

Mongolian Education Resource Platform Based on Springmvc+Hibernate+Spring Integration Framework

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Abstract: With the popularization of educational informatization and the advancement of computer technology and multimedia playback, the process of educational networking has reached new heights nationwide. The education networking in Inner Mongolia Autonomous Region is currently in a rapid development stage. In order to provide Mongolian-speaking students with the benefits of educational networking, it is imperative to design and implement a Mongolian language educational resource platform. The designed Mongolian Language Educational Resource Platform in this paper adopts a B/S architecture and utilizes the SpringMVC, Hibernate, and Spring frameworks for overall development. Firstly, the relevant technical knowledge used is introduced, including the B/S architecture, the main frameworks used, and CSS technology, among others. Then, the requirements specification and detailed design plan of the platform are elaborated, including the database design. Finally, the implementation process of the core functionalities of this Mongolian language educational resource platform is described, and unit testing methods are employed to test these core modules. The system in this paper achieves the basic functionalities of the Mongolian language educational resource platform, and the entire platform's functionalities have met the expected goals.

Keywords: Education network, Mongolian Language, B/S architecture, SpringMVC, Hibernate.

1. Introduction

The education networking in Inner Mongolia Autonomous Region is currently in a rapid development stage. In order to ensure that Mongolian-speaking students can benefit from the achievements of education networking, it is imperative to design and implement a Mongolian language education resource platform[1].

Currently, in most developed countries, "Internet + Teaching" has become the preferred choice for many university teachers and students. Many foreign universities widely utilize online education platforms for teaching, such as Open University, European Progress School, Jones Online University, and other online education platforms. In the United States, compared to full-time campus learning, more students prefer options like part-time work and study or studying while working, which provide greater flexibility[2]. The advent of the internet perfectly caters to the expectations of these individuals. Blended education through online integration breaks the constraints of time and space in traditional teaching methods, making learning a fast, flexible, and enjoyable process. Additionally, the government's increased attention and investment in information infrastructure better support the development of online education, rapidly establishing it as an important teaching mode [3]. The United States is the largest country in terms of scale for online education, with over 360 universities offering remote learning, and 3.5 million people participating in online education, transforming American universities into virtual institutions[4].

Currently, both domestically and internationally, the widely recognized and regarded educational resource platform is MOOC (Massive Open Online Course) website. This platform categorizes teaching resources based on professional disciplines or renowned universities[5]. Its emergence allows knowledge and information that were

previously tightly confined within the walls of higher education institutions to be disseminated to a much broader world through the internet. As long as one has internet access and a decent network environment, anyone has the opportunity to enjoy the learning resources that were once exclusive to the members of specific institutions. However, this platform is primarily designed for college students and adults, and the main courses offered are mainstream university courses. Additionally, the teaching resources on this platform are predominantly in video format[6].

The widely used educational platform for primary and secondary schools in Inner Mongolia currently is ZhiXueWang (Smart Study Website). ZhiXueWang provides users with a user-friendly platform interface and comprehensive resource services. It utilizes big data analysis to fully explore the value of campus examinations. The platform enables various teaching activities such as in-class practice, homework assignments, and unified tests through different smart terminal devices like mobile phones, scanners, and grading machines[7]. It collects teaching data to achieve intelligent grading and automatic analysis across all subjects. This platform offers comprehensive educational services based on knowledge points for teachers, students, and parents[8].

Currently, there are various types of online teaching platforms both domestically and internationally, all of which have achieved the goal of online education. However, most of these platforms still have the following issues.

(1) Currently, although numerous educational platforms offer a variety of functions, the implementation of certain features requires downloading a separate client, which can be complex and negatively impact the overall efficiency of the platform[9].

(2) Although there are currently various forms of online teaching platforms, there is still no Mongolian-language online teaching platform available to serve the majority of

Mongolian students[10].

