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Development and Design of Online Course Scheduling System for Computer Room in Colleges and Universities based on BPXS

Xiaoping Su, Sheng Wang

School of Computer Science, Southwest Petroleum University, China

Abstract

With the continuous development of Internet technology and information technology, computer technology has been specifically applied in various industries, and it has become a trend to use it to solve specific problems. In view of the shortcomings of scheduling work in university computer room, such as large scale, many links, complex process and so on, a general scheduling system for university computer room is designed. The system recruits Thymeleaf template as the front-end template engine and SpringBoot for back-end program development. The hierarchical structure design pattern based on MVC idea completes the realization of each functional template, which can effectively improve work efficiency and save labor costs. At the same time, security access control through Spring Security can prevent ultra vires operation and ensure the security of the system.In this work, the key technologies of scheduling system are introduced, then the requirement analysis and functional module design of the system are carried out, and the conceptual design and logical design of the database are briefly carried out. Subsequently, part of the implementation of the system is briefly described. Finally, we make a summary according to the development process of scheduling system in university computer room.

Keywords

Scheduling System; SpringBoot; B/S.

1. Introduction

In the past few years, the rapid development of higher education has enabled the rapid popularization of computer room teaching in colleges and universities.[3] However, the traditional scheduling method is complicated and inefficient, and even some colleges and universities still retain the manual or semi-manual way to carry out scheduling, which not only requires a lot of time and energy, but also prone to curriculum repetition and conflicts when the curriculum arrangement is unreasonable. This suggests that the development of computer room scheduling system in colleges and universities is of great significance in assisting computer room education, improving scheduling efficiency and saving manpower.

2. Introduction of Key Technologies

2.1. SpringBoot Frame

Compared with Spring, SpringBoot is a brand-new framework, which comes from the Spring family, so it not only has and can easily apply all the functions of Spring, but also simplifies the application development based on Spring. It can create an independent, production-level Spring application with a small amount of code. SpringBoot defaults to configuring the use of many frameworks, just as Maven integrates all jar packages. SpringBoot integrates all the frameworks. Its core design idea is: convention is better than configuration, and all the development details of SpringBoot are realized according to this idea. The architecture of Spring is shown.

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2.2. MySQL Database

MySQL is a relational database management system,[5] which is mainly used to store project-related data. There are complete data types in MySQL, and its operation is relatively simple. It implements data-related operations by using SQL statement system, and provides a variety of predefined interfaces for programming languages to use. At the same time, it has the advantages of low cost, high speed, small size and open source, so many small and medium-sized projects use MySQL as a database to store relevant data for project development.

3. System Analysis and Design

3.1. Demand Analysis

The research of this system is aimed at the scheduling system of university computer room, which is mainly divided into three parts. The first is for ordinary teachers. Ordinary teachers are allowed to query the free computer room through their own course requirements, and submit the application by filling in personal information and course information, which is submitted to the scheduling teacher for review, and the application is completed after successful review. The second is for scheduling teachers. Scheduling teacher is mainly responsible for reviewing the computer room application submitted by ordinary teachers, adjusting and arranging reasonably according to the application situation, class size and classroom capacity, and counting the relevant course information. The third is for the system administrator. The system administrator mainly manages the data of the whole system, including teacher information and authority, teaching building, semester schedule. The system is designed mainly from these three parts. The system use case diagram is shown.

