Design of Online Multimodule Educational Administration System Based on Time Difference Database Technology

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Abstract. At present, the online multi-module educational administration system is poorly targeted, resulting in low retrieval accuracy. In order to solve the above problems, a new online multi-module educational administration system is designed, and the hardware and software of the system are designed. The hardware of the system consists of a computer carrier and its supporting peripherals, an information collector, a central data processor and communication equipment. The internal storage recording instrument of the hardware is equipped with an FTP server, and the network can view, download and delete data at any time. The remote control can also control the operation status of the collection and storage tasks. Mainly through Tomcat 7.0 server, using the Java language to compile software program code, build a hierarchical framework system to achieve software work. The experimental results show that the designed online multi-module educational administration system has stronger information retrieval ability and higher retrieval precision.

Keywords: Time difference database · Online educational administration · Multi-module educational administration · Educational administration system

1 Introduction

The rapid development of computer and network technology has triggered the global digital frenzy, which has played a huge role in promoting the development of social economy. What followed was a fundamental change in the way people access, communicate, and process information. While the society changes at full speed, it also brings new opportunities and challenges to the educational administration management in colleges and universities. To realize the networking of university campus, network construction is the basic and various management information system construction is the core. How to make use of the existing educational resources to quicken the pace of networked university construction, make the campus network keep up with the pace of school reform, and do a better job in basic services for students and teachers is the core task of digital campus construction [1, 2].

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The object of educational administration management is the basic information of every student and teacher and the related information of daily educational administration. These messages are in constant flux. Therefore, the educational administration management information system should be able to provide the sufficient information, the quick inquiry method and the on-line processing educational administration function for the user. At the same time, the Academic Affairs Office should provide accurate statistical data for the superior departments. Due to the large number of staff, complex data sources and difficult statistical management work, in the past, each work needs to spend a lot of energy and time, the statistical data is often not accurate [3, 4]. Therefore, the informationization of educational administration is to focus on solving these problems.

To sum up, this paper introduces TDOA database technology to design a new online multi-module educational system, and designs the hardware and software of the system, and validates the effectiveness of the system.By building collectors, the storage has strong compatibility and storage space; Through the hierarchical design of the retrieval process, the retrieval accuracy is higher; Xgboost algorithm is introduced, and the second-order Taylor function is added to the gradient lifting iterative decision tree algorithm to improve the speed and accuracy of xgbost algorithm for data file classification.Compared with the traditional method, it has faster information retrieval speed and higher retrieval accuracy, saving a lot of manpower and material resources.

2 Hardware Design of Online Multimodule Educational Administration System Based on Time Difference Database Technology

The design of online multi-module educational administration system based on TDOA database technology mainly uses Tomcat 7.0 server to compile the software code by using Java language, and constructs the hierarchical framework of the system. The hierarchy structure is shown in Fig. 1:

According to Fig. 1, the design of online multi-module educational administration system based on TDBMS is mainly divided into three layers: the first layer is the information display layer. Mainly responsible for the customer and the operator to the art course assistant system access, as well as page information browsing and related task operation, is the client main contact application system level, the second layer is the network processing layer. Through the use of the server network supported by the principal computer to analyze the information needs of customers and operators, and transmit the analysis results to the third layer for logical examination and correlation analysis, the requirements that meet the requirements of network rules can be obtained through examination and retrieval of the relevant data to meet the customer needs; the third layer is the data application layer, which is the highest and most core level of the whole system structure. Mainly responsible for receiving the relevant requirements information transmitted to the second layer, carrying out logical operation and relevant content analysis, and managing the data of the whole system, including data analysis, classification, inspection, storage and other tasks, and also responsible for the detection of system problems, maintenance and system update [5].

