculous and funny surface.

Yossarian and Billy are the nobodies, the former one is bomber and the latter one is the priest assistant in the army. In the aspect of anti-hero description, the two authors are different.

Yossarian doesn't want to surrender to reality, he is unwilling to be exploited, slaved and utilized. He is good at thinking about problems, brave in rebelling. He tries his best to get power from bottom to top. This is a dreadful and filthy war. If there was no war, Yossarian could live, maybe live forever. There must be someone sacrifice for the war, Yossarian doesn't want to be one of them. It's natural for a person to be dead, but who dies earlier is decided by environment. Yossarian is willing to sacrifice for anything expect environment. He is wise to see the people who are black and blue in the world of Catch-22. So he is crazy to the utmost, and becomes a brave fighter who seeks for survival and dignity as a man, becomes a fighter who looks for regulation and order in an unreasonable world.

He said it was not frightens when he went for Sweden. He said he had fought for country for so many years, now the country had escaped from danger, while he was at risk. So he should fight for himself now.

The hero's behavior and experience in Catch-22 shows a powerless individual's helpless and puzzle when he faces evil that is even more terrible than war. By the analysis of this figure, we see how the individual be distorted by society, and how hard he tried to struggle for his own fate. This is an image of indignant anti-hero. At first, he accepted everything unconditionally, and then he revolted consciously, and roused at last. All of this embodies the author's fierce protest for absurdity.

In Slaughterhouse-Five, Vonnegut tries to form Billy as a subversive anti-hero figure. By Billy's mouth, the author clears up government's propagandistic narration for the war, satirizes hypocritical and cruel action of religion, and discloses leading consciousness's control for ordinary people. But Billy's morality is still

under the monitor of society, in this sense; Billy is just an anti-hero figure who is limited within Vonnegut's permission. In Slaughterhouse-Five, succumbing is the attitude Billy treated what happened around him. There is plenty of pessimism, helpless, and succumbing in the novel. Billy has to accept space-time view and life view of Tralafaamadore, that is human beings and other things are insects that stick in the amber. They don't have right to choose life and can't escape from the control of fate. That's why they have to accept fate passively.

At the war time, he cried for his unconscious abuse of two horses; after war he persuades his children not to work for people who make weapons more than one time. In the night, he weeps for human beings pain and death. From Billy, we see human nature and morality. But just because the human nature and morality, Billy continues to endure the unfairness and does nothing to fight against oppression.

For the death that appeared in the novel, the author repeated a short sentence "so it goes" more than 100 times. He is so miserly that he even uses no exclamatory mark. From this we can feel the stoniness of the novel. As "so it goes" repeats more and more, the meaning is deeper and deeper. At last, it becomes a screech owl, when we see it, we see death. A series of "so it goes" make reader fall in tears, but Vonnegut just spreads out his hands, shrugs and laughs. In this aspect, we can understand the author's life philosophy: pessimism, helpless, and succumbing.

It is sure that Catch-22 and Slaughterhouse-Five have two different tones of black humor. Catch-22 is radical while Slaughterhouse-Five is moderate. That's why we have different feeling after reading the two novels. The different art features are related to their different life experience. Heller was born in a Russian offspring Judaic family. His father was dead when he was 5 years old. His mother is not English-speaker, coldhearted, and incommunicative. Even more, she is not Heller's blood mother, which she disguised from Heller for 15 years. Until 15 years, Heller knew the truth when he attended his brother's wedding. So he was stroke and enraged by the fact. In 1942, Heller joined the air force. For him, death is interesting all along. In his memory, his father's funeral was just a party. 27 years later, he became a bomber and faced death for himself, and began to write Catch-22.

Vonnegut's family was warm and happy. His parents were kind and never beard grudges. So he grew up in lenient environment. The black housekeeper cultivated him to be a man who is sympathizing and tolerant. In his opinion, making retaliate is just dirty trick while mercy and lenience are his self-discipline. He confessed his life was a retreating journey. In an interview, he explained his art attitude. He didn't like anger, mordancy, and acerbity. Whatever he wrote, he tried to make people laugh, if not, he failed. Anger, mordancy, and acerbity resulted in vanish of comedy. Only by moderate mock, jeer and scorch, can the novel produce and keep the feature of "laugh" and comedy. That's Vonnegut's art aim and principle, and it is also the characteristic of Slaughterhouse Five.

