BS-based Digital Geological Library

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Abstract

Big data is the product of rapid development in today's world. As a precious result of geologists, geological data plays an important role in promoting economic construction. In 2010, the Ministry of Land and Resources of China pointed out that it is necessary to speed up the informationization process of the geological industry and promote the industrialization of geological information information services. In order to promote the informatization process of the geological industry, integrating Internet technology into the management mode of traditional geological data is the research content of this paper. Through the construction of a digital geological data platform, the intelligent management of geological data is realized, which greatly reduces the time for scientific researchers and geologists to find geological data, and provides a platform for the mining of geological data, which is conducive to accelerating the combination of geology and the Internet. In the future research and work, the information management of geological data will become an inevitable development trend.

Keywords

Big Data, Internet, Geological data, Intelligent, Management.

1. Introduction

Al The rise of the Internet industry is the common melody of the world today. With the rapid development of China's economy, the development speed of the Internet is in the first echelon of the world, and China's geological industry as a traditional industry has been developing slowly for a long time. Now, to promote the industry. Further development, we think about how to integrate geology into the Internet. For the mine, we have established an intelligent management system for the mine, which can visually manage the mining of the mine resources, greatly reducing the risk of mining workers and standardizing mining. In response to the prevention and control of geological disasters, we have established an intelligent monitoring system that can effectively detect the real-time displacement of landslides and greatly reduce property losses caused by geological disasters such as landslides. For the management of geological data, the National Geological Data Museum built by China is used to collect important geological data in China and provide data services for researchers and geologists[1]. It can greatly enhance the utilization of data and bring into play the value of data.

Traditional geological data management can be divided into two aspects. The first is to use commercial software, such as ArcGIS, MapGIS and other GIS software for data storage[2]. The advantage of this is that it is easy to manage, and can use geological data to draw geological profiles, drilled histograms, etc. However, software licensing is expensive. The pressure on general corporate finances; the second is to use the BS structure to independently develop an information platform for geological data management. The advantage of this is that it has high flexibility, can design data types independently, store data, and develop cycles. Short, less expensive.

Therefore, for the information management of enterprise-level geological data, we choose the BS structure and independently develop a geological data management system to serve the vast number of geological workers and researchers, so that the data can play its value.

2. Selection of digital platform structure

BS structure and CS structure have their respective advantages as the most mainstream software development structure. The BS structure can be accessed through browsers such as Google, Firefox, and IE. The URL specifies its access path, which has the advantage of enabling access to data without installing any third-party app[3].

The CS structure is mainly used for the development of some large-scale software, and its functionality is generally stronger. Taking ArcGIS as an example, the software can not only realize the management of geological data, but also use geological data to draw contours, geological profiles. Drawing, etc., its application is more widely used.

For the development of enterprise-level geological data, the BS structure is more suitable. Because, for the drawing of various graphics, there are professional software, such as Auto CAD, LI ZHENG, etc., and the background management system for developing geological data can be customized for the characteristics of geological data, so that the surgery has specialization and different functions are given to Different software implementations can make full use of the value of data and facilitate data management.

3. Selection of computer programming language

There are many types of computer programming languages. Java is an object-oriented programming language. Its many advantages make it the most widely used enterprise-level background programming language. Object-oriented thinking is a kind of programming idea. Under the guidance of object-oriented thinking, we use Java language to design and develop computer programs. The objects here refer to everything in reality, and each has its own attributes and behaviors. Object-oriented thinking is to refer to the real thing in the process of computer program design, abstract the attribute and behavior characteristics of the thing, and describe it as the design idea of computer event. It is different from the process-oriented thinking, emphasizing that the function is implemented by calling the behavior of the object, rather than step by step to implement the implementation. The importance of the framework is that it implements some of the features and can well ease the low-level application platform and high-level business logic. In order to achieve "high cohesion, low coupling" in software engineering. Divide the problem into individual solutions, easy to control, easy to extend, and easy to allocate resources. Our common MVC software design philosophy is a good layering idea.

4. Architecture design of digital platform

The BS structure and the Java language are selected for the development of the project. In order to simplify the development process, the Spring series framework is introduced to integrate the overall architecture. The architecture has a three-tier architecture, namely the Controller layer, the Service layer and the Dao layer. The Spring framework can use its own design to reduce the coupling. The Maven-based project can realize the overall management mode of the project. The digital geological data management system is mainly composed of four modules: geological data management, geological map management, user information management and system application management. The geological maps include borehole histograms, engineering geological profiles, etc. The tabular data includes physical and mechanical index information, soil and water quality analysis tables. Each different geological information is designed as an object, and Java implements operations on these objects. In addition, different types of geological data have been sorted and organized for different generations, and different modules have been developed for management. Achieve classification query of different materials. The interface diagram of the platform system is shown in Figure 1.