The Mongolian language education resource platform adopts the B/S architecture and is developed using the SpringMVC, Hibernate, and Spring frameworks. The platform covers relevant technical knowledge, including the usage of B/S architecture, major frameworks, and CSS technology. In addition, it introduces the platform's requirements specification and detailed design plan, including database design. The implementation process of the core functionalities is described, and the core modules are tested using unit testing methods. The system has successfully

implemented the basic functionalities of the Mongolian language education resource platform and has achieved the intended objectives.

2. Platform Related Technology Introduction

2.1. SpringMVC Framework

The workflow of the SpringMVC framework is shown in Figure 1 below.

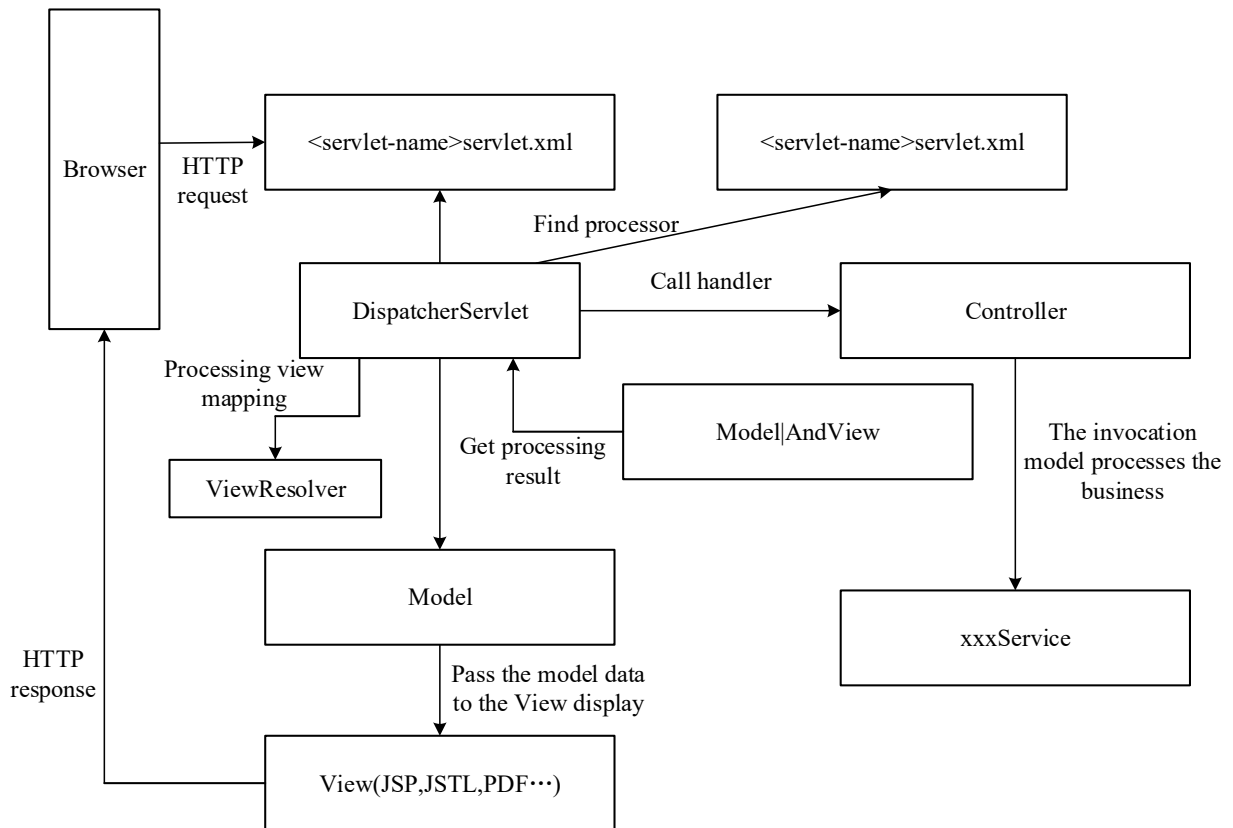


Figure 1. Working principle diagram of SpringMVC

The SpringMVC framework can be considered as a tool provided by Spring for implementing the MVC(Model-View-Controller) architecture. It helps developers easily achieve the separation of concerns between the view, model, and controller, and it is a technology that operates in the presentation layer. Now let's introduce the working principle of SpringMVC: When a request is made by the browser, the front controller, DispatcherServlet, intercepts the request. Then, it calls the handler mapper, Handler Mapping, which combines the request information such as the URL, request headers, and request parameters (e.g.,cookies) to find the specific handler, Handler. The handler is then returned to the DispatcherServlet. Next, the DispatcherServlet finds the backend controller, Controller, by invoking the handler adapter, HandlerAdapter. After the Controller completes its execution, it returns a logical view, ModelAndView, to the DispatcherServlet[11]. The DispatcherServlet passes it to the ViewResolver, which converts the ModelAndView object into an actual view. Finally, the DispatcherServlet parses the parameters from the model in the ModelAndView object to

obtain the complete view and successfully responds to the client's request.

2.2. Hibernate framework

