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Design of University Student Status Management System Based on Web B/S Architecture

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Abstract: This paper aims to design and implement a university student status management system based on Web B/S architecture in view of the drawbacks of traditional student status management. Through the analysis of the research status in this field, the achievements and deficiencies in aspects such as technology integration, function optimization, and data security are clarified. A detailed demand analysis is carried out from three aspects: business requirements, user requirements, and functional requirements. The system adopts B/S architecture, is developed with Java combined with front-end technologies, uses MySQL as the back-end database, and relies on cloud server services. The overall architecture and network topology structure are designed. Each module of the system implementation is elaborated in detail, including student information management, course and grade management, reward and punishment information management, and system management modules. Function, performance, and security tests are conducted on the system. This system improves the efficiency and service quality of university student status management and provides strong support for the informatization construction of universities. In the future, the intelligent direction can be explored to further enhance the system functions.

1. Introduction

In recent years, remarkable progress has been made in the research of university student status management systems in terms of technical architecture and function expansion. In terms of mobile internet-based applications, Chen Heng[1] et al. designed a university student status archives management system based on mobile internet. By leveraging mobile internet and cloud computing technologies, it realizes real-time synchronous data update, provides convenient query and management functions, and improves the efficiency and accuracy of university student status archives management. In terms of cloud computing architecture applications, Zou Hua[2], based on the high security characteristics of cloud computing, adopts the B/S mode and distributed cloud storage database, uses Java as the development language and MySQL as the back-end database, and combines multi-layer architecture to develop a university student status management system, enhancing the security and stability of the system. In emphasizing the importance of the system, Ye Dong[3] conducts design research on the university student status management system under Web,

emphasizing its importance in the daily management of universities and providing convenience and basis for teachers and students to query information and for management personnel to carry out work. Regarding the data security issue of student status archives management, Li Jing[4] combines blockchain technology with university student status archives management. By comparing conventional databases with blockchains and analyzing their applicability, a university student status archives management system based on blockchain is developed to provide guarantee for data security. In conclusion, current research in this field has made achievements in aspects such as technology integration, function optimization and data security. However, with the advancement of educational informatization, university student status management still faces some challenges and further exploration and innovation are needed to meet the growing needs of student status management. Therefore, this study aims to design and implement a university student status management system based on Web B/S architecture, integrate function modules, realize centralized management and sharing of student status information, and improve stability, reliability and ease of use through optimizing architecture and function design, providing an efficient and convenient solution for university student status management.

2. Requirement Analysis of Student Status Management System

2.1 Business Requirements

The student status management system needs to meet management requirements in multiple aspects such as student information, classes, departments, majors, courses, student grades, and reward and punishment information. Specifically, it includes: accurately recording students' basic information, supporting batch import of freshman information and being able to handle situations such as students changing majors and adjusting classes; managing class, department, and major information, supporting the addition, deletion, modification, and query of information, and real-time statistics of the number of students in classes; recording course information and supporting the modification and query of course arrangements; accurately recording student grades, supporting teachers to input and students to query, and providing functions of grade modification and statistical analysis; recording students' reward and punishment information, and supporting the input, modification, query, and management of information.

2.2 User Requirements

Student users hope to conveniently query personal information, course information, grade information and reward and punishment records through the system, and apply for student status changes; teacher users need to input student grades and evaluations through the system and query class information for teaching; administrators need to comprehensively manage system data, perform data input, modification, deletion and query operations, and generate statistical reports to support school decision-making.

2.3 Functional Requirements

The system should provide convenient and fast information input and modification functions to ensure the accuracy and integrity of data; have powerful query and statistical functions, support multi-condition query and statistical analysis, and generate statistical reports; ensure data security, adopt various security technologies to prevent illegal access and tampering of data, and perform access control according to user roles and permissions to ensure the security and confidentiality of data.

3. Design of University Student Status Management System

This system adopts B/S architecture[5], is developed with Java combined with front-end technologies, and uses MySQL as the back-end database of the system. Relying on cloud servers, it realizes efficient application services and database services. Users can access the cloud server and database through web pages. The system architecture fully considers the characteristics of cloud services and is different from the traditional business system architecture.