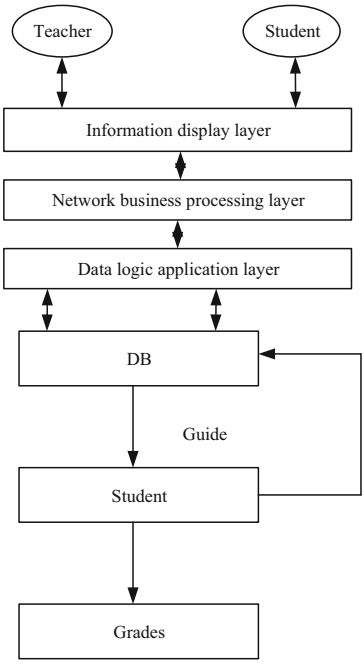

Fig. 1. Hierarchical framework of online multimodule educational administration system based on TDBMS

The hardware part of online multi-module educational administration system based on TDOA database technology is mainly computer carrier and its peripherals, information collector, central data processor and communication equipment. The hardware

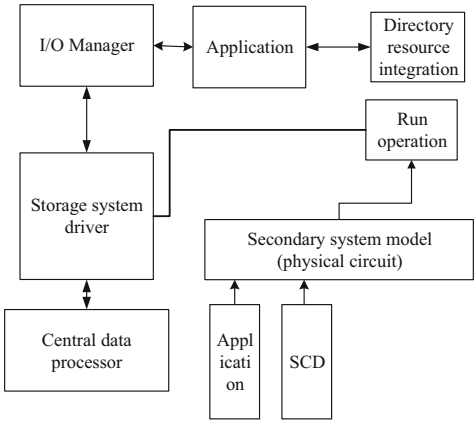

Fig. 2. Hardware structure of online multimodule educational administration system based on time difference database

structure of online multi-module educational administration system based on TDOA database technology is shown in Fig. 2:

According to Fig. 2, the basic computer equipment is Windows 10 processing system, Tomcat 7.0 server, Oracle 10 database, 360 GB disk memory, 4 GB running memory, supporting mobile network, wireless network and broadband, supporting TCP/IP network communication protocol computer server. Infrastructure based on this computer configuration and designed for the system, communication links with external information collectors and communication devices through LAN or mobile networks, supported by network protocol rules [6, 7].

Hardware peripherals are mainly composed of information collector and communication devices. Because of the complexity, large scale and various sources of the information database of fine arts courses, it is necessary to enrich and arrange the database of fine arts courses information retrieval system by information collector, which is mainly responsible for extracting and saving the information related to fine arts from a large number of web sites or related platforms to the structured information database. Therefore, the collector needs to be strong enough in compatibility and adaptability, as well as large enough information storage space. The collector structure is shown in Fig. 3:

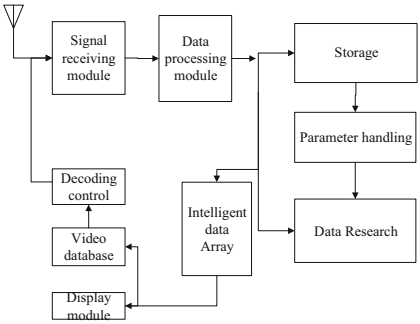

Fig. 3. Collector structure

This article selects the multifunctional data acquisition instrument, each way of independent amplification 1–1000 times; can choose the corresponding operation mode according to the software characteristic (DC/AC voltage/ICP adaptable with constant current source), strong adaptability; can support GPS synchronization, support mobile network and wireless network communication, can access all the website information allowed by the Internet under the communication protocol support; 12/16/24 bit models are complete, can measure UV signal; each way can set gain, can measure IEPE input, can measure rotate speed, can increase D/A, arbitrary signal generator, DDS frequency synthesizer [8]. The multifunctional harvester is shown in Fig. 4 below:

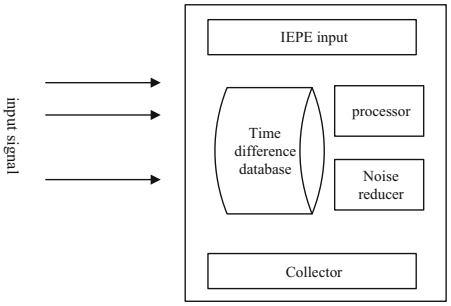

Fig. 4. Structure of multifunctional acquisition instrument

In addition, in order to ensure the normal operation of data acquisition and storage, a large capacity data acquisition recorder is configured, which can be used for offline independent acquisition and storage, as well as real-time acquisition and transmission. The internal storage capacity is up to 512 gb. The memory chip adopts the storage medium with small volume and large space (which can be expanded to 1 TB) and occupies almost no space, reducing the waste of space volume [9]. The circuit diagram of the acquisition instrument is shown in Fig. 5.

