Design and Implementation of Student Management System Based on Internet Big Data

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Abstract. Due to fast development and wide popularization of information technology, the traditional teaching ideas, teaching methods, teaching processes and teaching organizations have changed, which has caused fundamental changes in teaching mode and education system. The student management system in view of Web technology is the main carrier of information administration in universities. This paper puts forward a solution to the self-management system of universities based on big data mobile internet. This system is related to self-learning, self-management, and using multiple mobile internet applications to help students use the self-management system, in order to improve students' ardour and initiative take part in teaching activities; The learning process management and curriculum evaluation management have been established, and the teaching quality has been comprehensively considered from multiple dimensions, so that the training have a gift for universities has been effectively guaranteed.

Keywords: Internet; Big data; Student management system

1. Introduction
With the step-by-step advancement of China's educational reform, the talents needed by the society are not as single as before. It is a brand-new requirement for universities to cultivate students with innovative minds and cooperative consciousness under the educational reform [1]. Various information storage and processing resources in the school are connected with each other through high-performance network equipment, in order to fulfill the interconnection and intercommunication of the campus internal network [2]. College students' information management is an important part of college management. Strengthening students' information management is an important measure to realize scientific and humanized management in universities. However, the traditional information management system can not meet the dynamic management needs.

Realizing the leapfrog development of education has become the top priority of contemporary education. Through the campus information construction, the use of "internet plus", cloud computing and big data technology integration, the establishment of a new student management system can greatly improve work efficiency [3]. Therefore, this paper constructs a student management system based on
Web technology, in order to fulfill the dynamic student management and realize the systematization, standardization and high effectiveness of information management.

2. Design scheme of student management system based on Web technology

2.1 Overall design of the system
The devise of the student management based on the system Web technology is simply to design the system as a B/S mode in which users can directly access the information on the server through a browser and remotely maintain the system [4]. In the new information technology era, the construction of college student evaluation system needs cloud computing as the platform support, big data as the core, Internet of Things as the main network, and intelligent perception as the main information source to realize intelligent student information processing. The structure of student comprehensive evaluation the system is as shown Figure 1.

![Fig.1 Structure diagram of student comprehensive evaluation system](image)

The student management system platform builds a digital campus information platform based on the original campus network, so that users can access the system platform resources through the Internet anytime and anywhere. General users (such as students) are responsible for inputting user info (such as home address, parents' contact information, etc.) into the system, and can access personal related information anytime and anywhere. There are quite a lot such users, and they have relatively small operation authority on the system. The visual display of the results of student evaluation should be concise and beautiful, and more forms such as charts should be used to visually display the situation of student evaluation. At the same time, the display on the mobile terminal should be considered, so that users can view it regardless of the environment they are in, and the user experience can be improved by caring service.

2.2 Functional design of each subsystem
This system covers almost all the information of college students, including students' basic information, family information, teacher information, scholarship loan information, etc. The information is divided into several modules to be developed separately, which not only improves the development efficiency, but also reduces the coupling, which provides the foundation for the secondary development of the platform in the future [5-6]. Specific functional modules are shown in Figure 2.

There are three identities in system design: administrator, teacher and student. The user administrator has greater authority to enter according to the password and perform some operations. Teachers also enter according to passwords, and perform some operations on students' scores and auxiliary teaching information. That is, teachers and students can log in and check relevant information through specific accounts; Then, the performance indexes of evaluation, such as accuracy and recall rate, are determined [7]; Then, the algorithm in Mllib machine learning library in Spark platform is used to model the prediction problem. For example, K-means clustering algorithm can be used to analyze the community of students, judge the range of students' friends, and which students are mainly clustered with; Automatic classification of student information by using big data platform.
Fig.2 Functional design of one-stop self-management platform for student information from the perspective of big data

- System logic architecture

After the system runs, the leaders and counselors use the import function to input the existing data before the system runs, such as students' basic information, class information, disciplinary information, counselor information, etc., and then the students improve the information that the students do not have and have permission to modify, such as family information and employment information. Honor information and credit information are applied by students, uploaded with photo vouchers, and then reviewed by counselors. The logic the block diagram is as shown Figure 3.