3.2. System Design

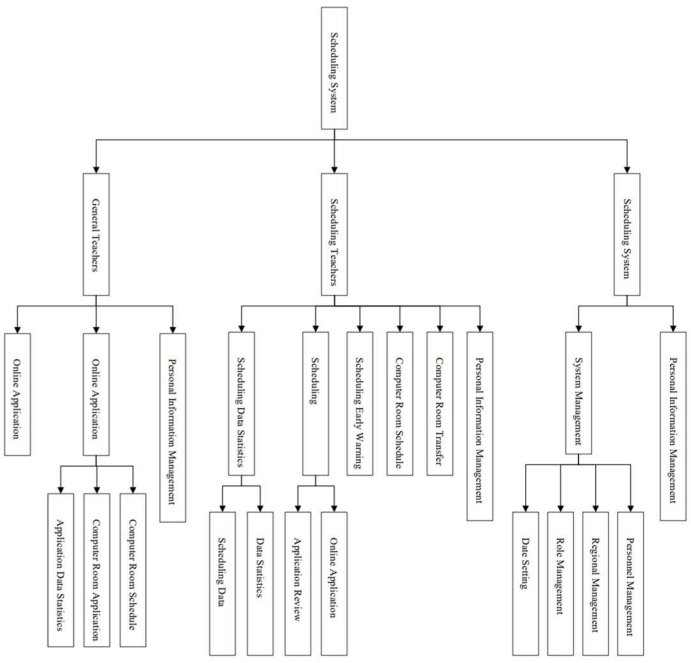

Fig. 1 Functional Module Diagram

According to the identity rights of login users, the scheduling system of university computer room can be divided into system administrators, scheduling teachers and ordinary teachers. Each role identity has different functional permissions and can perform different functions. 错误!未找到引用源。The system function module is shown in Fig. 1.

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3.2.1. System Administrator Function Module

The system administrator is mainly responsible for the management of the whole system, including the following functional modules.

(1) Personal information management: manage personal information such as faculties, teaching and research departments, contact information and login passwords.

(2) System management:

A. Personnel management: manage the users (scheduling teachers, ordinary teachers), including personnel information viewing, personnel addition, staff deletion, personnel information modification, password reset, personnel batch import, personnel permissions setting.

B. Regional management: manage the teaching area (teaching building, classroom), including viewing the information of the teaching area, modifying the teaching area, adding the teaching area, deleting the teaching area, etc.

C. Role management: view the identity classification of system roles and their corresponding functional permissions.

Date setting: it is used to set the specific time of the start and end of each semester, which is convenient for course application management.

3.2.2. Scheduling Teacher Function Module

Scheduling teacher is responsible for reviewing the application of ordinary teachers and making reasonable adjustments and arrangements according to the needs of the course, including the following functional modules.

(1) Personal information management: manage personal information such as faculties, teaching and research departments, contact information and login passwords.

(2) Scheduling:

A. Online application: complete the computer room application operation by filling in the teacher's personal information, course information and course schedule online.

B. Application examination: review the specific applications submitted by ordinary teachers, which can be adjusted accordingly by consulting the relevant information of the application.

(3) Scheduling data statistics:

A. Data statistics: it is used to count the data of all kinds of courses that have been scheduling, the statistics of different events, the amount of scheduling of different colleges, etc.

B. Scheduling data: through the screening operation, the specific courses applied for by the computer room are divided into approved and unapproved courses, and the corresponding management is carried out, including course search, course view, course deletion and audit results can be rejected.

(4) Transfer of courses in the computer room: reschedule and reschedule the courses that have been approved.

(5) Computer room curriculum schedule: check the computer room curriculum arrangement by week and teaching building area to see whether the computer room is idle, and support the daily and monthly export of the computer room curriculum schedule.

(6) Scheduling warning: show the current week of the semester, check the successful course schedule of scheduling this week, and based on the red status.

3.2.3. General Teacher Function Module

After logging in successfully, ordinary teachers can fill in the course and its related information online and complete the course application and other operations, including the following functional modules.

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(1) Personal information management: manage personal information such as faculties, teaching and research departments, contact information and login passwords.

(2) Online application:

A. Computer room schedule: check the course arrangement of the computer room by week and teaching building area to see if the computer room is idle, and support the daily and monthly export of the computer room schedule.

B. Computer room application: fill in the teacher's personal information, course information and course schedule online, and complete the computer room application operation.

C. Application data statistics: check the status of submitted course applications, which can be divided into three states: approval, rejection and non-review.

