



Design of Intelligent Accounting Education System Based on Data Processing Technology

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Abstract. The intelligent education system contains a large number of access data and course data, resulting in high load. In order to optimize the response performance of the system, an intelligent accounting education system based on data processing technology is designed. The system is composed of several modules. The main function of the student information management module is to let the administrator have enough operation space to add and delete the student table. The classroom attendance module is used for students' daily classroom attendance. After the user logs in to the system, the system will judge the user's role. The data preprocessing module is designed based on data processing technology. Data preprocessing is realized through data cleaning, data normalization and data smoothing. The classroom state monitoring module is used to monitor students' classroom state during class and make timely early warning. The network lesson preparation and class module can implement the whole classroom teaching process in stages to help students preview before class. The financial knowledge discovery module can realize the mining of financial knowledge. In the run configuration module, configure the hardware for the server and client respectively. The test results show that the user load, operation response load and data load of the system are high, indicating that the system meets the design requirements.

Keywords: Data processing technology · Accounting education system · Data cleaning · Classroom condition monitoring

1 Introduction

The ten-year development plan of educational informatization (2011–2020) mentioned that educational informatization is a weak link that needs to be strengthened in China's educational informatization construction project. To improve this short board, we should give full play to the supporting role of sophisticated information technology in all links of education. At the same time, we should vigorously build high-quality digital resources, provide learners and audiences with a diversified, convenient and compatible information-based learning environment, and call on and lead everyone to develop the concept of lifelong learning, And then provide institutional guarantee for the construction of learning society [1]. Internet plus "Internet plus" was launched in July 2015, and the key points of action planning and development in the Internet plus area were clarified.

“Internet +” is actively applied to collect various port needs, deepen the combination of production and teaching in the Internet field, and speed up the cultivation of compound talents. Compared with other countries, China’s financial and accounting education has distinct traditional characteristics of Chinese education. But education immutable and frozen, especially in the new era, should be actively adapted to the trend, respect for the objective laws of history and the law of social development, and make the “Internet plus” era deeply integrated into the whole process of talent training. Therefore, in October 2015 and January 2017, the Chinese government issued two long-term planning documents to promote the reform and development of accounting education. The main points mentioned are based on the Internet plus, and the reform and innovation education mode is the main goal for the development of accounting education. The Internet plus education model represent the general trend and the historical necessity of [2], whether it is a reform of the financial accounting profession or a future development mode of financial accounting professionals in China.

In fact, many people around the world think that accounting education under the background of “Internet plus” is a simple application of information technology or digital communication technology in the training of accounting professionals. This view is obviously one-sided. We should not draw a conclusion in advance about the nature of the combination of the Internet and education, but should regard the combination of the two as the new requirements of the new era for the current social accounting talent training mode. Based on this background, an intelligent accounting education system based on data processing technology is designed.

2 Design of Intelligent Accounting Education System Based on Data Processing Technology

In order to optimize the load capacity of accounting education system, an intelligent accounting education system is designed based on data processing technology. Its overall structure is shown in Fig. 1.

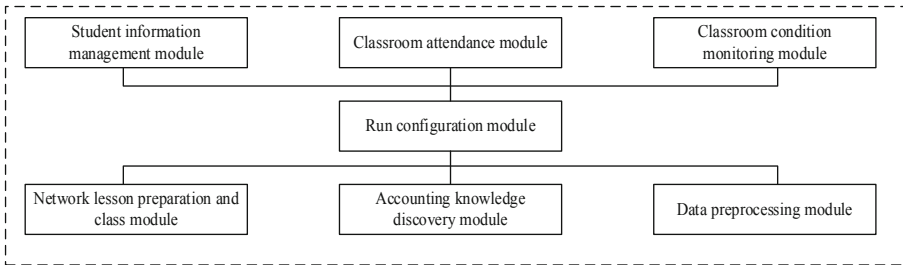


Fig. 1. Overall system structure

It can be seen from Fig. 1 that the design system includes student information management module, classroom attendance module, data preprocessing module, classroom status monitoring module, network lesson preparation and class module, financial

knowledge discovery module and operation configuration module. The following will be analyzed and designed one by one.