Hibernate is used to establish and manage the connection between the DAO (Data Access Object) layer and the database. It encapsulates the steps involved in using JDBC to operate on the database, making it more convenient and efficient for programmers to interact with the database. By utilizing the Hibernate framework in program development, developers do not need to repeatedly write the same JDBC code or extensively test the correctness of written SQL statements. Instead, developers only need to edit the configuration file and invoke the methods provided by the framework to fulfill the requirements of data manipulation, including data insertion, deletion, modification, and retrieval. This significantly enhances our programming efficiency[12].

The main reason for using Hibernate technology in this article is due to its three advantages in database operations. Firstly, Hibernate is a lightweight ORM (Object-Relational Mapping) framework. Secondly, Hibernate encapsulates

JDBC and allows easy database manipulation using an object-oriented approach through the ORM mapping mechanism. Thirdly, Hibernate also provides a caching mechanism, which can improve efficiency.

2.3. Spring framework

The Spring framework can be understood as an open-

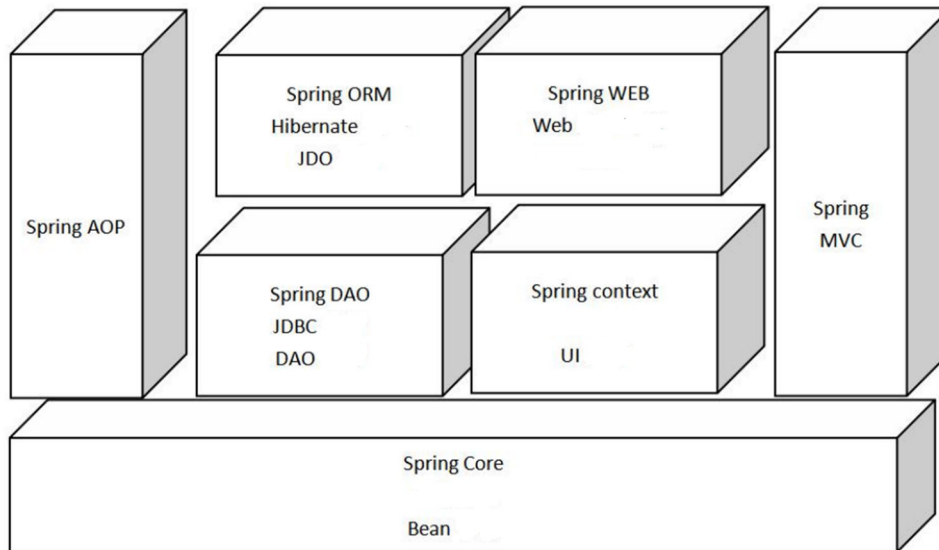


Figure 2. Spring frame

2.4. B/S structure

B/S structure stands for Browser/Server architecture, which is a web structure that facilitates the sharing of resources and information over the Internet. Users can directly access the server through a web browser without the need for a separate client program installation. It can be observed that the B/S structure utilizes the browser to directly access server resources, eliminating the need for downloading dedicated client programs, thereby saving development costs[13]. In the B/S model, most of the business processing is concentrated on the server, with only a small portion implemented on the frontend. Under the B/S structure, users simply need to send web requests through browser pages, which are then transmitted to the server. After processing the request, the server responds with the processing results to the browser, which in turn presents the server's returned resources to the user.