As Chinese scholar WU Congju said, Heller's anger shows his hope for human being, while Vonnegut's moderation is based on his pessimism life attitude. In other words, if there was no hope, there would have no anger. And these two novels are embodiments of life view of Heller and Vonnegut.

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Chapter 101
Study on Non-Native English Teaching

Jingjing Guan

Abstract With English as an international language, there was a lot of pressure on non-native teachers of English to improve their spoken language skills to meet the changing needs of their student. The author investigated in the basic condition of NNESTs, and the author argued that improves their professional qualities and teaching accomplishments should be put on the agenda as soon as possible.

Keywords NNESTs · Challenge · Investigation · Further learning

101.1 Nnests' Challenges

101.1.1 Challenges from Students and Parents

NNESTs are authentic of English in school permanently, but now their steady status is shaking [1]. Although the importance of learning English is mentioned all the time, the NNESTs "scent" the challenging "smell" nearby. The Chinese students have more chances of learning English. Many students may have opportunities to learn abroad, so many students' oral speaking is better than NNESTs [2]. And most of student's parents have bachelor's degree, which is potential threatening to NNESTs. They will always complain about the teachers' pronunciation, grammar and teaching methodology. Thus, the NNESTs are busy dealing with the parents rather than students.

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101.1.2 Challenges from New Teaching Aids Involved

With the development of Computer-assisted Language Learning, the past teaching methodology-repeating what the book says-is not suitable. Elegant tape and video may help students correct their pronunciation and intonation, even NNESTs themselves. The only need of NNESTs is to push the button! Many kinds of audio-visual instruments (computer, multimedia) are involved in classroom, which infringe and replace the role of traditional teachers [3]. As a matter of fact, NNESTs are almost the part of these instruments, while as the sound of NNESTs gradually fades away.

101.2 Investigation of Nnests

101.2.1 On Nnests Basic Condition

In the system of teacher evaluation, academic credentials and technical titles are main standards to measure NNESTs professional qualities [4, 5]. With the enlargement of the college, the amount of the college students is dramatic increasing. Under the circumstance, many colleges adopt the undergraduates to teach English. Here is the table of teachers' age, academic credentials and technical titles of my college in 2005-Qiqihar Medical University. As shown in Tables 101.1, 101.2.

One of the core question of university English educational reform is the how to improve teachers qualities [6]. The academic credentials are directly related with the teaching scientific research ability. The proportion of teachers with bachelor's degree is higher, which shows the teachers' development cannot follow the development of situation. 80.9 % of universities English teachers do not have the graduated educational background. There are also many issues in the age structure of University English teacher. If the young teachers don't receive the further education, the university English teaching qualities and the educational reform will get seriously affected. Although the old teachers have more experience of teaching, their language learning will not steady improve after reaching their higher competence-"fossilization" which is called "plateau phenomenon" in language acquisition.

Table 101.1 Total amounts of teachers on academic credentials

The total amount of teachers	Academic credentials			
	Doctor	Master	Bachelor	Three-year undergraduate
21	0	4	17	0
Proportion (%)	0	19.1	80.9	0

Table 101.2 Total amounts of teachers on technical titles and age

The total amount of teachers	Technical titles				Age			
	Professor	Associate professor	Lecturer	Teaching assistant	24–30	31–40	41–50	51–60
21	1	4	3	13	13	4	3	1
Proportion (%)	4.8	19.0	14.3	61.9	61.9	19	14.3	4.8

101.2.2 On Nnests Basic Professional Qualities

Language is the communication instrument of human beings. It is also the thinking instrument and civilization carrier of human beings. In fact, the process of learning language is the process of socialization—the process of gradually accepting and grasping the cultural system of target language. Language is a symbol system, which is formed of certain elements and rules. Learning language must learn and grasp the basic elements and rules (grammar). As NNESTs, their professional knowledge should include not only the basic knowledge of language but also the essential characteristics and special rules (linguistics).