2.1 Design of Student Information Management Module

The main function of the student information management module is to let the administrator have enough operation space to add, delete and other operations on the student table [3]. The detailed design is as follows: the main functions of the student information management module are: browsing student information, adding student users, modifying wrong information and deleting student users.

2.2 Design of Classroom Attendance Module

The classroom attendance module is used for students' daily classroom attendance. After the user logs in to the system, the system will judge the user's role. If it is a super administrator, all classroom attendance information can be displayed; If it is an ordinary user, only the attendance information of the teacher to which the user belongs will be displayed. If attendance has not been started, the teacher can click the start attendance button to start sending data to the algorithm server, update the database and display the results according to the recognition results returned by the algorithm, and click the details to view and export the attendance information according to the class attendance information displayed in the main interface; After the teacher clicks stop attendance, the system will stop sending data to the algorithm server and count the classroom attendance of each class. If there is absence in attendance, the system will send a notice [4].

Main class design of classroom attendance module: classes involved in classroom attendance module include `signcontroller`, `signserviceimpl`, `signdao` and `rpcutii`. `Signcontroller` is mainly used to implement the interfaces of various functions of the classroom attendance module, `signserviceimpl` is mainly used to implement the processing logic in the classroom attendance module controller, `signdao` is used to interact with the database, and `rpcutii` is used to interact with the algorithm model to obtain the data analyzed by the algorithm.

The logic implementation of the classroom attendance module is as follows: the classroom attendance module is mainly divided into the function after starting attendance and the function after stopping attendance. The functions after starting attendance mainly include viewing attendance information and exporting attendance results. The user clicks the start attendance button in the main interface of classroom attendance, and the front end sends a request to the `//sign` interface. After receiving the request, the `startsign()` method of `signcontroller` starts a new thread for each class through the thread pool, which is executed once in 30 s; In the thread, according to the `CLassID` returned by the front end, call `findbyclassidq` method to take out the `stuid` and `facefeature` of the student and store them in the map; And take out the video to be checked in from the server address where the data is located. The video here uses the prepared interface to transmit the data from the camera using RSTP protocol and save it to the destination address, and store it in the format of ID on the first floor and ID on the first class; At this time, the `post` method of `rpcutii` is called to transfer the data address and student map as parameters to the server where the algorithm is located for face recognition, and the returned attendance

information is sent to `signserviceimpl` for database update, returned to the front end and displayed on the interface. The export module uses the `exportsigninfo()` method in `signcontroller` to call `signservice` for data query, put the returned data into the list, initialize excel with POI, load the data, and export the file through out output stream [5].

The function of stopping attendance mainly includes the corresponding logic of stopping attendance and attendance status alert. The user clicks the stop attendance button, and the front end sends a request to the // stop interface. After receiving the request, `stopsign()` of `signcontroller` forwards the request to the `signserviceimpl` implementation class. The `stopsignservice()` of this class sets the flag in `ThreadLocal` to false. At this time, the thread will stop executing the attendance task when it judges that the flag is false next time, And return to false `SignController` after receiving false, call `selectSign-Info ()` method, inquire the attendance information in the database, and return to `List <Sign>`, call `sendInfo ()` in `websocketServer`, push the system forward to notify in real time, remind users to view.

According to the system function, class diagram and logic implementation process, the classroom attendance module completes the code writing task and realizes the classroom attendance function interface.

2.3 Design of Data Preprocessing Module

The data preprocessing module is designed based on data processing technology.

Cleaning data is the core of data processing. The data cleaning process is as follows: after simple data analysis of the original data, define a set of data cleaning and conversion rules, which are generally based on the demand objectives of data analysis and defined according to the data type. The rules generally include attribute selection, duplicate record deletion, sequencing, structuring, etc. For massive and large-scale data, judge whether it meets the cleaning requirements, that is, whether it is dirty data (repeated records, illegal data, null values, missing values, etc.) [6]. If so, clean the data, convert the dirty data into quality data, and then return the clean data; if not, return the clean data directly.

The formula of data normalization is as follows:

$$y = \frac{x - \min V}{\max V - \min V} \quad (1)$$

In Eq. (1), y represents the normalized data; x represents the original data; $\min V$ represents the minimum original data; $\max V$ represents the maximum original data.

