Innovation and Entrepreneurship Education System of New Engineering Talents Based on Knowledge Base

Yan Wang[1(✉)], Fang Sonh[2], and Hai-hong Bian[3]

[1] School of Information and Control,
Shenyang Institute of Technology, Shenyang 113122, China
hp20190808@163.com
[2] Shanghai Kuanrui Information Technology Co., Ltd., Shanghai 118300, China
[3] Nanjing Institute of Technology, Nanjing 210000, China

Abstract. Due to the poor performance of the traditional innovation and entrepreneurship education system for new engineering talents, the online examination system for innovation and entrepreneurship education and training for new engineering talents is optimized based on the knowledge base. Microsoft asp.net is used as the development tool and SQL server is selected As the database platform of the system, 2005 designed and implemented an intelligent test paper online examination system, and discussed the design and implementation process of typical modules. Furthermore, the traditional genetic algorithm is improved, and the mutation operator and hybrid operator in the genetic algorithm are optimized. Finally, the black box test method is used to test the performance of the system, and the effectiveness of the application of the system is verified.

Keywords: Knowledge base · New engineering talents · Innovation and entrepreneurship education · Online examination

1 Introduction

With the continuous reform and development of China's education system, innovation and entrepreneurship education has become an important part of China's education system and an indispensable part of China's future diversified education system development. In recent years, with the rapid expansion of the scale and quantity of many domestic educational institutions, extensive and centralized innovation and entrepreneurship examination has become a problem faced by many educational institutions [1]. The organization and management of innovation and entrepreneurship education examination is very heavy because of the learning level, the diversification of learning mode and the complexity of students. In addition, the innovation and entrepreneurship examination is a centralized organization mode in a short time, which brings heavy work burden to the organization and personnel of innovation and entrepreneurship examination.

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The traditional mode of examination management has become more and more unable to meet the current management needs. It is more and more urgent to carry out online examination information and networking needs [2]. With the rapid development of educational informatization in China, the innovation and entrepreneurship online examination mode has been widely used as a new assessment method and examination method in the actual teaching examination, and gradually evolved into a hot field of research and application in the current education industry informatization construction [3]. Based on the above reasons, this paper starts from the actual needs of innovation and entrepreneurship examination management, aiming at the current situation of innovation and entrepreneurship examination in China, analyzes the problems and shortcomings of the current innovation and entrepreneurship examination mode, and demonstrates the significance and goal of the construction of the examination teaching system.

Through in-depth analysis and exploration, this paper designs a solution of online examination system of innovation and Entrepreneurship Based on knowledge base, and on this basis, studies the online examination system of innovation and entrepreneurship. First of all, it analyzes the feasibility of online examination system construction, and makes a detailed demand analysis of innovation and entrepreneurship online examination system [4]. Using a variety of software development technologies, on the basis of clarifying the system design objectives, this paper analyzes and designs the functional modules, system modeling, system architecture, system input and output, system security and system database of the innovation and entrepreneurship online examination system, and then constructs a multi-layer architecture innovation and entrepreneurship online examination system. On the basis of the system design, using the object-oriented software engineering design mode, the program of the system is developed, and finally an online innovation and entrepreneurship examination system with perfect functions is developed and realized.

2 Education and Training Online Examination System

2.1 System Hardware Configuration

The background of the innovation and entrepreneurship education examination system is the operation interface for system administrators, teachers, marking personnel, etc., and the management of system paper formation, marking, etc. is carried out in the background [5]. In terms of design, the innovation and entrepreneurship education examination system adopts the standard engineering design mode, and uses the standard engineering design theory to design the functional framework of the system. The system can be divided into modules with independent functions to enhance the scalability of innovation and entrepreneurship education examination system.

In order to discuss the design of the system, this paper draws the functional modules of the system by using the structural diagram of the functional modules. The online examination system of innovation and entrepreneurship education is divided into two parts. In the functional design, the back-end is mainly designed into four functional blocks: system user management, examinee performance management, innovation and entrepreneurship education examination management, and innovation and entrepreneurship education examination management New entrepreneurship education question bank management

function block [5]. The function module structure of innovation and entrepreneurship education online examination system is shown in Fig. 1.