3.1 Overall Architecture Design

The front-end display layer is developed using technologies such as HTML, CSS, and JavaScript to provide users with an intuitive and friendly operation interface. The interface is simple and clear, with a reasonable layout. Responsive design is adopted to ensure normal display and operation on different devices (such as computers, tablets, and mobile phones). At the same time, user interaction functions such as form input, button click, and drop-down menu selection are implemented, and dynamic effects and data validation of the page are realized through JavaScript to ensure that the data entered by users conforms to the specifications. For example, on the student information entry page, format validation is performed on fields such as student ID and name to prevent the submission of incorrect data.

The business logic layer is mainly implemented by server-side programming languages (such as Java and Python) and is responsible for processing user requests, executing business logic, and interacting with the database. This layer converts the operations of front-end users into specific business instructions and processes and processes data. For example, when a user submits a request to modify student information, the business logic layer first verifies the user's permission, then reads the corresponding student information from the database, performs the modification operation, and saves the modified information back to the database. At the same time, the business logic layer is also responsible for handling various business rules and logical judgments, such as the calculation of student grades and the review of reward and punishment information.

The data access layer is responsible for interacting with the database and implementing operations such as data storage, reading, updating, and deletion. This layer uses the API or ORM (Object-Relational Mapping) framework provided by the database management system to convert the data in the database into an object form that can be processed by the business logic layer, or save the object data of the business logic layer to the database. For example, when the business logic layer needs to query student grade information, the data access layer receives the request, executes the corresponding SQL statement or calls the database stored procedure, obtains the grade data from the database, and converts it into an object form that can be used by the business logic layer and returns it. The data access layer is also responsible for handling operations such as database connection management and transaction control to ensure the security and integrity of data.

3.2 Network Topology Structure Design

The system adopts a client-server (B/S) architecture[6] and is connected through the Internet. The server is deployed in the school's data center or on a cloud server and is responsible for storing and processing the system's data and business logic. The client accesses the system through a browser without the need to install additional software.

The network topology structure adopts a hierarchical design, including access layer, aggregation layer, and core layer. The access layer is responsible for connecting client devices such as computers, tablets, and mobile phones and providing network access services. The aggregation

layer is responsible for connecting multiple access layer devices and performing data aggregation and forwarding. The core layer is responsible for connecting servers and aggregation layer devices and providing high-speed data transmission and routing functions.

To ensure the security and stability of the system, devices such as firewalls, intrusion detection systems, and load balancers are deployed in the network[7]. Firewalls are used to prevent illegal access and attacks from external networks. Intrusion detection systems are used to detect and prevent security threats in internal networks. Load balancers are used to balance the load on servers and improve the performance and reliability of the system.

3.3 Main database tables

As an important information management tool, the college student status management system is carefully designed and provides different functions for different types of users. The system focuses mainly on the efficient management of student information. In practical applications, in order to effectively prevent data redundancy and significantly improve the performance of queries, after in-depth analysis and careful planning, this study has constructed a student information table that covers comprehensive student information, a course information table that records course-related content in detail, a score information table that accurately reflects the student's academic performance status, a reward and punishment information table that objectively presents the student's reward and punishment situation, and a user information table for managing various types of user information.

Table 1 Student Information Table (student_info): Used to store the basic information of students, including student ID (uniquely identifying a student), student name, gender, class, and major. It provides basic data of students for the system.

Table 1: Student Information Table (student_info)

Field Name	Data Type	Length	Is Nullable	Description
student_id	VARCHAR(20)	20	No	Student ID, uniquely identifies a student.
student_name	VARCHAR(50)	50	No	Student name
gender	CHAR(1)	1	No	Gender, 'M' represents male and 'F' represents female.
class_name	VARCHAR(50)	50	No	Class.
major	VARCHAR(50)	50	No	Major.

Table 2 Course Information Table (course_info): Records various course information offered by the school, including course ID (uniquely identifying a course), course name, and instructor. It provides course-related data for functions such as score management.

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Table 2: Course Information Table (course_info)

Field Name	Data Type	Length	Is Nullable	Description
course_id	VARCHAR(20)	20	No	Course ID, uniquely identifies a course.
course_name	VARCHAR(50)	50	No	Course name.
teacher_name	VARCHAR(50)	50	No	Instructor.