The data smoothing formula is as follows:

$$x_i = \sum_{i=1}^n a_i x_i - 1 \quad (2)$$

In Eq. (2), x_i represents the data after smoothing; n represents the number of data; x_i represents metadata; a_i represents the average smoothness of data.

Data preprocessing is realized through data cleaning, data normalization and data smoothing.

2.4 Design of Classroom Condition Monitoring Module

The classroom state monitoring module is used to monitor students' classroom state during class and make timely early warning. After the user logs in to the system, click the classroom status monitoring button to determine whether the user is a super administrator. If it is a super administrator, the classroom status information of all classes will be displayed. If it is an ordinary user, only the classroom status information of the class will be displayed. Before class, the user clicks the classroom status monitoring button, The system starts condition monitoring. When the system determines that the students' concentration is 0 or their expression remains motionless for a long time in class, it will send a state early warning to the system [7].

Main class design of classroom status monitoring module: the classes involved in classroom status monitoring module include statusmonitorcontroller, statusmonitorserviceimpl, statusmonitorservice, statusmonitordao and rpcutii. Statusmonitorcontroller is mainly used to construct the interface of classroom status monitoring module, statusmonitorservice is mainly used to realize the processing logic in the controller of classroom attendance module, statusmonitordao is used to interact with the database, and rpcutii is used to interact with the algorithm model to obtain the data of algorithm analysis.

Logical implementation of classroom status monitoring module: after the user enters the correct user name and password and successfully logs in to the system, different information will be displayed according to the authority. When the user clicks start class, the front end will send a post request to/statusmonitor, and the statusmonitorcontroller will receive the CLassID information and call the startstatusmonitor method. Open a new thread for each class through the thread pool, and this thread will execute once in 30 s; In the thread, according to the CLassID returned by the front end, call the findbyclassid () method to take out the stuid and facefeature of the student and store them in the map; And take out the video to be checked in from the server address where the data is located. The video here uses the prepared interface to transmit the data from the camera using RSTP protocol and save it to the destination address, and store it in the format of ID on the first floor and ID on the first class; At this time, the post method of rpcutii is called to transfer the data address and student map as parameters to the server where the algorithm is located for face recognition and expression recognition, and the returned recognition information is sent to statusmonitordao for database update, returned to the front end and displayed on the interface. For classroom status warning, a count value will be set, which is initially 0. After each expression recognition, the unrecognized student ID and expression will be counted and put into the map. When the count reaches four times, comprehensive statistics will be made on the student expression of the map counted four times and whether it is detected. If the face is not detected four times or the expression recognized four times remains unchanged, Send the student name to websocket for status warning and remind teachers to view the notice.

The classroom condition monitoring module completes the coding task and realizes the classroom condition monitoring function interface according to the system function, class diagram and logic implementation process [8].

2.5 Design of Network Lesson Preparation and Class Module

“A good beginning is half success”. As the preliminary preparation of teachers’ classroom teaching, the effect of lesson preparation design directly affects the subsequent teaching process and teaching results. As the main part of the whole teaching process, the network lesson preparation and class module has two login roles: teacher and student. Different users have different interfaces and permissions when entering the system. The login information of teachers and students share the unified student status information of the school data center, which is initially set by the system administrator according to the unified data information of the data center. If the data center of the school does not have the personal information of a teacher or student, the system will not assign the user account and permission. If a new teacher or student comes to the school, as long as the data center has entered and updated the information, the system will automatically associate the updated information of this person, and the system administrator can establish a personal account and assign permission. The initial user name of the teacher set by the administrator is the Chinese pinyin initials of the personal name, while the students are their own names, and the initial password is 123456. After teachers and students log in to the platform, enter the “password modification” option to reset their login password. The authentication process of the system for teachers and students can be described by activity diagram. The execution flow of each activity, the processing flow of a use case, and some interaction flow can be described by activity diagram.

After teachers and students use different user names to enter the system, they will obtain different operation interfaces and use permissions respectively. The authority of teachers is further refined into head teachers and famous teachers. Head teachers have the authority to set up new class student information. After entering the system, each teacher can use the functions of office communication, school-based resources, teaching business, online classroom, teaching query, examination management and so on. The function of network lesson preparation and class module is mainly reflected in the selection and setting of teaching materials and homework before, during and after class, and the release and real-time monitoring of classroom exercises in classroom teaching.

