Design and Implementation of College Student Management System Based on B/S Architecture

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Abstract. Student information management system is a data processing method used by colleges and universities in the face of large-scale business processing. Based on the problems of data storage risk, single function and weak concurrency control faced by traditional university management system, this paper puts forward a set of design scheme of college student management system, aiming at promoting the creative transformation and development of traditional university student management system in China with the help of the existing characteristics of this architecture model. The platform belongs to B/S architecture, and the design and deployment of the overall functional framework will be completed with Javaweb technology as the core. The client will provide various functions and services, and the server will be responsible for business logic control and call. The platform function simulation test results show that the functional modules such as student information query, student course query, student achievement query, student management and teacher personal management are running normally, which meets the diverse needs of students and teachers and is conducive to improving the management efficiency of college students.

Keywords: business processing · student information management · B/S architecture · computer software application

1 Introduction

With the development of computer science and the rapid development of Internet technology, the application and development of modern information system based on Web has become a hot spot in the process of informatization. At the same time, colleges and universities have expanded enrollment year after year, the number of students has increased sharply, and the amount of information about students has also doubled, which has led to the shortage of school database resources and the difficulty of management. The traditional university management system has a single function application and service content, and can only support students and teachers to complete a single information query and browsing operation. The teaching and educational administration work is still done in paper form, which wastes a lot of manpower, material resources and time in the process of printing, transmitting and notifying, and the information of various departments cannot be effectively communicated, which brings great inconvenience to the work

Fig. 1. B/S operation flow chart

and greatly restricts the work of relevant staff [1]. In addition, the overall architecture design concept of the system is backward, and the concurrency control ability is weak, so that delays and jams occur frequently, which affects the user experience and reduces the access efficiency of the system. In view of this, this paper holds that the college student management system should actively learn from the advantages of enterprise-level development and application of Java language and client server architecture, build a college student management system based on B/S architecture, comprehensively enrich the student management system to meet the needs of students and teachers, and promote the high-quality development of the college student management system. The platform combines data information with application services, and can promote the reform of traditional college student management mode in the form of online operation, remote service and multi-dimensional display, so as to provide reference for the modernization of traditional student management in China.

2   Overview of Key Technologies

2.1   B/S Architecture

B/S architecture is a browser/server structure, which needs to be deployed on the server side, and only the browser is needed to access the website and run other required software on the client side. In the B/S framework, users express their requirements at the client, and input the corresponding parameters, and then access the server through the network. First, the logic layer solves the user's requirements, then the data requirements are transmitted to the library, and the specific content is executed by the server. Finally, the business logic layer accepts such feedback information, thus generating a web page that meets the user's needs. This shows that the logic of the B/S structure client and server is more concise and clear, and the data can be processed more efficiently. The specific process of B/S operation is shown in Fig. 1.

2.2   JSP Technology

JSP, whose full name is Java Server Pages, is a dynamic web page development technology, and its core function is to realize some functions of user interaction interface of Java web application. The overall function and application style of JSP technology are similar to those of ASP technology. It inserts Java program segments (Scriptlet) and JSP tags (tags) into traditional webpage HTML (a subset of standard generalized markup language) files (*.htm,*.html), thus forming a JSP file with the suffix (*.jsp) [2]. The core of JSP technology is JSP page, which contains three script elements, namely script,

Table 1. JSP three instruction information table

Instruction	Explain
Page	Page directive is used to define various attributes of JSP pages. Page is the most complicated instruction, and it has many properties, such as import, language and paging.
Include	Static inclusion instructions are used to introduce other JSP files. Other JSP files introduced by using the include instruction will be translated into a servlet by the JSP engine, so include is called static inclusion.
Taglib	Used to import tag libraries (JSP standard tag libraries, third-party tag libraries, custom tag libraries) in JSP pages.

statement and expression. JSP scripts are written in Java language, that is, regular Java code segments, which are tags that start with $< \%$ and end with$\% >$. Declarations include variables and methods, all of which are marked with $< \%!$ Start and end with$\% >$. For tags whose expressions start with $< \% =$ and end with$\% >$, the normal operation of JSP pages requires not only script elements but also JSP instructions to handle the rest of the JSP pages. The JSP engine located on the server side will compile JSP according to JSP instructions to generate Java files, and the instructions will be automatically eliminated when the generation is completed. The three instructions of JSP include page, include and taglib, which are detailed in Table 1.

JSP is an extension of Java Servlet, and its main purpose is to separate the presentation logic from Servlet. Compared with other dynamic Web development technologies, JSP technology has some application characteristics, such as universality, reusable components, simplified markup language, and the separation of application and page display, which makes the development of web-based applications quick and easy.

2.3 SSM Framework

SSM (Spring + SpringMVC + MyBatis) framework set is integrated by two open source frameworks, Spring and MyBatis. SSM framework is based on Java development, which is suitable for Web application development framework with simple data sources. Compared with SSM (Spring + Struts + Hibernate) framework of the same type, SSM framework is lighter and more flexible in overall operation. SSM architecture follows J2EE development specification.