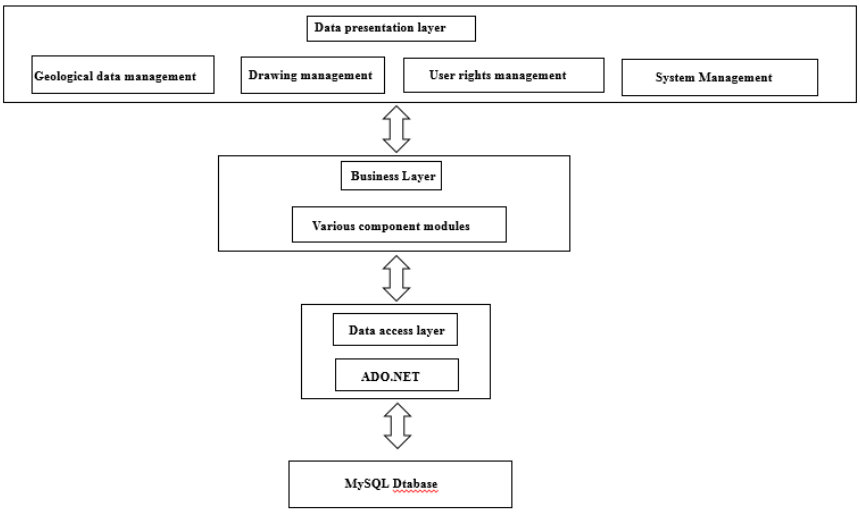

Fig. 1 platform architecture

The project is based on the Windows 7 operating system development, using the open source development environment, and finally deployed to the Linux operating system, using Tomcat as the server software for project operation.

5. Database selection and design

The database as the data storage container is the core technology of data storage. The commonly used relational databases are Oracle, MySQL, SQL Server, etc. The relational database can realize the association between data, which is beneficial to the management of related data. As a mature and stable relational database, MySQL can bear a certain amount of concurrency and facilitate data storage. Therefore, in this project, MySQL 5.0 is selected as the database to realize storage of 50 GB data.

The design of the database table, design a unique ID for the project name, and associate different types of data under the same project with the project ID by establishing a foreign key. In the design of the user table, the user permission table and the user information table are designed for the access of different privileged users, and the group division is realized. In terms of data security, take the user table as an example. The password and related sensitive information are encrypted by the md algorithm, as shown in FIG. 2, and the user password is encrypted.

User	Password
root	*81F5E21E35407D884A6CD4A731AEBFB6AF209E1B

Fig.2 Encrypted user password

6. Development of the main functions of the digital platform

The digital platform mainly has six major functions: 1. User registration and login; 2. Uploading of different types of geological data; 3. Preview of different types of geological data; 4. Downloading of different geological data; 5. Deleting useless data ; 6. Search function of geological data.

The main functions of the digital platform are: realizing the user's login, realizing the retrieval of geological data, realizing the access of different types of data, realizing the preview, uploading and downloading of different types of data.

6.1 User registration and login

The section headings are in boldface capital and lowercase letters. Second level headings are typed as part of the succeeding paragraph (like the subsection heading of this paragraph). All manuscripts must be in English, also the table and figure texts, otherwise we cannot publish your paper. Please

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In the Spring series framework, there is a framework for assigning roles and permissions to users, namely Spring security, through which different user permissions can be set. For users with administrator rights, project uploading, map management, project deletion, etc., Figure 3 is the user login interface. For those with general permissions, you can only preview, download, and so on the added items. Perfect role and authority allocation enables geological data to serve different populations. Researchers can use geological data for data mining and fully exploit the value of data. Ordinary geologists can build 2D or 3D models based on geological data, visual analysis. The stratigraphic features of a certain area.