This module can realize the phased implementation of the whole classroom teaching process and pay attention to students’ pre class preview. Through the homework feedback of students’ preview before class, teachers can quickly and timely understand the mastery of students’ interpretation knowledge. In the process of phased implementation of teaching, the teaching courseware and classroom practice are cut in the way of knowledge point Association. This method is different from the previous lesson preparation design. Teachers no longer put a single courseware in a class to the end, but teach the corresponding knowledge points in segments in the way of micro Curriculum. Each knowledge point is automatically associated with the corresponding teaching materials and exercises. When teachers teach this knowledge point, the corresponding materials and exercises will be automatically associated for teachers to choose and call. At the same time, if students answer the exercises of this knowledge point incorrectly, the system will automatically establish the wrong question database of this student’s knowledge point for targeted correction of wrong questions and consolidation and review of knowledge points. In the process of online class, teachers can teach students new courses in the order

of knowledge points, supplemented by targeted classroom exercises, monitor and count students' homework in real time, and timely understand students' effective mastery of the knowledge points. For objective questions, the system will automatically review the correct and wrong questions, while teachers of subjective questions can clearly see the solution process of students' original handwriting, and use wireless projection to launch and explain on the screen.

This module provides the most convenient and concise pre class assignment setting and publishing function. Teachers only need to select the "upload material" function option in the course editing to upload the teaching materials to the server for students to download and browse before class, so as to provide targeted reference resources for students' autonomous learning and exploration before class. Teachers can quickly detect and master the pre class preview effect of students by using the "pre class homework" function. In the pre class homework options, teachers purposely add the topics of corresponding knowledge points to the pre class exercises according to the needs of teaching knowledge points, and publish them online in time. In the environment supported by wireless network, students can Download Preview test questions of their corresponding disciplines anytime and anywhere by using tablet terminal, and submit and upload the answer results after quickly answering in the way of original handwriting on tablet computer. Teachers no longer have to wait for the homework to be handed in uniformly and completely before correcting the homework, or temporarily find several students to answer the assigned homework on site in class, so as to detect and understand the preview effect of students. This method not only helps teachers comprehensively and concretely grasp the pre class preview of each student, but also provides hierarchical teaching according to their aptitude according to the homework feedback of different students, which provides a scientific reference basis for teachers to improve the follow-up classroom teaching effect, so as to grasp the overall situation and take into account the whole part.

This module provides the automatic association function between topics and knowledge points. Each topic is labeled with the corresponding knowledge points. After students complete the answers to the topic, if they want to continue to review the knowledge materials or exercises similar to the topic, the system will automatically present the same teaching resources and homework exercises as the knowledge points corresponding to the topic for students' reference and learning. At the same time, the wrong questions answered by students each time will be automatically summarized into the student's personal wrong question bank, and each wrong question will be classified and summarized according to the knowledge points. In this way, after a period of study, students can clearly understand their mastery of the knowledge point according to the number and situation of wrong questions corresponding to the knowledge point, and formulate more targeted plans and arrangements for the next review and consolidation.

2.6 Financial Knowledge Discovery Module

The financial knowledge discovery module can realize the mining of financial knowledge. Many people regard data mining as another commonly used term, knowledge discovery in database and KDD. Others just regard data mining as a basic step in the

process of knowledge discovery in database. The knowledge discovery process consists of the following steps:

- 1) Determine the target pattern: before data mining, it is necessary and important to determine the functions and tasks to be realized by the system and the mining ability of the output pattern.
- 2) Data selection: retrieve data related to analysis tasks from the database, and put forward questions and assumptions for specific application fields. Of course, it also requires a lot of domain knowledge.
- 3) Selection of data mining tools: there is no general tool for data mining, and it often needs to integrate a variety of tools to meet the needs of mining. On the basis of determining the mining task, select the appropriate data mining technology, such as classification model, which is often realized by guided neural network or induction technology (such as decision tree); Common clustering analysis techniques; Association analysis uses association discovery and sequence discovery techniques.
- 4) Data preprocessing: unify the data into a standard format suitable for mining by mining tools.
- 5) Data cleaning: eliminate noise and inconsistent data.
- 6) Data transformation: resetting variables or generating new variables, and possibly changing data types.
- 7) Data mining: use the selected algorithm or algorithm combination to search repeatedly in the pattern space, and extract hidden and novel patterns from the data set, which is the core step of information mining.
- 8) Pattern evaluation: according to some interest measure, identify the really interesting patterns of knowledge, explain and provide the mined knowledge to users.