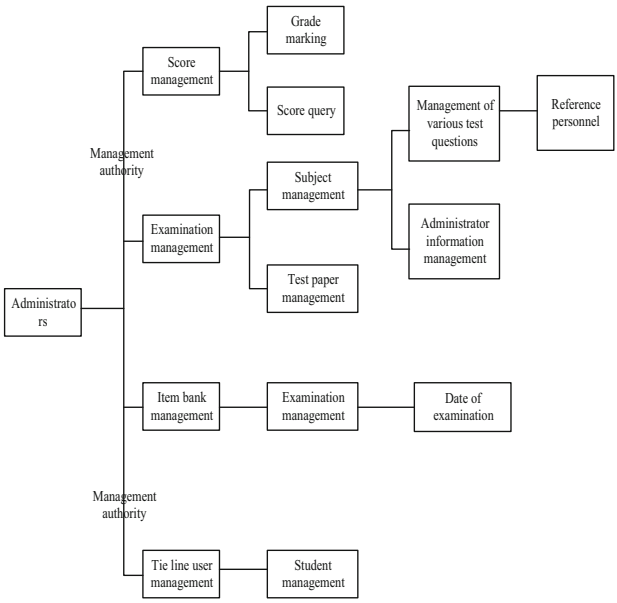

Fig. 1. Function module structure of online examination system for innovation and Entrepreneurship Education

The front desk of innovation and entrepreneurship education online examinee system is mainly designed for examinee services, as shown in the figure. Administrators manage users in the background, and examinees register through the registration function provided by the system, and the front desk of the system is designed with the registration function. For the registration of the system, it is found in the preliminary research that there are roughly three requirements as follows:

(1) Some schools or educational institutions need candidates to register successfully according to one or two of ID card, student number, registration number, etc., that is, before candidates register, they need to verify and control the authenticity of the examination through the above-mentioned unique ID information to ensure the validity of candidates' identity.
(2) Some schools or educational institutions do not need to provide registration function, but use the unique ID information such as student number to assign password to the corresponding exam in advance, and the examinee can directly log in to the exam system for examination after getting the password.
(3) Some schools or educational institutions need to control the entrance of examinees according to the examination permit before examinees enter the examination room of the examination system. After qualified examinees enter the corresponding seats,

they can enter the examination permit number to effectively avoid the trouble caused by examinee registration [6].

Even if the registration function is not designed in the innovation and entrepreneurship education examination system, the network system of the remote online innovation and entrepreneurship education examination also needs the registration function to control the security and browsing authority of the system.

The online examination system of innovation and entrepreneurship education based on the knowledge base mode adopts the application mode based on the multi-layer system architecture, and uses the multi-layer system structure based on the B/S architecture mode and the knowledge base environment to achieve [7]. Multi tier architecture can effectively separate the performance layer, general business logic layer, core business logic layer and data layer, so as to ensure the scalability of innovation and entrepreneurship education online examination system.

The system layered architecture design is conducive to reducing the difficulty of development, making the program developers have their own responsibilities, clear division of labor, and multiplying the collaborative efficiency of system program development [8]. At the same time, the use of layered design is conducive to reducing the coupling degree of the system, and because users can only access the database through the data access layer, reducing the entry point of data operation, many security risks of the system are shielded. The designed system architecture is shown in Fig. 2.

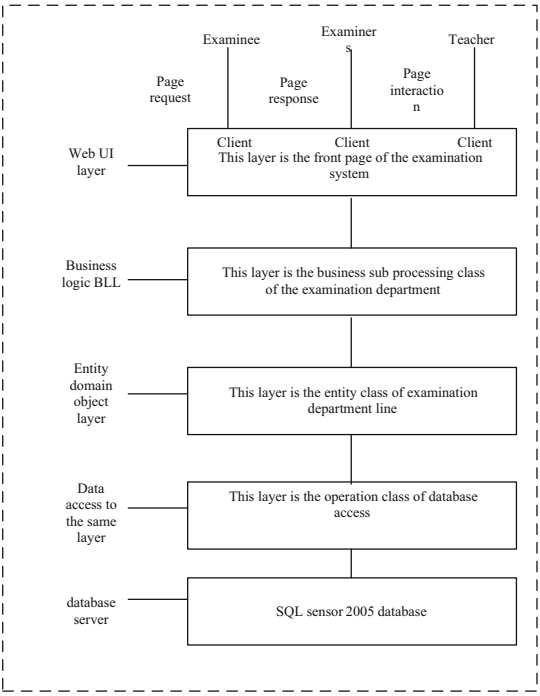

Fig. 2. Hierarchy of innovation and entrepreneurship education examination system