101.2.2.1 Linguistics and Language Teaching Methodology

College English teaching belongs to language education, which relates to Pedagogy, Psychology and Applied Linguistics [7]. It requests NNESTs should not only possess good accomplishment but also understands the linguistics and correlated language teaching theory to improve the theory standard. So there are two advantages of linguistics:

Make NNESTs comprehensive and cognize the essence of language and improve the ability of the language competence and performance
Make NNESTS observe the regulation conscientiously and adapt the proper language teaching methodology.

101.2.2.2 Language Competence and Language Performance

Chomsky divided the language ability into two parts: language competence and language performance. He argued that competence (language knowledge) is the mastery of formal properties of the grammatical system of a language and performance (language skill) is the execution of this knowledge in actual use. Recent years, most of teachers teach the students massive language knowledge instead of adopting various efficient methodologies to improve their language performance. The first reason is the pressure of test. Another is the teachers' poor performance. They haven't very capacity to enhance the students' communicative skills. Although NNESTs are proficient in spoken English, few of teachers may possess

the ability to use the language appropriately. Such a skill should be well developed for non-native teachers to communicate effectively in the second language and maintain the quality of teaching English to speakers of other languages. Pragmatic competence involves the ability to use language appropriately and also comprehend utterances, particularly indirect speech acts by native speakers. This is identified as a key component of a language user's pragmatic competence. "Dumb" teachers must be eliminated by the students and society.

101.2.2.3 Culture and Humane Knowledge

It is important for teachers to identify and consider culturally appropriate discourse strategies or the preferred forms of communication in a classroom. Culture is invariably attached to the way a language is used and non-native teachers need to become aware of the cultural norms and non-verbal language that accompany spoken language in the target culture. They must be made conscious of the various discourse and pragmatic features of different cultures and the importance of such features in intercultural communication [8]. Discourse strategies employed by a teacher can be a key to ensuring a successful classroom environment. NNESTs are expected to have following characteristics:

Comprehend everyday expressions and idioms and cultural connotation of foreign language.
Comprehend common allusions and legends in foreign language communication.
Understand experience, accomplishment and contribution of main artists, writers and scientists in the target countries.
Understand the situation of the target countries' politics, economy and other environments.
Understand the differences of living style, behavior and the way to communication in target country.

101.2.2.4 Scientific Research Capacity and Standard

Along With the enlargement of the college, NNESTs haven't enough time and energy to research. The research is in a passive position. The standard of NNESTs researching capacity should be increased as soon as possible. Under the gradually severe situation, following is the analysis of my college English teachers' research achievements in 2004. As shown in Table 101.3.

We can see that most of research achievements are published by provincial press. There are few research achievements of higher standard. Though few teachers consciously combine the teaching process and research process, and they have made encouraging progress. But the entire condition isn't good that most teachers may not consistently engage in research and aware the significant of research.

Table 101.3 Total amounts of teachers on research

Quantity	Essay		Works		Research topic	
	State	Province	State	Province	State	Province
Total	1	3	0	2	0	2
Average	0.048	0.143	0	0.095	0	0.095

The causes result in the current situation is:

Most of the teachers are young. Though they have higher enthusiasm, their research competence is lower.

The workload is heavy. The teachers have little time to reach.

The researching resources and funds are insufficient.

The knowledge structure of English teachers is not reasonable and comprehensive. Many factors lead to the severe situation of English teacher research. So the author raises the new strategies:

The college should create favorable conditions for researching objectively. Launch various activities and research method learning courses. Encourage the teachers' research by using preferential treatment.

The teachers should improve their own research ability subjectively.

Transform simplistic subject theory supporting into cross-subject theory supporting.

Transform qualitative research into combination of qualitative research and quantitative research.

101.3 Solutions

Along with technology advancing by leaps and bounds, NNESTs act as a special team who shoulder heavy responsibilities to foster the young with the makings of a statesman. While the ages of NNESTs are reaching younger whose teaching experience is insufficient? Besides influenced by the market economy, many teachers' thought is unruffled. The phenomenon of brain drain is very serious. Improve their professional qualities and teaching accomplishments should be put on the agenda as soon as possible. That is to say we should pay more attention to the teacher development and education.

101.3.1 Strengthen on-the-Job Education

According to the needs off teaching reforming, NNESTs should learn continuously and engage in advanced studies.