In data mining, the analysis method used is concept description. Describe the connotation of a certain kind of object and summarize the relevant characteristics of this kind of object. Concept description is divided into characteristic description and distinguishing description. The former describes the common characteristics of a certain class of objects, and the latter describes the differences between different classes of objects to generate the characteristic description of a class, which only involves the commonness of all objects in this class of objects. Concept description is usually closely related to data conceptualization. It often generalizes the data set in multiple abstraction layers, which is convenient to investigate the general behavior of data. In this sense, it is similar to OLAP of data warehouse.

2.7 Operation Configuration Module

In the run configuration module, configure the hardware for the server and client respectively.

Server side computer reference configuration: intel53000ah server motherboard, DDR II 667 MHz hard disk. Core 2 Duo E6600, 2.40 GHz CPU, Intel 1g * 2 memory, western data (wd2500ys) 250 g.

Reference configuration of client computer: dual core 1.8 GHz CPU, 2G memory and 320G hard disk.

3 System Test

3.1 Test Environment

The test of the system is inseparable from the basic hardware and software environment. The following is a brief description of the hardware and software environment:

- 1) Network environment: university internal Ethernet, the connection rate of the server is 100 m, and the connection rate of the client is 10/100 M.
- 2) Server: two Lenovo Wanquan servers with CPU of Xeon E5504 * 2 and memory of 4G are used.
- 3) Client: 13 Lenovo Qitian 800e, Intel Core Q9400 CPU and 2G memory.
- 4) Basic software: Windows 2000 server system is installed on the server, SP4 patch and IIS are added. Install SQL Server2000 database software on the server at the same time and patch SP4. The system installed on the client is Windows XP and ie8.0 is installed 0.

3.2 Test Items

Load test the designed system, that is, add the maximum number of tasks it can perform to the tested system, test its capacity and persistence, and detect whether the system can still provide all functions and run stably. Find out the undetected bugs in the system through load test to ensure that the system reaches the performance baseline determined in the performance test. The design system is tested with 100 threads, 200 threads, 500 threads and 1000 threads respectively.

3.3 Load Test Results and Analysis

The user load test results under 100 threads, 200 threads, 500 threads and 1000 threads are shown in Table 1.

Table 1. User load test results

Serial number	Thread	Maximum concurrent users (PCs.)
1	100	563
2	200	539
3	500	504
4	1000	468

According to the user load test results in Table 1, when the threads gradually increase, the maximum number of concurrent users of the design system gradually decreases, but the decline is low. At the same time, the maximum number of concurrent users of the system is high as a whole, indicating that the system can bear a large user load.

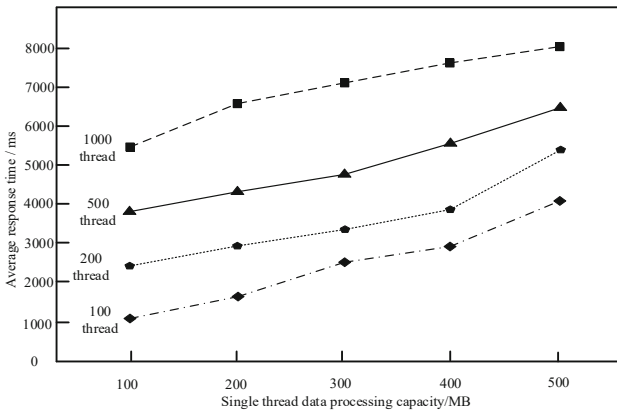


Fig. 2. Average running response time test results

Then, the average running response time of the design system is tested under 100 threads, 200 threads, 500 threads and 1000 threads. The specific test results are shown in Fig. 2.

The test results of average running response time in Fig. 2 show that the average running response time of the designed system also increases with the gradual increase of threads, but the increase is low. At the same time, the overall running response of the system is fast. The maximum average running response time of the designed system is 8000 ms for 1000 threads, which is smaller than the initial 5000 ms. The main reason is that the design system optimizes the data preprocessing module and improves the response performance by cleaning the data.