As can be seen from the figure, the online innovation and entrepreneurship education examination system is designed as a four-tier system architecture, with each layer calling each other and progressing layer by layer, and finally realizing the operation of the database. The system's knowledge base UI layer provides a knowledge base service interface for examinees, examiners and teachers, so that users can realize information interaction in the knowledge base environment only through the front-end client [9]. Such a design effectively guarantees that the online examination system can carry out information interaction based on remote places, and effectively meets the management business of innovation and entrepreneurship education online examination based on the knowledge base environment [10]. This module is the core of the system. Its basic functions include three parts: intelligent test paper, artificial test paper and borrowing historical test paper. Among them, the manual test paper formation method is to customize and output the test paper according to the basic needs of the operators, so as to meet the basic needs of the test paper makers; Genetic algorithm is a computational model simulating the natural selection and genetic mechanism of Darwinian biological evolution. It is a method to search the optimal solution by simulating the natural evolution. Genetic algorithm starts from a population which represents the potential solution set of the problem, and a population consists of a certain number of individuals encoded by genes. Intelligent test paper generation mainly adopts the strategy based on genetic algorithm to set the basic constraints according to the basic needs of users, and then uses the strategy based on genetic algorithm to automatically extract questions from the test database, and finally generates and outputs the test papers that meet the requirements.

2.2 System Software Optimization

With the continuous development of intelligent technology, the basic steps of the commonly used algorithm for generating test papers are as follows: firstly, the system matches the knowledge distribution, question type distribution, cognitive classification distribution, difficulty distribution, discrimination distribution, time distribution and score distribution of the test papers according to the overall requirements of the test papers entered by the users, and forms the parameter table for generating test papers, and then selects topics from the test paper database according to the parameter table. This method does not consider the mutual restriction among various parameters, such as knowledge distribution, question type distribution, difficulty distribution, etc. Therefore, the test questions that can not meet all the attributes are often found in the question bank during test paper formation, so they have to be replaced by the test questions with approximate attribution, which will eventually reduce the index of test paper formation. In view of this problem, the relevant topic selection methods are studied.

In the process of system users registering personal information, the main participants in the process are students. Only when students register personal information and pass the system verification can they participate in the system process of online examination system, such as students' online examination, query results, edit personal information, etc. [11]. When students register, they need to fill in some personal information, and the password also needs at least six digits. If the input information does not meet the requirements, the system will display a prompt message, and then return to the registration page

and re-enter the information that meets the requirements. After the user registers correctly, the corresponding personal information is stored in the background database of the examination system, and the ID number obtained by the student is displayed in a fixed position on the page. The time sequence diagram of the student's personal information registration is drawn by the business process of the system. The class involved in the time sequence diagram of the student's registration is the student class. From the overall point of view of the online examination system, the student information registration is In the first part, only after the student registration information is verified by the system, can the system be used normally for online examination. The system administrator can manage the student information through the high authority information management function, and can arrange the required examination questions for different candidates. The user registration module management sequence diagram is shown in Fig. 3.

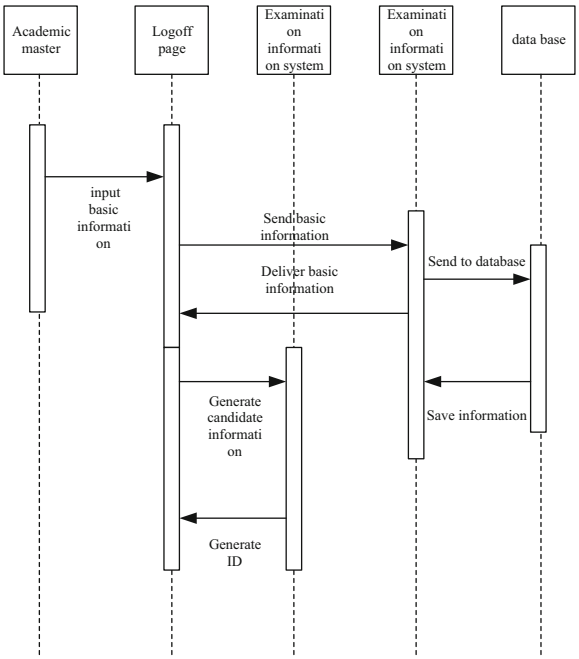

Fig. 3. Management sequence diagram of user registration module

Further scene description based on the above figure:

Step 1: students enter the registration page;
Step 2: input the name, student number, email, password and other information, and send the information to the system database;
Step 3: the system verifies whether the input information format and other aspects meet the requirements;
Step 4: return basic information;

Step 5: insert the user information into the corresponding table in the database without the user information;
Step 6: send the information to the database for saving;
Step 7: display the user's ID number in a fixed position on the page and prompt for successful registration.