Dispatch NNESTs to learn how to teach by observing other teachers' classes and emulating their teaching methods.

Dispatch NNESTs abroad to learn advanced theory of linguistics, language acquisition and teaching methodology.
Conduct various English teachers training course and English teaching seminar.
Send NNESTs to learn cross-subject knowledge-psychology, computer, education, linguistics, literature and philosophy.
Invite the famous academician to give lectures.
Participate in scientific conference at home and abroad.

101.3.2 Reform the Teaching Method and Raise the Teaching Efficiency

In view of NNESTs shortage, the reform of teaching methodology and method must be enforced. With the rapid development of Internet, many excellent Internet teaching resources have accomplished information sharing. So we should positively launch Computer-Assisted Language Learning which give fully play to advantages. In some degree, it may alleviate the teachers' overload caused by backward teaching method and methodology.

101.4 Conclusion

Under the circumstance of English teaching reforming, Non-native English Speaker Teachers will become more and more important. With English as an international language, there is a lot of pressure on non-native teachers of English to improve their spoken language skills to meet the changing needs of their students. Recommend outstanding talents. Keep top-notch talents. Engage core talents. Build up contingents of higher Standard English teaching team in China.

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Chapter 102
Rhetorical Analysis of Beauty of Famous English Sayings

Xiaona Wu and Lanlan Wang

Abstract Famous English sayings have rich ideological content and beautiful language. Due to the use of various rhetorical devices at phonological, semantic, syntactic levels and figures of speeches, the English sayings have developed a unique style. Their beauty is generated by phonological repetition, semantic antithesis, syntactic parallelism, and the use the various figures of speeches such as simile, metaphor and paradox.

Keywords Famous english sayings · Rhetoric · Phonologic · Semantic · Syntactic · Figures of speech

102.1 Introduction

Famous sayings are the wisdom of ancient sages, content-rich, concise, full of philosophy, and thought-provoking. Reading them is reading a concentrated life. Why can famous sayings be passed from generation to generation with lasting charms? Apart from their rich ideological content, it is also due to their beautiful language. The forms of famous English sayings are perfect. The application of various devices at phonologic, semantic and syntactic levels and figures speech creates a unique style. This article will have a preliminary discussion on the beauty of famous English sayings from the perspective of rhetoric devices so as to help English language learners to more fully appreciate their charms.

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102.2 Rhetoric Analysis

102.2.1 Beauty Created by Phonological Repetition

Many famous English are melodious and catchy. Famous saying using a variety of famous rhyme styles produced various sound effects which are clear, bright, dignified, soft, or powerful.

Alliteration is frequently used. In this device the same consonant sound is repeated at intervals in the initial position of words [1]. The effect it achieves is a prominent focus, a deeper impression, a balanced rhythm, or emotional catharsis. For example:

It is better to be faithful than famous (Theodore Roosevelt).

Slow and steady wins the race (Robert Lloyd).

Forgiving is not forgetting. It's letting go of the hurt (Mary Bethune).

Assonance is the other device commonly used. Assonance is the "echoing" or "resemblance" of vowel sounds in the stressed syllables of a sequence of words. This device is usually used effectively to convey various sensory impressions. For instance:

Happiness lies not in the mere possession of money; it lies in the joy of achievement, in the thrill of creative effort (Franklin Roosevelt).

We have no more right to consume happiness without producing it than to consume wealth without producing it (George Bernard Shaw).

Homeoteleuton is another device. This Greek word means "similarity in endings" and in this device words, phrases or clauses in close succession and with the same sounding suffix or syllable(s). The rhythm produced is clear and bright, as is shown in the following examples:

Early to bed and early to rise, makes a man healthy, wealthy and wise (Benjamin Franklin).

The first wealth is health (Ralph Waldo Emerson).

Creditors have better memories than debtors (Benjamin Franklin).

102.2.2 Beauty Generated by Semantic Antithesis

English sayings often use antithesis with structural symmetry but contrast meanings. It is the adjectives, verbs and nouns with contrast meanings that play the critical roles in antithesis. Antithesis has formal, visual, and phonological beauty; in content, it can achieve both emphasis and reflective comparison. It has the feature of leaving some implications for people to think over, thus reaches the artistic effect and practical function of implication but not exposition.