Table 3: Grade Information Table (score_info)

Field Name	Data Type	Length	Is Nullable	Description
score_id	INT	11	No	Grade ID, auto-increment primary key.
student_id	VARCHAR(20)	20	No	Student ID associated with the student information table.
course_id	VARCHAR(20)	20	No	Course ID associated with the course information table.
score	DECIMAL(5,2)	5	No	Grade.

Table 4 Reward and Punishment Information Table (reward_punishment_info): Used to record students' rewards and punishments. A reward and punishment ID uniquely identifies a piece of reward and punishment information. It is associated with the student information table through student ID and provides a description field to record specific reward and punishment content.

Table 4: Reward and Punishment Information Table (reward_punishment_info)

Field Name	Data Type	Length	Is Nullable	Description
reward_punishment_id	INT	11	No	Reward and punishment ID, uniquely identifies a piece of reward and punishment information.
student_id	VARCHAR(20)	20	No	Student ID associated with the student information table.
description	VARCHAR(200)	200	No	Description.

Table 5 User Information Table (user_info): Stores information of various users of the system, including user ID (uniquely identifying a user), username, password, and role (student, teacher, administrator), etc. It provides data support for user authentication and permission management of the system.

Table 5: User Information Table (user_info)

Field Name	Data Type	Length	Is Nullable	Description
user_id	INT	11	No	User ID, uniquely identifies a user.
username	VARCHAR(50)	50	No	Username.
password	VARCHAR(50)	50	No	Password.
role	VARCHAR(20)	20	No	Role (student, teacher, administrator).

4. System Implementation

4.1 Student Information Management Module

The student status management system in this study consists of four modules: student information management, course and score management, reward and punishment information management, and system management. The student information management module can perform addition, deletion, modification, and query of students' basic information. Operations first verify user permissions[8]. Entered information is saved in the database after inspection. Querying is based on conditions such as student numbers. If there are associated data during deletion, a prompt will be given for processing. The course and score management module manages course and score information. It has functions of addition, deletion, modification, and query of course information and entry, modification, and query of student scores. Entering course information requires inspection. For entering student scores, students and courses need to be selected. Query results are displayed based on conditions for viewing and modification. The reward and punishment information management module manages students' reward and punishment information. It has functions of addition, deletion, modification, and query. Entered information is saved after inspection. Query results are displayed based on conditions. If there are associated data during deletion, a prompt will be given for processing. The system management module is responsible for user permission management and data backup and recovery. It has functions of adding, deleting, modifying users and allocating permissions. Permissions are allocated according to roles. Entered information is saved and permissions are allocated after inspection. When modifying, verification[9] is performed first, then information is read for modification and saved, and permissions are reallocated. If there are associated data during deletion, a prompt will be given for processing. At the same time, it provides backup and recovery functions. The system performs regular backups. In case of failure, data can be recovered and data integrity and consistency can be checked.

According to the above functions, it is summarized as the following system function module diagram as shown in the Figure1.