Based on the above steps, the system is further optimized. The online examination system uses two input pages to complete the input of various types of questions. After logging in to the system, the teacher user clicks the corresponding question entry link to enter the page of adding test questions. In the page, select the name of the set questions, set the number of the test questions and other information, enter the content of the test stem and the correct answer, and then click the add button to enter it into the test question database [12]. The specific process of adding new questions is mainly to connect the test database, bind the test data and update, add and delete the data. The main controls in the new test question page are list controls and text box controls. Through these controls, information such as the subject, question number and question type of the question can be input. These controls are bound with the corresponding table fields in the test question database. After the teacher edits all the contents of the test question, click the Add button to submit all the information of the test question to the background database The test questions are added [13].

Taking the single choice questions as an example, this paper introduces the implementation process of adding and modifying test questions, and the state chart and sequence chart of adding or editing test questions. In this module, the core to effectively complete intelligent test paper formation is the basic requirements of test paper users, mainly including the following aspects: the proportion of knowledge points; the difficulty of knowledge points; the number of test questions. The essence of this problem is a problem solving problem with multiple constrained objectives [14]. In order to solve this problem effectively, three basic test paper forming processes are set up and implemented. The basic basis of the three processes are as follows:

(1) Based on the percentage of knowledge points;
(2) According to the distribution of knowledge points in questions;
(3) Randomly group papers.

Users can choose according to the actual situation. The management module of the question bank completes the management function of the related question database of the test paper system. Firstly, the system assigns permissions to users. The database for teachers with permissions to edit test questions mainly includes the entry, modification, query and deletion of test questions. The typical input flow of question bank is shown in Fig. 4.

The basic idea of coding method based on the real number matrix is as follows: take each test question in the test question bank as the analysis object, when the test question is coded independently in real number, when the test question has n attribute values, its eigenvector is $n + 1$ dimension, and each dimension corresponds to each parameter of the paper formation problem, such as the number of knowledge points, difficulty, question type, etc. The mapping method is as follows: the test paper corresponds to a

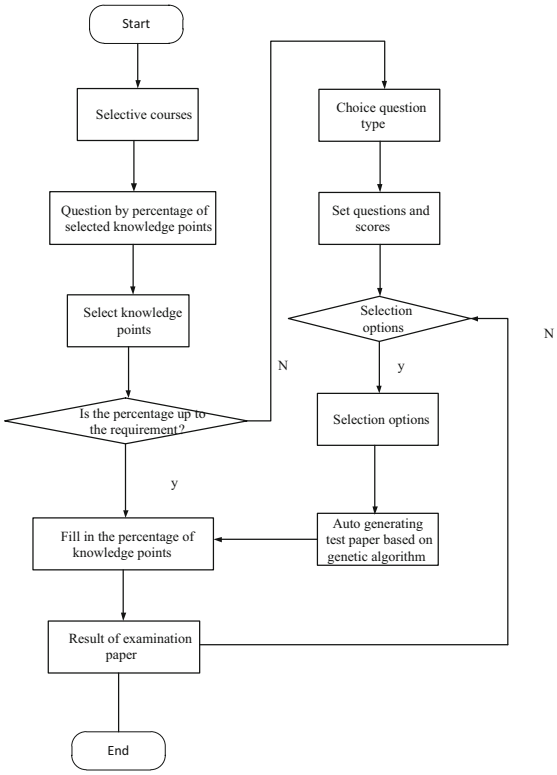

Fig. 4. Edit the sequence of test questions

matrix chromosome, in which the test questions correspond to matrix vectors, and the test attributes are the gene positions in the chromosome. If the number of test questions is n and the attribute of test questions is m, the problem of generating test papers in this test question bank can be described as a matrix of $(n+1)*(m+1)$. Each column of the matrix represents each attribute value of the test question. The matrix model of test paper coding is optimized as follows.

$$a =_i \left\{ \begin{array}{l} a_0, \quad a_1, \quad a_2, \quad \ldots, a_n \\ a_{10}, \; a_{11}, \; a_2, \quad \ldots, a_{1n} \\ \ldots \\ a_{m0}, \; a_{m1}, \; a_{m2}, \; \ldots, a_{mn} \end{array} \right\} \begin{array}{c} \ldots..\text{Evaluation value of test paper} \\ \text{Question A1n} \\ \ldots \\ \text{Question } A_{m0} \end{array} \tag{1}$$

In order to effectively design the fitness function for the problem of generating test papers, this paper proposes the fitness function based on the linear scale transformation. The basic idea can be described as follows: the corresponding mark attribute is weighted to intercept, and combined as the objective function to calculate the overall fitness value. The weight allocation method of target attribute is: wi = 1. In this paper, we use the piecewise function to design the scalar function, and its definition is shown in formula 2.