Antithesis is the rhetorical contrast of ideas by means of parallel arrangements of words, clauses, or sentences [2].

As antithesis is the deliberate arrangement of contrasting words or ideas in balanced structural forms, it is effective to achieve the symmetry of formal beauty and strong sense of contrast [3]. For example:

Money is a good servant and a bad master (Francis Bacon).

You make a living by what you get; you make a life by what you give (Ronald Reagan).

Let us never negotiate out of fear, but let us never fear to negotiate (John Fitzgerald Kennedy).

102.2.3 Beauty Generated by Syntactic Parallelism

Parallel structure makes a language neat and orderly in form, concise, full of rhythmic tones, and sonorous and powerful to read, so as to achieve the effects of deepening feelings, increasing the intensity of the language, and generating strong appeal. Parallel structure is used extensively in famous English saying [4].

A parallelism is a figure of speech that uses similar structures in separate sentences to express related ideals. In parallel structure it is necessary to balance word for word, phrase for phrase, clause for clause and sentence for sentence.

Parallelism has the features of neat structure, bright rhythm, concise expression, and emphatic meaning. As it is well-balanced with sonorous rhythm and consistent stretch, it is effective in enhancing the language potential, expressing strong thoughts and feelings, and indicating a profound truth. For example:

Laugh, and the world laughs with you; snore, and you sleep alone (Anthony Burgess).

102.2.4 Beauty Generated by Ingenious Use of Figures of Speeches

Simile and metaphor are two most simple and most commonly used rhetoric, and also the most widely used as rhetorical devices. They are used in many famous English sayings to create accurate, realistic, vivid, philosophic, brief, and profound effects, which make the sayings easy to understand [5].

A simile is a figure of speech which makes a comparison between two unlike elements having at least one quality or characteristic in common, often introduced with the word "like" or "as". Many English sayings contain beautiful simile, with the shining glory of language art. Take the following as examples:

Sloth, like rust, consumes faster than labor wears (Benjamin Franklin).
Money is like muck, not good except it be spread (Francis Bacon).
Time drops in delay, like a candle burned out (William Butler Yeats).

A metaphor is a figure of speech where comparison is implied. It is also a comparison between two unlike elements with a similar quality. But unlike a simile, this comparison is implied, not expressed with the word "as" or "like". For example:

Time is money (Benjamin Franklin).

Our destiny offers not the cup of despair, but the chalice of opportunity (Richard Nixon).

A great poem is a fountain forever overflowing with the waters of wisdom and delight (P. B. Shelley).

Paradox is also favorable in famous English sayings. Contradictory phenomenon sometimes does not seem logical, but often can be eye-catching, enabling people to take the hint, thus creates a surprising effect. The use of paradox in famous English sayings makes them even more thought-provoking.

Paradox is a figure of speech consisting of a statement or proposition which on the face of it seem self-contradictory, absurd or contrary to established fact or practice, but which on further thinking and study may prove to be true, well-founded, and even to contain a succinct point. Look at the following examples:

War is peace. Freedom is slavery. Ignorance is strength (George Orwell).

(These words seem to be contradictory and illogical when one reads first. But isn't the way that the thing goes? War is a continuation of peace and peace is another kind of war.)

The child is the father of the man (Wordsworth).

(Some of a person's personality, hobbies and habits are formed during childhood, then developed to the adult, and then until death. Isn't this a child first and a man later?)

One has to be cruel to be kind (Swift).

(Cruelty and kindness is conflicting, but sometimes the two contradictory sides are complementary. For instance, it is cruel to truncate a man's injured limbs, but it has to be done in order to save his life; it seems to be cruel for parents to have strict requirements on children, but such action is entirely out of kindness.)

102.3 Conclusion

It can be seen from the above that the beauty of famous English sayings lies not only in its all-encompassing, conciseness, and profound meanings, but also in its brief expression of complex rules and changing forms of English grammar. It is where the long history and enduring charms lies. If the English learners can appreciate and remember the essence of the language, they can not only achieve the learning objectives of mastering the vocabulary, rhetoric and grammar, but also can use them in oral communication and article writing as the finishing touch, not mention guide their life with them.

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