A. Spring.

The core application of Spring framework is a container framework, which can accept various components of Web layer, business control layer, dao layer and data

persistence layer. The application purpose of Spring framework is to make the relationship between various objects or modules be managed directly through configuration class description. Under the framework of Spring, there are three core technologies, namely control inversion (IOC), dependency injection (DI) and aspect-oriented programming (AOP). The use of Spring is not limited to server-side development. From the perspective of simplicity, testability and loose coupling, any Java application can benefit from Spring.

B. Spring MVC.

Spring MVC is a separate module under Spring framework, and it is a Web framework based on MVC pattern. Spring MVC can split the traditional model layer into Service layer and data access layer. In the practical application process, Spring MVC mainly uses the central controller DispatcherServlet to complete the request sent by the client. After receiving the request, query one or more HandlerMapping to match the Controller, and return ModelAndView to DispatcherServlet after the operation is completed, and then complete the response to the user request after rendering. Spring MVC has the characteristics of clear role division and clear division of labor, and can be well integrated with Spring framework, which has inherent advantages in application performance.

C. MyBatis.

MyBatis is a Java-based persistence framework, which can encapsulate JDBC, eliminating the manual setting of a large number of JDBC codes and parameters and the retrieval of result sets. Mybatis configures various Statements to be executed through xml or annotations, and generates the final executed Sql Statement through mapping between Java objects and dynamic parameters of Sql in statement. Finally, Mybatis framework executes Sql and maps the results to Java objects and returns, which greatly improves the convenience of data persistence layer [3].

2.4 Development Process

This system is a dynamic network system based on B/S architecture. The contents in the network can interact with each other through the association between the client and the server. The information of the client is the information that the user passes to the server through the browser, and the data of the server is the information that the network server returns to the browser according to the access request provided by the browser [4]. The overall development of the system is divided into two parts. Among them, the front-end development takes JSP technology as the core, and combines HTML code, XHTML code, XML elements and JSP operation instructions to form an interactive interface for the front-end users to register and log in, browse the school news notification area, and select the result generation time from the drop-down box, so as to facilitate users to log in and use the system with the browser of any device [5]. The back-end development is realized by SSM, a mature Web development framework, which connects the front-end interactive interface with the back-end server under a specific data interface. The specific implementation process is to use Maven to complete the integration and construction of SSM framework under Eclipse. After building a new Webapp and adjusting the configuration of Tomcat, jar packages required by SSM framework are added, including Spring related packages, MyBatis related packages,

MySQL related packages and log related packages [6]. Create a configuration file for the project after adding, and the key code is shown in Fig. 5. Create mybatis-config.xml file, spring-mvc.xml file and spring-mybatis.xml file respectively to complete the integration and configuration of the SSM framework of the system. Under the SSM framework, developers can complete the server-side design and development and the client-side design and development in turn according to the detailed system functional requirements, and finally use the execution code function under Maven attribute to observe whether the overall design of the system is wrong. The overall development ring of the platform consists of operating system, development language, Web server and database server. In terms of version selection, the operating system is Windows 10.0 x86-64bit, the development language is Java, JDK version 1.8.0_251, the Web server is Apache Tomcat 9.0, and the database is MySQL 5.7. There are also many editing and development environments to choose from. Here, our integrated development tool is Eclipse Neon 4.6.2 [7] .Through the introduction of the above key technical theories, the overall environment of system development, the configuration of related software and tools are determined, and the technical feasibility of the overall project of college student management system based on B/S architecture is also clarified.

3   Functional Implementation

3.1   Student Side

A. Student users log in to the system according to the existing registration information. Under this module, the system supports student users to query information according to the existing registration information, and displays the information of each key stage of student development in various forms such as words, pictures and charts in detail, which is convenient for users to view online. Users click the gray modify button as needed to edit each piece of existing information. In addition, the platform provides diversified information templates to meet students' various needs after employment. Students can download their own information tables by clicking "one-click generation", thus meeting students' job-hunting needs, innovating system mechanisms and improving the utilization rate of the system.

B. Student course inquiry.

Under this module, the system supports students to view a variety of courses offered by the school and choose their own elective courses according to their needs. In the section of viewing the contents of the courses offered by the school, it includes the courses offered by the school and the courses displayed in the historical records. Students can filter by time or search for courses by keywords, and the website on the other side shows recommended elective courses, which is convenient and fast.