2.5. CSS technology

CSS is a presentation standard in web standards used to provide styling to HTML pages. It is a style sheet language for computers. Developers use CSS styles to format web pages, thereby separating the content of the page from its presentation.[14]

3. Platform Core Function Requirement Analysis

3.1. Foreground user requirements

In this project, front-end users are mainly divided into two categories: student users and teacher users. The main functionalities for front-end users include user registration, login, password recovery, personal information modification, document management, micro-course management, video management, news management, my comments, my

source container that enables business management for SpringMVC and Hibernate. The core of the Spring framework lies in the Inversion of Control (IOC) technique and Aspect-Oriented Programming (AOP) technique. Figure 2 below illustrates the Spring framework diagram.

messages, my favorites, and site messages[15].After registering, teacher and student users are placed in different groups, granting them different permissions. Student users do not have the ability to upload resources, but they have access to all other functionalities available to teacher users. The specific use case diagram is shown in Figure 3.

3.2. Background management requirements analysis

Next, I will elaborate on the functionalities of the administrator user in the web backend. The backend management platform is a platform for managing educational resource files with the aim of updating the front-end pages in a timely manner. The administrator user functionalities are more complex and primarily include seven sub-functionalities. Firstly, there is the user management functionality, which includes grouping users, setting permissions for each group, account binding, site message management, and log management. Secondly, there is the resource content management functionality, which allows administrators to view and review resources published by users, as well as the ability to publish resources from the backend. Thirdly, there is the column management functionality, which involves adding and modifying sub-columns[16].Fourthly, there is the website maintenance functionality, which includes tasks such as data backup and restoration. Fifthly, there is the data statistics functionality, which allows for the statistical analysis of user registration numbers, resource publication numbers, and website traffic over different time periods such as years, months, and days. Sixthly, there is the template management functionality, primarily used to manage PC and mobile templates. Lastly, there is the configuration management functionality, which includes site settings, platform settings, and login settings. Figure 4 illustrates an example diagram of the functional requirements for the administrator user in the backend

management platform.