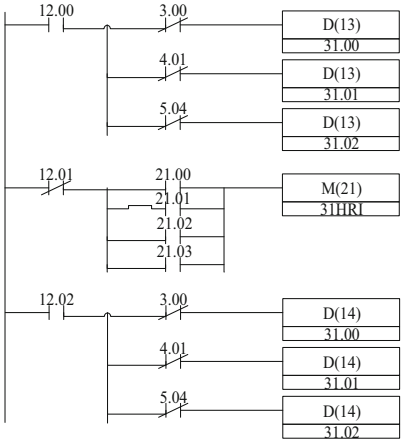

Fig. 5. Circuit diagram of acquisition instrument

The three core components of a computer server are the CPU central data processor, internal memory, and input/output devices. The main function of the central processing unit is to interpret the computer instructions and process the data in the computer software, read the instructions, decode and execute the instructions, control and allocate all the hardware resources of the computer (such as memory, input and output units), and perform general operations. The computer server circuit diagram is shown in Fig. 6:

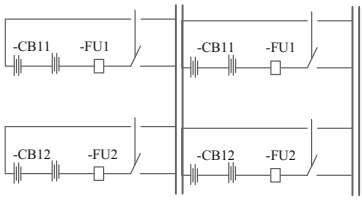

Fig. 6. Computer server circuit diagram

The central processing unit consists of two main parts: the controller and the arithmetic unit. It also includes the cache memory and the data and bus to realize the connection between them. In general, the central data processor is primarily responsible for processing instructions, executing operations, controlling time, and processing data for the information retrieval system [10]. The central processing unit controls other parts of the computer through the control circuit. The data information collected by the information collector is transmitted to the central processing unit of the computer server through the communication device for data processing. The data is transmitted orderly through the input unit, and the analyzed and processed data is transmitted outwards through the output unit or is transmitted to the memory for data backup and storage. The output information or instruction is then transmitted to the corresponding peripheral terminal through the communication device to execute the instruction task.

3 Software Design of Online Multimodule Educational Administration System Based on Time Difference Database Technology

After completing the hardware design of the system, the work flow of the online multimodule educational administration system is shown in Fig. 7 according to the system hardware and software flow.

According to the above data retrieval flow, the software retrieval is completed by information analysis, keyword data analysis, data retrieval, judging whether the retrieval results are appropriate and data input. Specific retrieval steps as follows.

Step 1: Course Management. Curriculum management is mainly responsible for the management of online art courses, and arranging the time of online courses by integrating the relevant information of teachers and students [11]. Because the system curriculum content is rich and diverse, the curriculum change will cause the bigger influence, therefore, the curriculum content and the time arrangement must be rigorous and reasonable, avoids many time changes. Confirm the course information input system course management interface, facilitate the relevant personnel inquiry understanding. At the same time, the corresponding course editing function should be designed so that the staff or clients can customize some information of the course, which is conducive to the development of the system. Also equipped with the corresponding notification function, users can get timely information on the course to inform, so that users can better respond to course adjustments, updates and so on.

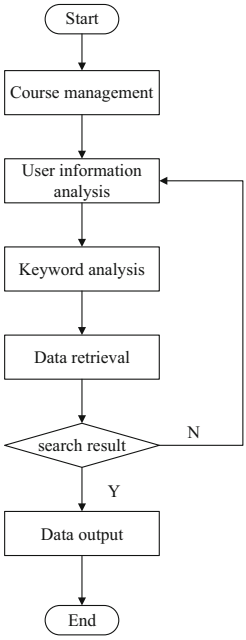

Fig. 7. Workflow of multimodule educational administration system

Step 2: Information Retrieval. Information retrieval is the most important function of the online art course assistant system [12], which is mainly responsible for analyzing the information needs of users, and then retrieving the related contents according to the analysis results. Firstly, the system searches the information in its own database. The information that can not be found is searched through the network communication to the Internet website and platform, and the information is obtained if the access authority permits, and saved in its own database to improve the system's data information resources. The acquired information resource is transmitted to the user's terminal interface through the information transmission line, and then the user can operate the information resource within the scope of authority. The information retrieval operation is shown in Fig. 8:

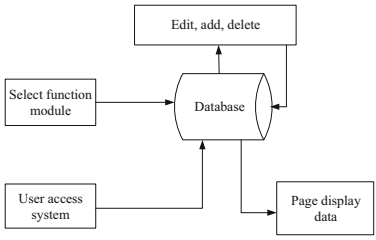

Fig. 8. Information retrieval operation process diagram

Part III: User information analysis. User information analysis is mainly responsible for system user login and information management. Users use the system, first of all to register the login account applied to the system, and set the password and related security issues, to strengthen the confidentiality of the account [13]. Then need to carry on the real name authentication, facilitates the curriculum study and the user management, prevents the appearance to defraud the account to cause the threat to other users. After registration, users have their own user center to edit and manage the information, which can record the user's learning, interest, style and other related information, enhance the system's personalized characteristics, and facilitate the system to supervise and manage the user's operation to some extent, and standardize the system's application order. At the same time, according to the user's identity there are different permissions, administrators than ordinary users for more administrative permissions, such as part of the information management, local interface access and curriculum information modification.

Step 4: System management. System management module is responsible for the information management of the whole system, including user operation, data processing, access to other platforms and so on [14]. Its core is the computer central processing procedure, carries on the total control to system each aspect content. Its control operation part mainly compiles through the Java code.

Step 5: Data storage. The data storage takes the computer disk as the main carrier and is connected with the information retrieval function module. Users through the login account, to access the database, according to the user's corresponding authority to find or edit data resources and other operations.

Web browsers in the software area are encrypted by special codes to ensure the security of the data stored in the management and control system. The login page of the system software part is registered by the user's registered mobile phone number, and the student enters the system browser visible to the student, and the student enters the teacher's login browser through the same login page. Through the mutual adjustment between the database of software system and each module of hardware area, the operation of browsers is maintained, and the stable operation of system and the safety of file data are guaranteed.

The ultimate goal of designing the hardware area of educational administration system is to ensure the system security and improve the system efficiency. Therefore, in order to achieve the design goal [15], this paper presents the XGBoost algorithm to assist the system management and control function. The XGBoost algorithm is an optimized distributed gradient computation integration algorithm. The idea of the algorithm is derived from the gradient lift iterative decision tree. The second order Taylor function is added to the gradient lift iterative decision tree algorithm to improve the speed and accuracy of XGBoost algorithm in classifying data files. The algorithm is specifically completed by using the following formula:

$$y_i = \theta(x_i) = \sum_{k=1}^{k} f_k(x_i) \tag{1}$$

Among them, k is the total number of data in XGBoost submodel, y_i is the predictive value of uankong data sample, x_i is the characteristic value of input file data, f_k is the controlled regression value of the algorithm's kth period.

In order to calculate the weights of each file data, [16] we use the Taylor function to normalize the initial input data and avoid the confusion of the data.

$$0 = 1(y, y_i) + \sum_{k=1}^{k} \beta(f_k) \tag{2}$$

In the standard model, $1(y, y_i), 0$ represents the difference between the predicted value of the previous formula and the recorded value of the actual data, the normalized processing coefficient and the positive value after calculating the weights of the data, so as to prevent confusion among the data [17]. The final simplified formula of the XGBoost algorithm is shown as follows: through the superposition calculation of multiple data, the formula 1 and formula 2 are fused, the predicted values of the iterative samples of the data are brought into the loss function [18–20], and the results are multiplied by the normalization coefficient:

$$o^t = \sum_{i=1}^{N} 1\left(y_i, y^{t-1} + g_i f_i(x_i) + \frac{1}{2} h_i y_i(x_i)\right) + \beta(f_i) \tag{3}$$

Based on Formula 1, the input data is compared with the data in the system database, and if the same type of medical record information is retrieved, it is stored in the same storage space to facilitate the operation of information call. According to Formula 2, the redundant data of decision tree are integrated and classified. Finally, the final management classification of data is accomplished by Formula 3.