EI is the attribute value of each target, and M is the error range.

$$f = \begin{cases} \left| \frac{a_i - n}{e_n} - \frac{m}{e_n + a_i} \right| \leq m_i \\ 1, \frac{a_i - 1}{e_n} \gg m_i \end{cases} \tag{2}$$

According to the weight distribution of the objective attribute, the objective function of the whole paper can be expressed as:

$$g_{\min} = \sum \log w_i f / \ln z(a_i + 1) \tag{3}$$

In order to effectively maintain the diversity of population in the actual calculation process, this paper introduces the exponential proportion transformation method into the transformation of fitness function, that is, the fitness function is transformed into the objective function by formula 3.

$$k = \frac{\prod (a_i + 1)^m}{\sum \Delta \ \sin 4\pi * g_{\min}} - f \tag{4}$$

2.3 The Realization of Innovation and Entrepreneurship Education Training Online Examination

The overall structure of online examination system is divided into the following modules: examinee login module, online examination module, question bank management module, examination system maintenance module. Next, the class diagram of the system is designed, and then the specific implementation of these functional modules in the system is introduced in detail. An abstraction and summary of a group of objects with similar attributes, behaviors and structures is summarized and abstracted from the external characteristics of multiple objects. A class has two special components: methods and attributes. Methods are the operations that can be performed by the objects instantiated by a class. Attributes are the states of the objects instantiated by a class. According to the needs analysis, a system can be drawn Class diagram. In order to fully guarantee the security of online examination system of innovation and entrepreneurship education, users need to log in and verify their identity before entering the system. The way of

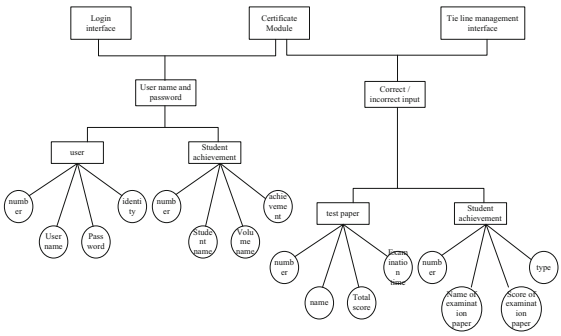

Fig. 5. Test training system control module

verification is mainly through user name and password. If the user name does not match the password, you cannot enter the system. The specific control implementation process is shown in Fig. 5.

It can be seen from the examinee examination interface that the online examination system based on knowledge base has replaced the traditional paper and pen examination mode. In order to facilitate the examinee to grasp the examination time, the system provides a timer. When the test time is 15 min away, the system will automatically pop up a prompt dialog box. When the test time is over, the system will automatically close the interface of the test, effectively preventing the unfairness brought by the examinee after the test. As shown in Fig. 6 is the flow chart of the examinee's program.

Based on the above steps, we can effectively optimize the online examination system of innovation and entrepreneurship education and training for new engineering talents.