Figure 3. Front user function diagram

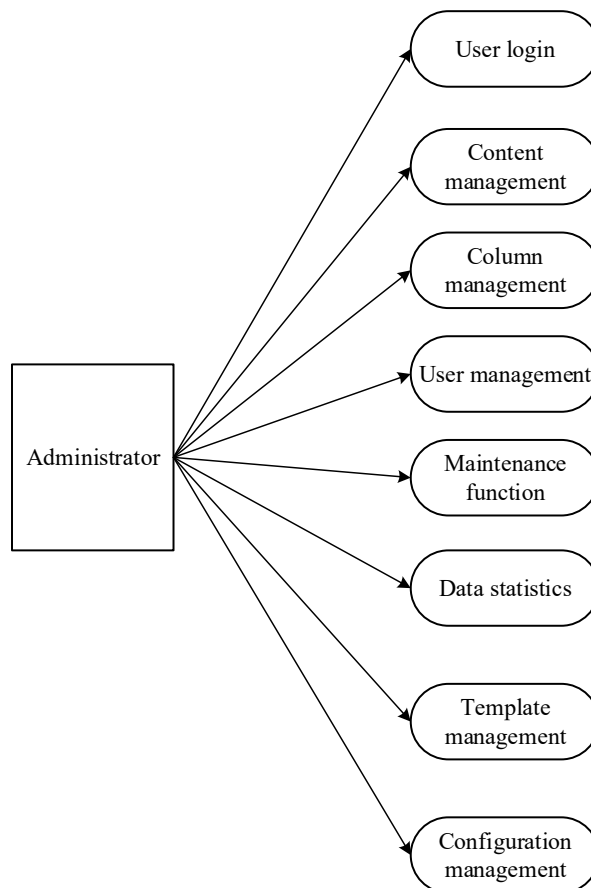


Figure 4. Administrator function diagram

4. Platform Related Technology Introduction

4.1. Detailed design of user module

First, when users first use the platform, they need to register. They can select the "Register" option and enter the registration page. They need to fill in the username, password, and verification code in sequence. They also need to provide an email address for password recovery in case they forget their password. After filling in these fields, they need to re-enter the password for confirmation to avoid typing errors. If the username does not meet the requirements, they will need to enter a new one. The confirmation password field will display a prompt if it does not match the initially entered password, and they need to re-enter it correctly before submitting the registration information. Finally, they need to enter the verification code, click "Register Now," and complete the registration process.

Users enter the login interface and use their username as their identity. They can log in to the platform only if the password they enter matches the stored information in the backend. If the password is entered incorrectly, an error message will be displayed. If the user has not registered yet, they can proceed with the registration process. In case a user forgets their password, they can click on the "Forgot Password" option at the bottom of the interface. They need to provide the email address used during registration to receive a verification code. After receiving the verification code, they can enter it in the interface. Once the verification is successful, they can proceed to the password modification page. They can enter a new password, confirm it, and click "Submit." The platform will automatically replace the old password with the new one. To provide convenience, the platform also supports login via WeChat. Users can simply scan the QR code with WeChat to log in. Users who are using WeChat login for the first time need to bind their username. If they have not registered a username before, they need to enter a username and bind it to their WeChat account[17].

Users enter the Member Center and click on the Document Library Management, which leads them to the Document Library Management page. Document Library Management includes two functionalities: Document List and Document Publishing. When publishing a document, users first browse their local computer to locate the resource they want to upload. Then they add required information such as resource title, wealth value, and the associated column. They can also optionally provide information such as whether the document is public, resource description, and resource author. Finally, they need to enter the correct verification code to successfully publish the document. The published content will be displayed in their own document list. Additionally, the published resources need to be reviewed and approved by an administrator before being displayed in the document library module.

4.2. Home page module detailed design

The homepage module is the first page displayed when the Mongolian Education Resource Platform is opened. Based on the analysis of the requirements outlined in Chapter 3's homepage module requirement document, the homepage functionality primarily includes the following modules: Search Module, Latest News, Today's Special Recommendations, Latest Resources, Member Updates, Reading Rankings, Weekly Hot Searches, and Friendly Links. When designing the homepage module, it is essential to consider both the convenient functionalities to be presented to users and to provide them with a visually appealing homepage interface. To illustrate the design process of the Member Updates sub-functionality, let's focus on it. Whenever there is a new member user registration or an existing member user makes a recharge, their usernames, the date of the latest update, and the wealth balance will be displayed in the Member Updates module on the homepage.

4.3. Detailed design of background management module

The backend management module is a platform that facilitates administrators in managing the frontend pages. Based on the analysis of the requirements for the backend management module in Chapter 3, the core functionalities of the backend management module can be divided into three main parts. The first part is user management, where the administrator user has the authority to manage all frontend users. The second part is resource content management, which includes functions such as viewing and reviewing the content uploaded by users, as well as the ability for administrators to publish resources from the backend. The third part is column management, which involves adding and modifying sub-columns.

4.4. Platform overall database E-R diagram design

The main entities of the Mongolian education resource platform include administrators, users, and teaching resources. A user can upload and browse multiple teaching resources, while an administrator can manage multiple users and teaching resources. Administrators can also create multiple groups, assign a unique group to each user, and each group has different permissions. The E-R diagram of the entire platform's database is shown in Figure 5.

The design for the various functional tables in the database is as follows, primarily using the User table as an example. The User table consists of two main types of users: administrators and members. Administrators include Admin and other administrators, with Admin having the highest level of management authority. The member group users include student user groups and teacher user groups. The attributes of the User table include User_id, Group_id, Username, Password, Email, and more. The "Can be Null" column is set to "No" by default. The specific table structure is shown in Table 1.