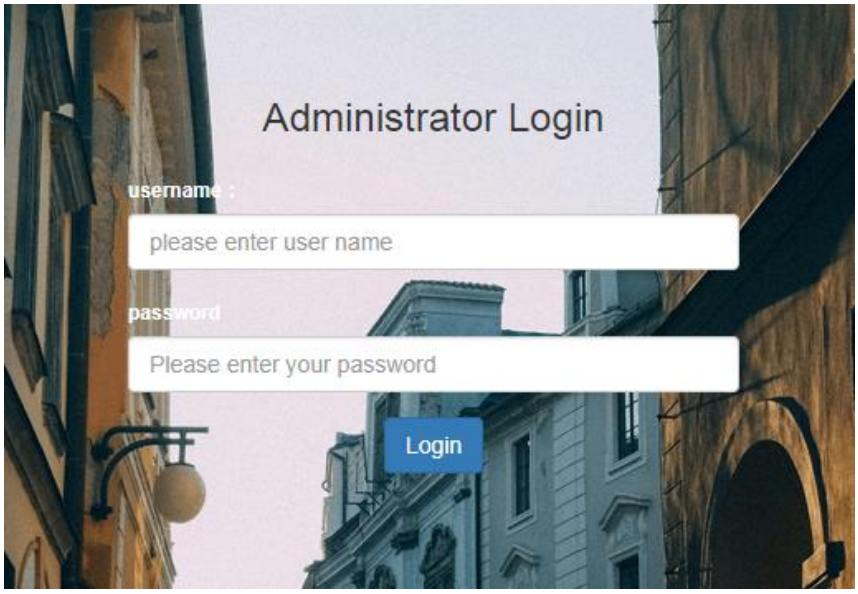

Fig.3 user login interface

6.2 Geological data upload

In this platform, geological data is divided into 7 categories. They are engineering geological survey data, engineering geological section drawings, drilling and exploratory column diagrams, geotechnical test data, physical and mechanical indicators statistics, soil and water quality corrosive analysis data sheets. Users can take new projects and past projects in multiple formats (pdf, jpg/png, docx, xlsx) upload, as shown in Figure 4.

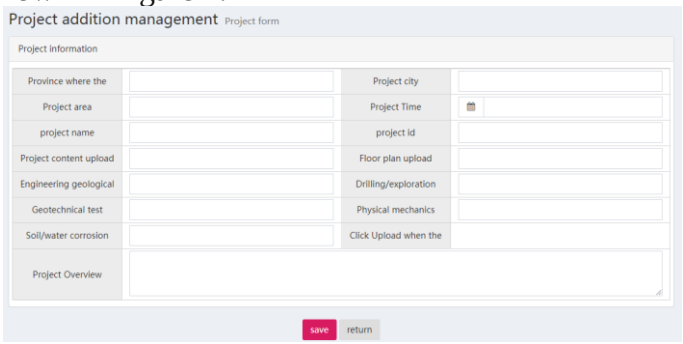

Fig.4 Upload of geological data

After uploading, all items can be viewed, and the province, city, region, project name and project time of the project can be displayed on the page. A total of 12,530 geological projects were uploaded, and users can quickly search according to the project name. The search content includes the project name, project date, the province where the project is located, the city where the project is located, and the project area. View the different types of geological data for the project. When uploading, if there is no related content, no relevant information is displayed.

The query of the project mainly depends on the three-tier architecture of the project, the controller layer calls the service layer service layer to call the dao layer, and finally queries the database through the sql statement, and finally displays the retrieved data on the page. As shown in Figure 5

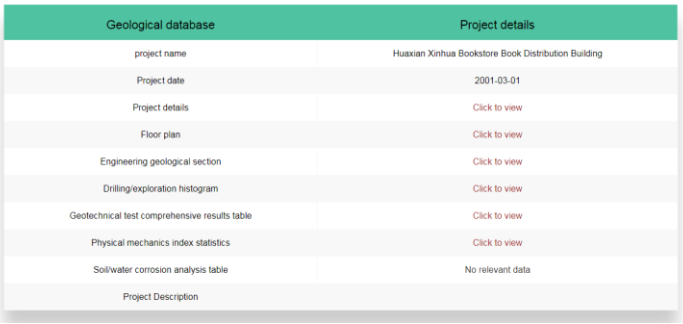

Fig.5 Display of retrieved data

6.3 Geological data download

All users can download the required items in the same format as the uploaded ones. We designed different types of file levels in the server to store the uploaded data, store the content corresponding to different resources in the database, and realize the download of geological data.

7. Conclusion

Enterprise-level back-end management software is applicable to various industries. The long-term development of China's geological industry lags behind and there is no good integration into the Internet. Therefore, it is very important to establish a variety of digital platforms that serve geology. BS structure and CS structure are common structures for software development. In order to realize the storage of geological data and related maps and reduce development costs, BS structure is undoubtedly a better choice. Through the construction of the platform, the traditional geological data management mode has been changed, and the storage method of geological data has been greatly improved, and the data utilization rate has been rapidly improved. I hope that in the future work, we can continue to deepen development, allow the geological industry to better integrate into the Internet, promote the digitalization process of the geological industry, and form a management mechanism for geological big data.

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