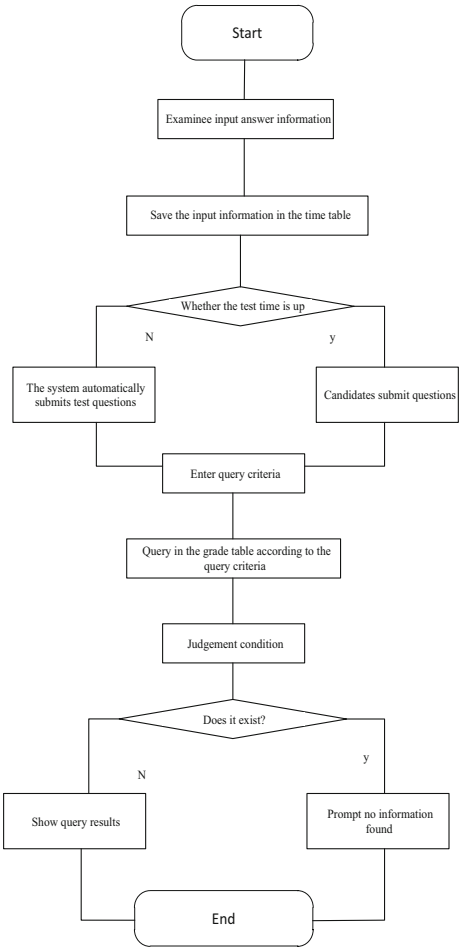

Fig. 6. Optimization of education examination and training process

3 Analysis of Test Results

Further optimize the operation effect of the online examination system for innovation and entrepreneurship education and training of new engineering talents. The test platform of the system mainly tests the business logic and function of the system, which is limited to the complexity of software and performance. Therefore, the paper carries out unconventional simple performance test, and does not elaborate the performance test of the system specifically. The following will discuss the system test from the business logic function test. The system test platform is divided into hardware platform and software platform, specifically as follows:

3.1 Experimental Environment

Hardware platform for system test:

CPU package: dual core Intel Pentium t24102000 MHz (15 × 133)
A main board: ThinkPad R73
System memory: DDR3 SDRAM, 2016 MB
Hard disk: 5400t 320 G
Display card: NVIDIA Quadra NVS 140 M (256 MB)
Display: Samsung b632

Software environment for system testing:

Operating system: Microsoft Windows Vista Ultimate (Table 1).

Table 1. Experimental parameters

Number	Test content	Duration
1	User login test (database connection)	2 h
2	Score information addition test	90 min
3	Score list display and modification test	2 h
4	Test category information initialization test	2 h
5	Test category list display and modification test	90 min
6	Add test questions	90 min
7	Marking test	90 min

3.2 Test Results

Based on the above experimental environment, the actual application effect of the current entrepreneurship education and training examination system is analyzed and tested, and the results are recorded by comparing the fake case side, as follows (Fig. 7):

Based on the analysis of the above test results, it is not difficult to find that the test results show that each functional module of the online examination system of innovation and entrepreneurship education operates normally and achieves the expected design goals.

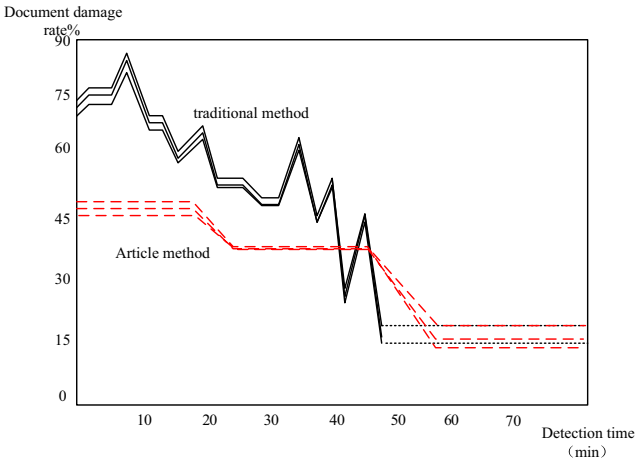

Fig. 7. Comparison test results

4 Concluding Remarks

With the continuous development of computer technology, the integration of computer and other fields is also in-depth. Among them, the computer-aided teaching system produced by the combination of computer and teaching has been continuously concerned and developed. Through comparative research, it is found that in the computer intelligent test paper and online examination system, the more widely used is the random test paper algorithm, which has been used in the test paper generation It has strong randomness, poor control ability to various indexes such as the difficulty and ease of the test paper, low stability of the test paper, and is not suitable for the needs of users. With the deepening of the research on intelligent test paper system, people have initially seen the combination of artificial intelligence algorithm such as genetic algorithm and test paper problem, and applied it to intelligent test paper strategy, and achieved a series of research results. Based on the theory of knowledge base, this paper focuses on improving the test speed and test quality of intelligent test paper generating system. The online examination system of innovation and entrepreneurship education and training for new engineering talents is studied. This study has a wide range of application prospects, but due to the large amount of data, the phenomenon of computer crash will appear, resulting in the system running effect not reaching the expectation, so in the future research, a large capacity CAI system will be designed.

5 Fund Projects

Shenyang Institute Of Technology school level key teaching reform project. Project No.: XJJG2019020, project name: exploration on the cultivation of innovative and entrepreneurial ability of new engineering talents. Project leader Wang Yan.

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