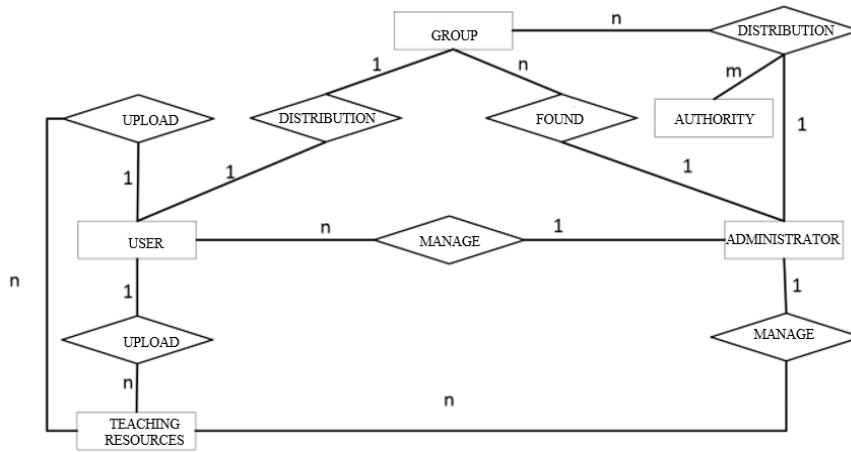


Figure 5. E-R diagram of system

Table 1. User table

Attribute name	type	Primary key/foreign key	Can be null
User_id	Int(11)	Primary key	
Group_id	Int(11)	foreign key	
Username	Varchar(100)		
Password	Char(32)		
Register_time	Datetime		Yes
Register_ip	Varchar(50)		Yes
Email	Varchar(100)		
Login_count	Int(11)		
Reset_key	Char(32)		
Reset_pwd	Vachar(10)		
Is_admin	Int(11)		
Grain	Int(11)		

4.5. Specific implementation of user functions

Users are the direct subjects for implementing platform functionalities, including login, registration, upload, download, bookmarking, password recovery, and modifying personal information. The specific implementation of this module will be demonstrated using login and document upload as examples. When a member user enters the Mongolian education resource platform, the main page will display a user login icon, allowing registered users to log in. To implement the user login functionality, the "submit" method of the "CasLoginAct" class first creates a variable of type "Cmssite" named "site" and calls the "getCmsUtils" method of the "CmsUtils" class to obtain the site. Then, it

creates a string variable named "sol" to call the "getCmsUtils" method of the "CmsUtils" class to obtain the template scheme path. The login failure count is retrieved, and the "site" and login failure count are written into the model. If the returned path is empty, the "loginSource" is set to null. If the "source" object is not empty, the "LoginSource" is set to "source". The template path is obtained by calling the frontend utility class "FrontUtils", and the template file name is localized, resulting in the "login.jspx" page. The entered username and password values are then compared with the backend database for verification. If the information matches, the login is successful; otherwise, it is unsuccessful. The user login page implementation result is shown in Figure 6.

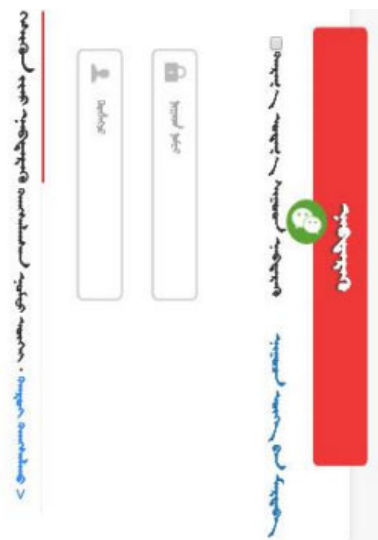


Figure 6. Login page

Next, let's discuss the implementation process and results of the member activity feature on the homepage. In the execute() method of the member activity implementation, an Integer variable named "orderBy" and a variable named "count" are created, and their attribute values are obtained. For displaying member activities, the "orderBy" value is set to descending order, and the "count" value is set to 6. Then, a List variable named "list" is defined, and the getList method of the cmsUserMng class is called to retrieve a list of activities, which is assigned to the "list" object. Finally, the activities are displayed on the frontend page.