C. Student grades inquiry.

Under this module, the system supports students to view the course scores of various disciplines in each semester and filter them by time or keywords. In addition, the system also supports the visual viewing of personal achievements in order to meet the individual needs of students. Under this function module, student users can graphically view their grades. Relevant data results will also be displayed in the form of charts, which is convenient for users to view and apply intuitively, as shown in Fig. 2 for a student's grades display.
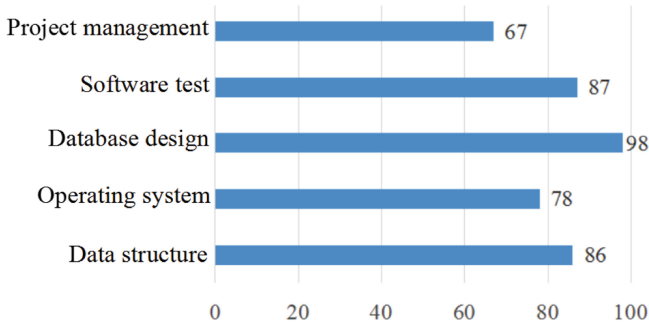
Fig. 2. Display of student course grades

3.2 Teacher Side

A. Student management.

The orientation of teacher users in the system focuses on the manager of student information. Functional authority includes three aspects: student management, resource management and daily management of students. In student management, detailed information such as students' enrollment, suspension from school and drop out of school is defined, and resource management includes information management such as student books and policy documents. Daily management includes the examination and approval of the process of taking leave and terminating leave, which is convenient for teachers to master and standardize students' daily life. Under the specific operation, when the teacher user enters the student name keyword in the retrieval box of the interface, the platform will segment the input content and calculate the similarity weight of the keyword in the index database by using TF-IDF formula [8]. Formula TF-IDF is shown in Formula 1, where W represents similarity weight, TF represents the frequency of keywords appearing in the index database, IDF represents the inverse frequency of index items containing keywords in all index items, f represents the frequency of keywords appearing in the index database, c(T) represents the total number of index items in the index database, n represents the total number of index databases, and m represents the number of index databases where keywords appear. The key codes for realizing this part of the function in the platform are as follows [9]. The whole operation process depends on the IndexSearcr method under the Lucene framework. The calculation results show that the greater the weight, the higher the frequency of the input keywords in the index database, and the higher the matching degree between the contents and keywords in the index database.

$$W = TF * IDF, \ TF = \frac{f}{c(T)}, \ IDF = \log \frac{n}{m} \tag{1}$$

```
public void testIndexSearch() throws Exception {

    Analyzer analyzer = new IKAnalyzer();

    QueryParser queryParser = new QueryParser( "name" , analyzer);

    Query query = queryParser . parse(" Liu Ming");

    Directory dir = FSDirectory . open(Paths . get(" /Users/ miyu-
feng/Downloads/lucene_ dev" ))

    IndexReader indexReader = DirectoryReader . open(dir);

    IndexSearcher indexSearcher = new IndexSearcher( indexReader);

    TopDocs topDocs = indexSearcher . search(query, 10);

    System. out . println("=======count-======="+ topDocs . totalHits);

    ScoreDoc[] scoreDocs = topDocs . scoreDocs;

    if (scoreDocs != null) {

        for (ScoreDoc scoreDoc : scoreDocs) {

            Int docID = scoreDoc . doc ;

            Document doc = indexSearcher . doc( docID);

            System. out. println("===id==" + doc.get("id"));

            System. out . println("===name==" + doc . get("name"));

        }

    }
}
```

B. Teacher personal management.

Teacher users are positioned in the system as the finishers of personal matters. Functional authority includes three aspects: publication application, award application and daily application. The publishing application meets the publishing needs of teachers, and the award application includes information management such as teacher title evaluation. Daily applications include applications for leave and leave cancellation, which is convenient for teachers' daily work. Publication application is more efficient under the feedback mechanism. Teachers can check the information of their own publication application and the number of historical publications. In the award application, teachers can obtain the latest award evaluation in time and click the application button to apply directly in the pop-up box.

After the platform design is completed, the simulation test will be carried out, with a total of 2349423 groups of original data. The experimental results of comparing Lucene framework with SQL command in data search are shown in Table 2. The results show that Lucene framework is far more efficient than traditional SQL commands in searching text content, and can adapt to the demand of search engine under Hadoop. In addition, the overall smooth operation of the platform and the concurrent processing ability of

Table 2. Lucene framework retrieval and comparison test results

Field name	Content	SQL command		Lucene framework		Decision
		Result set	Time (s)	Result set	Time (s)	
ID	4678	3	1786	3	300	Same
Name	Niu %	2367	3478	2367	1782	Same
Msg	Grades %	7834	28970	7834	3242	Same

Table 3. Platform performance test results

No.	Retrieval time	Thread	Tab	Connect time (ms)	Delay time (ms)
1	11:50:03	1–1	Network request	3	55
2	12:08:21	1–2	Network request	9	60
3	13:33:59	1–3	Network request	12	87

users are tested, and the test results are shown in Table 3. The results show that under the premise of 500 concurrent requirements, the platform runs smoothly, and the average response time is below 100ms, and the performance meets the design specifications [10].

4   Conclusions

Colleges and universities are the breeding bases for talents. With the development of Internet information technology, the society has put forward higher requirements for the management ability of college students. In order to improve the effectiveness of college student management, this paper designs a set of college student management system based on B/S structure, aiming at many shortcomings in the current student management mode, and promotes the high security, multi-function and high concurrency transformation and upgrading of college student management. Looking back, the information technology ecology has undergone earth-shaking changes. In the future, under the guidance of the Party, the follow-up research system will further improve data security performance, enrich functional modules, improve concurrency performance, and give students and teachers a better experience.

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