Fig.3 Logical block diagram of one-stop self-management platform for student information from the perspective of big data

- Design of data center management library
Write code in Java language to design data for HDFS module operation of hadoop system, and realize the management of data to HDFS module [8-9]; In order to increase the speed of establishing data center database and the convenience of operation, an open source Sqoop subproject is adopted to assist the establishment of central management database. The design of the above data center management library can be described as follows with the following figure 4.

**Fig.4** Structure diagram of data center management library

In the information age, four years' college life has produced a lot of data and information. After students are admitted, universities add student information into the orientation system, the student office establishes student files, and the academic affairs office enters the course information to be studied in the student talent training program, and searches for relevant information: students' basic information, student status information, examination information, graduation information, etc. There are two ways to query student information: by name and by student number. In the inquiry by students, there may be cases of the same name and surname, so when inquiring by name, you must first choose the department and major, so that you can inquire by name again; The database services used in the background are consistent, and different data table items are created for different functional modules, which are formulated in combination with the demand analysis in the early stage of the system.

- Relationship design of student management system

E-R diagram is also called entity-connection diagram [10]. It is a way to describe entities, attributes and connections, and to express the connections between entities more clearly. E-R model can express the designer's understanding of the problem by using simple symbols, which is an essential link in developing system software, and is also convenient for engineers to communicate with each other.

Through the E-R diagram of the student management system based on "internet plus", this paper analyzes the interrelation among colleges, majors, classes, students, teachers and courses, as shown in Figure 5.

**Fig.5** E-R diagram of student management system
• Database design

In fact, the design of system database is the process of defining and creating tables, which is the core and important part of the system development process. A good database design must have a reasonable structure and meet the needs of its own system. At present, the database is mainly based on relational database, and the current database systems mainly include Access, DB2, Microsoft SQL Server and so on. Taking Access as an example, this data has the characteristics of flexible operation and simple use, but its comprehensive performance is poor, so it can only be adapted to the system with small amount of data. This part belongs to the realization of system functionality. Because of the huge amount of student data, it is realized by combining Hive in hadoop with Spark SQL in Spark platform, and the calculation results can be displayed visually by drawing graphics with Jfree Chart tool;

In the student information management system, the basic table is as follows: user table, department table, specialty table, student basic information table, achievement table, curriculum schedule, teaching schedule, etc. The information provided by the main management of the system includes:

1) Student information: including contact information such as personal and family contact information of students, information on obtaining various certificates, information on students' resumes, information on quality evaluation, etc.

2) Students' achievement information of various courses during their school years.

3) Auxiliary teaching information: including online teaching courseware, online curriculum, online homework submission and review, online experiment registration, etc.

The system uses Spark SQL statement and Mllib machine learning module in Spark platform for data analysis. For example, when analyzing the correlation between students' scores and the times of entering and leaving the library, Apriori algorithm and association rules in Mllib library can be used. In the next logical design stage, it is necessary to transform the E -R model into the corresponding relational data model, and then draw the specific data structure table according to this relational data model, so as to prepare for the next database implementation.

3. Implementation of integrated management system based on Web technology

3.1 Development environment of student management system

In the course of system development, the hardware platform environment is also particularly important, this directly affects the performance of the educational administration system platform. The server platform with strong hardware support can make the system run safely, stably and efficiently. At the same time, in order to make the system achieve the expected effect in the application process, the development mode chooses pure B/S mode. The detailed development environment is as follows:

1) Server side:
   Operating system: Windows Server 2003 database: Microsoft SQL Server 2005 script processing: IIS5.1/ 6.0

2) Client: operating system: Windows 2000/ XP/ Vista browser: mainstream browsers such as IE6. 0/ 7. 0/ 8. 0 and Maxthon2. 0.

3.2 User login page

Implement user registration and sign in verification functions. Taking user log in verification by way of example, if account number and cipher are not null, query the user table to verify whether the user account number exists. If it does not exist, tips the user to get into a logon account or register a new account; If yes, it is judged whether the input password is the same as the cipher corresponding to the account in the user table. When the user logs in the interface to get into the user name and cipher, and submits the service request to login, login is responsible for comparing the user's input with the records in the database. If the comparison is consistent, the user can log in to the educational administration management system. Otherwise, the user is prompted that the password does not exist or is incorrect, and an error prompt will pop up on the system login page.
3.3 6 functional modules

Six functional modules, such as student basic information management module, achievement management module, reward management module, punishment management module, social practice management module and subsidy management module, execute SQL commands on the corresponding data tables in the database CSIMS.mdf through corresponding operation pages, and realize the operations of inserting, inquiring, modifying and deleting student information (such as name, achievement, award, etc.).