4.7. Library function concrete realization

The document library module is one of the core functional modules in the Mongolian education resource platform. The document library module is primarily designed to showcase document-type resources uploaded by teachers to all member users. During the implementation of the document library module, the "content" method of the core class

"DynamicPageAct" retrieves a unique identifier ID and assigns it to the "Content" object named "content". If "content" is equal to null, it returns a "Resource Page Not Found" message. Then, the maximum value for the document library pages is obtained. If the value of "pageNo" is greater than the maximum page value or less than 0, it returns a "Page Not Found" message. If the article has passed the final review, the User information is retrieved, including the User's associated group. Then, it is checked whether the User has the permission to preview the resource. If the User does not have permission but preview is not supported, a "User Unauthorized" page is returned. If the User does not have permission but preview is supported, the information is added to the model. The content, category, title, image, and other parameters of the resource with the given ID are retrieved and written into the model. The frontend utility class "FrontUtils" is called to set pagination parameters and other information for the frontend template. The implementation result of the document library functionality is shown in Figure 9.

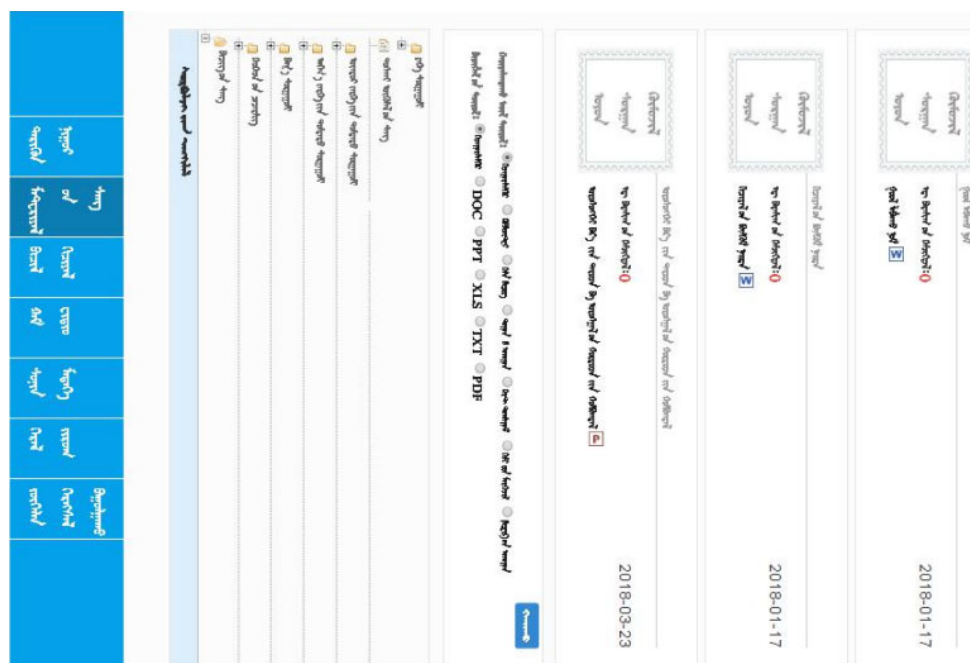


Figure 9. Library page

5. Conclusion

The Mongolian language education resource platform described in this article adopts a B/S (Browser/Server) structure and is developed using the SpringMVC+Hibernate+Spring framework. The platform is divided into two main parts: the frontend and the backend. The frontend is primarily designed to provide users with easy access to the Mongolian language education resource platform through the internet. The web backend supports the frontend services, including frontend management and data processing. When the backend receives requests from frontend users, it responds accordingly based on business operations. More specifically, as a management platform for Mongolian language education resources, the backend administrators have the ability to review, delete, modify, and query the resources uploaded by frontend teachers. This article starts with an introduction to the research background of the project and discusses the technologies used to

implement the platform. It provides detailed explanations of requirements analysis, detailed design, implementation process, and functionality show of the platform.

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