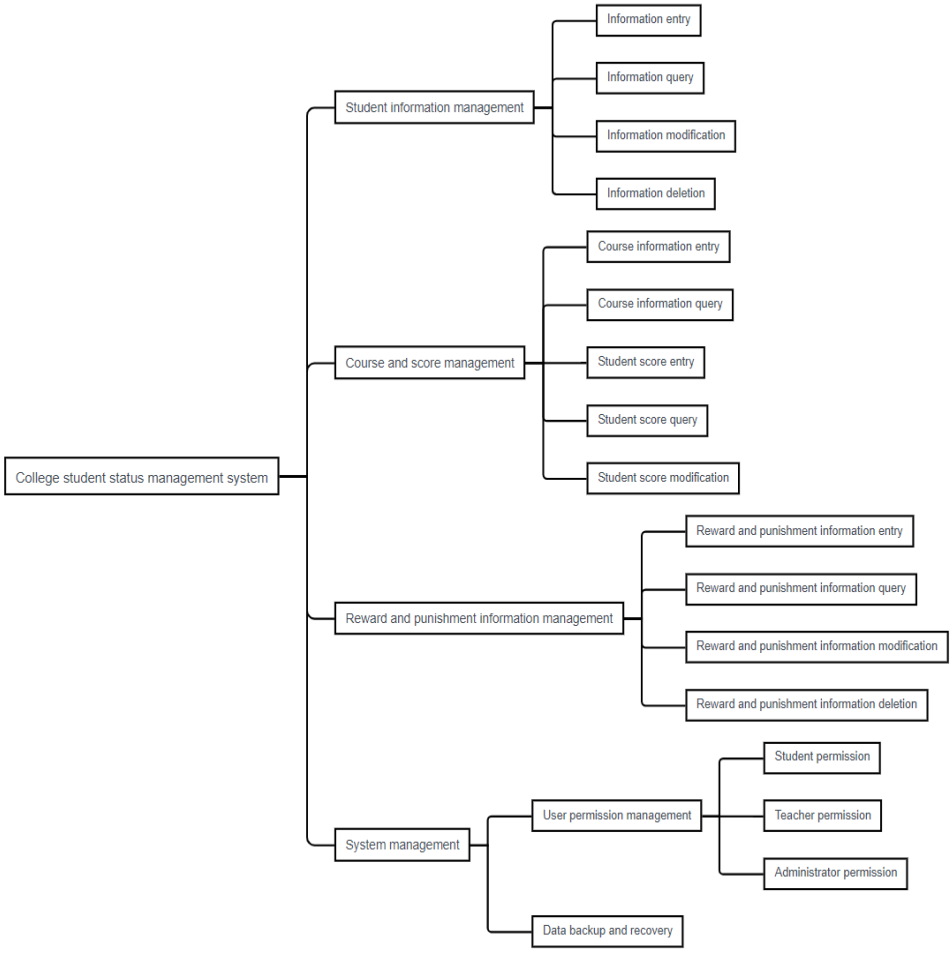

Figure 1: Function Module Diagram of Student Status System

5. System Testing

5.1 Function Testing

Function testing uses a variety of methods to comprehensively test the system functions. Black box testing is used to focus on whether the system functions meet the requirements. White box testing is used to check the correctness of code logic. A detailed test plan and test cases are formulated to cover each functional module and business process, including normal and abnormal situation tests. Tests are conducted on functions such as student information management, course and grade management, reward and punishment information management, and system management to verify whether functions such as addition, deletion, modification, query, import, export, permission management, data backup and recovery are normal and whether various constraint conditions are effective. After testing, the system functions are complete and the operation is stable.

5.2 Performance Testing

Response time testing is conducted. Performance testing tools are used to simulate simultaneous access by multiple users and measure the system response time. Tests are conducted on key functional modules such as student information query and grade query to ensure fast response under high load. Concurrent user testing is conducted. The number of concurrent users is gradually

increased to test the system performance and the stability of key business processes under high concurrency. After testing, the system performance is good and meets the requirements.

5.3 Security Testing

User permission testing is conducted to verify whether the permission control of different user roles is correct. Ordinary users cannot access administrator functions, and administrators can correctly manage permissions. Illegal users or unauthorized operations are attempted to check the system's refusal of access and prompt situation. Data encryption testing is conducted to verify the security of encrypted storage of sensitive data[10]. Attempts are made to crack encrypted data to test the encryption strength. After testing, the system has a high security level and meets security requirements.

6. Conclusions

By constructing a university student status management system based on Web B/S architecture, numerous achievements in system design and function implementation have been successfully attained. Regarding system design, the rational architecture enhances maintainability and scalability. In terms of function realization, multiple modules fulfill the requirements of university student status management, guaranteeing performance and stability while also emphasizing user experience and security measures. This system has made substantial contributions to university student status management, improving management efficiency and accuracy, enhancing transparency and fairness, and providing strong support for university informatization construction. In the future, this paper can further explore the intelligent direction and utilize advanced technologies to improve system functions and continuously provide better services for university student status management. In brief, the results of this system design and implementation are remarkable. After testing, it can effectively meet the needs of university student status management and provide convenience for university teaching management. University teaching management personnel should attach great importance to student status management and promote its continuous development.

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