Finally, the maximum data load under 100 threads, 200 threads, 500 threads and 1000 threads is tested. The test results are shown in Table 2.

Table 2. Maximum data load test results

Serial number	Thread	Maximum data load (MB)
1	100	1256
2	200	3256
3	500	8632
4	1000	12365

The test results of the maximum data load in Table 2 show that the maximum data load of the designed system increases sharply with the gradual increase of threads, indicating that the data load performance of the system is strong. The main reason is that the server and client configuration hardware are set in the operation configuration module of the design system. The application of accounting education system is divided into two parts to improve the load bearing capacity of the system.

Taking the unit test of Teaching Material upload function module as an example, this paper expounds the detailed test process. The test is carried out manually. In the login state, the URL is not forced to be requested. Ordinary teaching materials are uploaded in the login state, and courseware exceeding the size limit of teaching materials are uploaded in the login state. In this test, the URL request part adopts the boundary value analysis method, and the teaching material size limit test adopts the equivalent class analysis method. According to the above process, the current application performance of the intelligent accounting education system based on data processing technology and the original teaching assistant system is further compared and analyzed, and Fig. 3 is obtained:

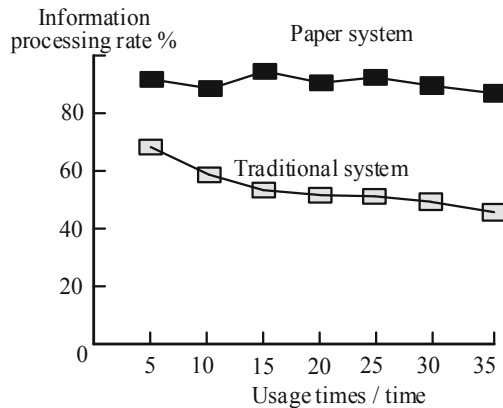


Fig. 3. Comparison test results of system operation performance

According to the above test results, it is not difficult to find that, compared with the original teaching assistant system, the information processing speed of the system in the actual application process is significantly improved, can better realize the use requirements of intelligent accounting education, has high teaching practicability and better improve the teaching quality. The reason is that the design system optimizes the performance of course management and improves the efficiency of student management, so as to ensure the quality of accounting teaching.

4 Conclusion

The education system provides a convenient way for students to master knowledge. For this paper, an intelligent accounting education system based on data processing technology is designed. From the aspects of accounting knowledge discovery, data pre-processing, classroom management, etc., the accounting education system is intelligent and convenient. The performance test results show that the design system has good response performance and ensures the quality of accounting teaching. But there are still many places to be improved, and in-depth research will continue in the future.

References

1. Sansone, D., Rossi, M., Fornero, E.: 'Four bright coins shining at me': financial education in childhood, financial confidence in adulthood. *J. Consum. Aff.* **53**(2), 630–651 (2019)
2. Irvine, H., Ryan, C., Guthrie, J., et al.: The financial health of Australian universities: policy implications in a changing environment. *Account. Audit. Account. J.* **32**(5), 1500–1531 (2019)
3. Compen, B., De Witte, K., Schelfhout, W.: The role of teacher professional development in financial literacy education: a systematic literature review. *Educ. Res. Rev.* **26**(2), 16–31 (2019)
4. Chen, Y.H., Lee, W.C., Tseng, C.H., et al.: Cognitive learning performance assessment and analysis with CSCL applied on the NetGuru platform and CSPL applied on the TAoD platform for the network experiment class. *J. Supercomput.* **76**(1), 16–46 (2020)
5. Wang, S., Zhang, F., Gong, Q., et al.: Research on PBL teaching of immunology based on network teaching platform. *Proc. Comput. Sci.* **183**(11), 750–753 (2021)
6. Long, Y.: Research on art innovation teaching platform based on data mining algorithm. *Clust. Comput.* **22**(6), 14943–14949 (2019)
7. Farias, G., Fabregas, E., Peralta, E., et al.: Development of an easy-to-use multi-agent platform for teaching mobile robotics. *IEEE Access* **1**(7), 55885–55897 (2019)
8. She, X., Zhan, Q.-H., Wu, C.-X.: Multi-node information resource allocation recommendation algorithm based on collaborative filtering. *Comput. Simul.* **38**(06), 419–423 (2021)