4 Experimental Research

In order to verify the effectiveness of the online multi-module educational administration system based on TDOA database proposed in this paper, experimental comparison is made with the traditional system.

The experimental parameters are set as Table 1:

Table 1. Experimental parameters

Project	Parameter
The server	Nginx1.0.15 server
data type	Static data/dynamic data
Operating system	Lniux operating system
Interaction mode	Web database interaction
Response mechanism	Pageinit response mechanism

According to the above experimental parameters, the system in this paper is compared with the traditional system. The experimental results are shown in Fig. 9.

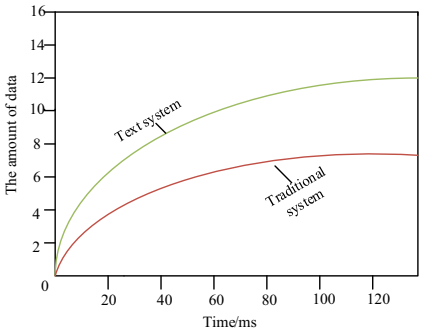

Fig. 9. Experimental results of retrieval capability

According to Fig. 9, the retrieval ability of online multi-module educational administration system based on TDBMS is better than that of traditional system, and the ability of grasping keywords is better. The retrieval system in this paper introduces Oracle 10 database and expands the scope of the database. Oracle 10 database has the ability of data analysis, can record the data and integrate all the data words into the database for the convenience of the users. In the process of retrieval, the system can quickly analyze the keywords, and search in the database, through the search of data information and feedback information, generate effective independent data, all independent data at the same time in the same time, in a way of feedback to a number of principles, according to their own specific content to choose each other, so as to achieve a diversified information retrieval. The server document designed in this paper also has the function of data extraction. XML documents inside the system can feed back information to users in real time to help users better analyze data.

The results of the precision experiments are shown in Table 2:

Table 2. Accuracy test results

System	Number of search terms	Number of related entries
The paper system	1589	1572
Based on data mining system	1241	1109
Based on data analysis system	1025	822

Compared with the experimental results in Table 2, the data retrieval ability of the system proposed in this paper is stronger, and the system proposed in this paper is better than the traditional system in terms of the amount of retrieval data and retrieval accuracy. When searching for the same keywords, the system proposed in this paper has the largest number of retrieval terms and keywords, of which the relevance between the retrieved terms and keywords is as high as 98.93%, the data relevance of the traditional data mining system is 89.36%, and the data relevance of the traditional data analysis system is 80.19%.

At the same time, the file transmission task is assigned at this time, and the files are transmitted centrally according to different transmission directions. The security degree of the transferred files is compared, and the control security rate comparison table is constructed as follows (Tables 3 and 4):

Table 3. Result table of system design control safety rate

Control time/s	Control safety rate
20	88%
40	94%
60	97%
80	99%

Table 4. Results of traditional system design control safety rate

Control time/s	Control safety rate
20	67%
40	78%
60	82%
80	86%

To sum up, the online multi-module educational administration system based on TDOA database proposed in this paper has strong file management and control performance, can process complicated file information to a certain extent, and can continuously provide file inspection service by querying accurate separate files in the complex information flow, and can provide a solid data operation basis for subsequent research operations.This is because the design of the system through the application of xgbost algorithm for distributed gradient calculation, improve the speed and accuracy of data file classification, avoid data confusion.

5 Concluding Remarks

Based on the analysis of the characteristics of the current online system application and users' use, this paper designs the online multi-module educational administration system based on TDB, introduces the basic hardware facilities of the system, and compiles the main software programs in Java language, and reasonably designs the application modules of the system, which is beneficial to the intelligent and personalized development of the information automatic retrieval system and the development and progress of the field of information education technology in our country.

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