3.4 User management

After logging on the system platform, the user account determines its authority according to the matching role identity in the database. Different accounts have different authority due to different roles. The administrators are also divided into super administrators, first-level administrators and second-level administrators, and the first-level administrators have greater authority than the second-level administrators. The task of authority verification is to verify whether the users have certain operating authority over certain resources in the system (such as browsing all the students' test scores) [8]. In this module, you can add new courses, modify/delete courses, modify exam names and add/delete exam subjects. Confirm when deleting examination subjects, thus avoiding misoperation. This module needs to be logged in before it can be used.

3.5 Realization of comprehensive evaluation and analysis of students in school

On the basis of obtaining, integrating and extracting data sources such as students' personal information, one-card consumption information, entering and leaving dormitory and library, the system uses Spark SQL statement in Spark and machine learning algorithm in MLib tool library to analyze and comprehensively evaluate students' school situation. List all kinds of query options required by users on this page. Users can select 0 or more conditions, and convert the user's selection into SQL conditions in the ASP.NET file for query processing. This kind of management system can collect data from all aspects of students and collect them, that is, it can grasp the expenditure of students on living expenses during school, and also let teachers know the students' mastery of knowledge. The most important thing is to obtain data information that is beneficial to the progress of schools and convenient for decision-making. Then the system randomly selects students according to certain rules. First-come-first-served mode, that is, during the course selection stage, the system adopts the principle of selecting courses first and winning the bid first, and the number of course selection cannot exceed the number limited by the administrator.

4. System test

| Table 1 Log in to the test results table |
|-----------------------------------------|
| **Functional description** | **User login** |
| Use case purpose | Test whether the user login function is normal |
| Precondition | The client and server are running normally |
| Input/action | Expected output/correspondence |
| get into the exact user name and cipher | The user successfully logs in, closes the login window, and the corresponding function menu items can be executed |
| Do not enter or enter the wrong user name and password | Prompt the user "User name or password cannot be blank!" Or "wrong user name or password, please re-enter!" |

| | Same as desired output |
In other words, system testing is an activity to check or compare whether the actual output is the same as the expected output. The user enters the user name and password, and clicks the "OK" button. If the user can enter the system safely, it is determined whether the function of the user login module meets the requirements. At the same time, it is necessary to judge the login authority to determine whether it can realize different functions. In order to test the system better, test cases are written. Here, the login function of the system is mainly used as a test case, as shown in Table 1.

Achievement management is an important module of educational administration system. It is important to test whether there are additional records in the achievement database after the achievement is submitted, and whether the revised records can be found in time after the achievement is revised. Use the Session object variable to record the login user name and password. Once the session ends or there is no new access operation after some time, the session link will be automatic disconnected. Achieve interaction between students, this part of application should be managed by the resource layer. At the same time, the application layer also includes various applications to expand the thinking and horizon of college students, which is helpful to expand the thinking of students. The realization of application layer functions depends on the establishment of resource layer. After the above test, the student management system in view of Web technology meets the needs of student information management, and the whole system is running well, but some functions are still insufficient and need to be improved in the future design.

5. Conclusion
This paper adopts the new generation information technology in the "internet plus" era, uses cloud computing, big data and Internet of Things technology to build a comprehensive evaluation platform for college students, and comprehensively analyzes students' dynamic learning data and daily behavior data. This paper expounds the design and implement of functional modules in the process of system development. Completed the analysis and design of database table structure; In this system, the interface is simple and clear, and it seems to have a fresh feeling. Moreover, there are many functions, such as entering, inquiring and modifying grades, online teaching courseware, submitting and correcting homework, etc. In the way of chart analysis, students' school performance, rewards and punishments, awards, employment, etc. are directly displayed, so that schools can scientifically analyze data and carry out targeted decision-making reform. After data is accumulated to a certain degree, big data mode analysis and management of student information can be realized.

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