Personal schedule: check all the courses that have been successfully approved and scheduling by the current teacher, and present the courses according to the two-dimensional table of periods / weeks.

3.3. Overall Architecture and Design

The front page of the scheduling system in the university computer room is built by using the Thymeleaf template. The outstanding feature of this template is the Java template engine for rapid development of pages, which can dynamically replace static content and enable dynamic display of pages, which provides an elegant natural template for development workflow. It can correctly display the HTML in the browser, or it can work as a static prototype for stronger collaboration among the development team.错误!未找到引用源。

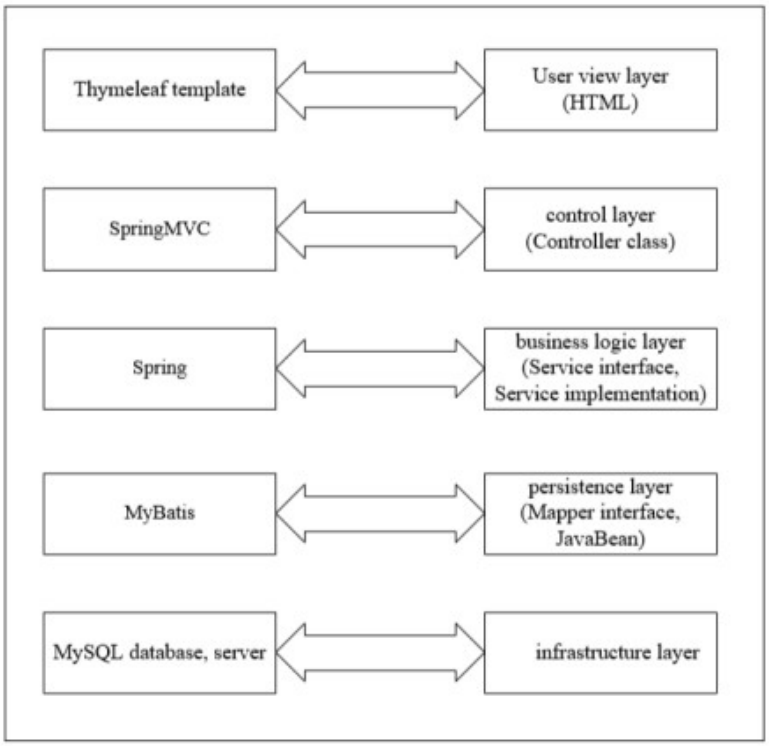

Fig. 2 System Design Architecture Diagram

The back-end implementation is developed based on the Springboot framework and MyBatis, which uses MySQL as a database to store system-related data. This framework collocation simplifies the difficulty of development, saves a lot of time spent on configuration files and

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related configuration parameters, and improves the overall development efficiency of the system.

The design of the system uses the MVC design idea and adopts the hierarchical structure design based on Bhand S. it has good expansibility and is convenient for later maintenance. The system is mainly divided into user view layer, control layer, business logic layer, persistence layer, infrastructure layer. The design architecture of the scheduling system in the university computer room is shown in Fig. 2.

The program structure of the system uses the hierarchical structure of Dao, Service and Controller, in which the Dao layer is mainly used to perform related operations on the database and complete the specific business logic implementation of number operations. The Controller layer is responsible for the specific business logic control, receives the request from the foreground, and dispatches the request to the Service layer which specially handles the business processing logic according to the content and mode of the request. The Service layer processes the requests distributed by the Controller layer and hands over the feedback information from the Dao layer to the Controller layer.错误!未找到引用源。.

4. System Realization

4.1. Page Permission Settings

The foreground interceptor is used to intercept requests sent by users and process their requests accordingly to verify whether the user is logged in. It distinguishes the functional permissions between logged-in users and non-logged-in users, and prevents non-logged-in users from accessing pages other than user permissions through abnormal ways. The specific implementation creates a class that implements the HandlerInterceptor interface and overrides the preHandle method. The return value in the preHandle method is true to allow subsequent operations, otherwise they cannot be performed. The preHandle method is used to judge whether the login user information exists in the Session, and the corresponding return value is set to intercept. In addition, it is necessary to configure the classes that implement the HandlerInterceptor interface in the spring-mvc.xml configuration file and set up the pages that need to be intercepted. The code of the interceptor is as follows.

```
public boolean preHandle(HttpServletRequest request, HttpServletResponse response, Object handler) throws Exception {
    HttpSession session =request.getSession();
    User user=(User) session.getAttribute("user");
    if (user!=null) {
       return true;
    }
    else {
      request.setAttribute("msg"," Not logged in, please log in first!");
      request.getRequestDispatcher("/").forward(request,response);
       return false;
    }
}
```

4.2. display of Some Pages

4.2.1. Login Page Display

Users can operate on the scheduling system only after they have successfully logged in. On the user login page, the user needs to enter the entry number, password and corresponding

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verification code to log in, and then the scheduling system will verify the student number, password and verification code entered by the user to verify whether it is correct. 错误!未找到引用源。 After all the verification is successful, go to the home page of the background system. The login page is shown in Fig. 3.

Fig. 3 Login Page

4.2.2. Backstage Home Page Display

When the user successfully logs in, the course scheduling system will enter the corresponding background home page according to the permissions of the user role. Different roles have different functional permissions and can perform different user operations. The background home page of the course scheduling teacher is shown in Fig. 4.

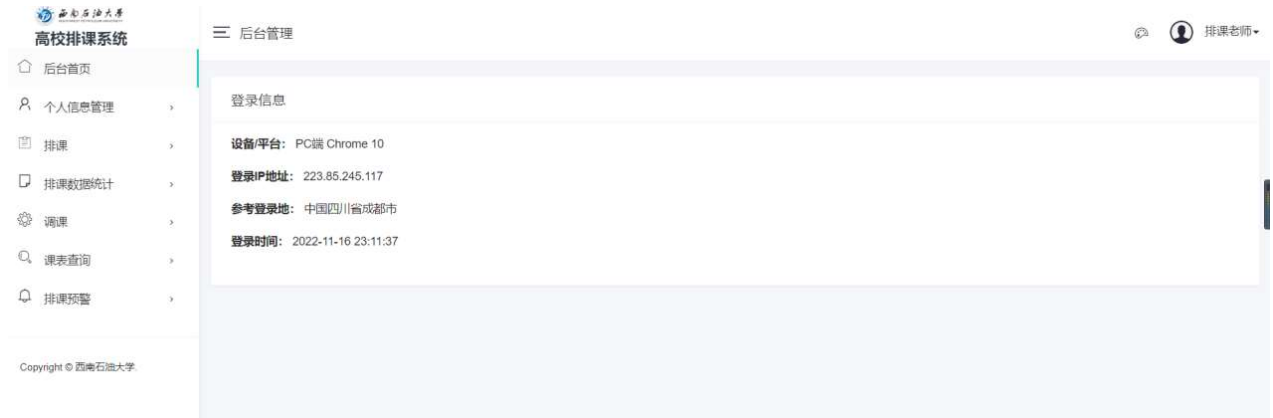

Fig. 4 Background Home Page of Course Scheduling Teacher

5. Conclusion

Based on the SpringBoot+MyBatis framework, a university computer room course scheduling system is designed and developed by using the SpringBoot+MyBatis framework, and the hierarchical architecture of MVC design pattern is adopted to separate the system performance layer from the data layer, which is more conducive to system management. It realizes the demand of convenient course arrangement in university computer room, and facilitates the timely adjustment and planning of curriculum arrangement. In addition, it avoids the time and place conflict of computer room course arrangement, effectively improves the work efficiency of university computer room course arrangement, simplifies the whole computer room application process, and enables it no longer tedious and complicated.

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