Design and Implementation of Information System Based on Java Technology Platform

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Abstract. In order to solve the problem that the treatment plan, patient information, and treatment results (images and other data) of the hospital tumor center are all in the original independent system, it is very inconvenient for doctors to carry out treatment and query treatment results. The principle of the MIS system is adopted. The Java technology platform has constructed a set of hospital management information system with full process and full element management.

Keywords: Java; Spring Boot; Mis

1. Introduction
Management Information System, abbreviated as MIS, has the general characteristics of an information system. It is a specific application of an information system in the field of management. It is led by people and uses computer hardware, computer software and other office equipment to perform information-related operations, such as collection and storage., Delivery, processing, maintenance and use, etc. With the development of the country and society, medical informatization has become the general trend. [1-13] The original way to complete information transmission through paper media and word of mouth is far from being able to meet the needs of society. Use the computer network to manage the whole process of information on medical equipment and doctors through the computer network to eliminate the original information islands, so that the processed information can be saved in the information center at any time, becoming an information resource, and allowing doctors to publish at any time Relevant medical information and query information resources can improve communication efficiency and improve the overall hospital medical quality.

2. System Requirements Analysis
There is a certain distance between the cancer center and the hospital headquarters, and patients need to be treated here every day. Although the network is currently connected, treatment plans, patient information, and treatment results (images and other data) are all in separate systems. It is very inconvenient for doctors to carry out treatment and query treatment results. It is necessary to build a Hospital Management Information System that can realize the whole process and all-element management of center tumor treatment to help hospitals realize relevant management.
2.1. **Software development environment requirements**

The hospital has a set of Huawei private cloud with 512G memory and 100T storage space, which can provide various remote virtual servers of Linux and Windows for the information system built by the hospital. According to the current national software localization requirements, it is recommended that the hospital information system adopt the Java language that can run on the localization technology platform, and the database adopts the free and open source MySql database.

2.2. **User's permission design**

Research what specific permissions are required for users of different positions. The data archived by the tumor center is private information for patients. We need to ensure that the information system users have the authority to isolate the patient information maintained by themselves and the patient information maintained by others, and the authority must be set.

2.3. **User log management**

Provide log management for the user's main database operations, keep the user's login and logout, the addition, deletion, and modification of business data, and keep a complete and checkable record.

2.4. **System interaction design**

The system needs to have a good user interaction interface, and the user can quickly view the information of each patient. The system is compatible with multiple browsers in the unit, and the operation interface is good.

2.5. **Framework of Hospital Management Information System**

Under the current hospital management conditions and computer network environment, how to build a management information system suitable for the hospital. Discuss how to choose the information (texts, pictures, etc.) that needs to be collected and released, what kind of computer processing procedures to set up, and personnel permissions.

2.6. **Database management**

Do a good job in database design, design a complete data model for hospital users and patients, ensure the complete entry and preservation of various information, and formulate a regular data backup strategy to ensure complete business data.

3. **System design and implementation**

The system adopts a server/browser (B/S) architecture. There is no need to install client software on the client, only a browser is required. The server runs the database and main program codes. This system is developed based on the Spring Boot framework. Spring Boot is used to simplify the creation, operation, debugging, and deployment of Spring applications. Using Spring Boot, you can focus on the development of Spring applications without paying too much attention to XML configuration. The main development language used in this system is Java. The database of this system uses MySQL relational database, and MyBatis, which is used by the persistence layer framework, realizes the relational mapping between the database and Java objects.

3.1. **System function module design**

This system mainly has 5 main modules: instrument and equipment information management, patient data management, query and statistics, medical work registration statistics, instrument and equipment maintenance, and system management. The equipment information management mainly records the main equipment information of the tumor center. Patient data management mainly registers the patient's name, gender, age, disease diagnosis, treatment plan, contact information and other information. Medical work statistics mainly record the daily work that each doctor needs to complete in the cancer center. Instrument and equipment maintenance records the maintenance and equipment failure of the
tumor center equipment. The system management module completes user management and authority management, and records information such as user logs. The query and statistics module can query statistics equipment information and patient data information.

![Diagram](image)

**Figure 1.** Function module diagram of tumor center management information system

### 3.2. Data sheet design

MySql database is one of the most popular databases at present, with powerful functions, convenient use and good security. The system database contains 16 data tables including medical equipment information, patient information table, management user table, user log, medical work registration, equipment maintenance information, authority information table, and hospital department information table.

| Number | Name          | Type of data | Length | Empty or no |
|--------|---------------|--------------|--------|-------------|
| 1      | Patient ID    | Int          | 8      | no          |
| 2      | Patient name  | Varchar      | 50     | no          |
| 3      | gender        | Varchar      | 50     | no          |
| 4      | age           | Int          | 8      | no          |
| 5      | source        | Varchar      | 50     | yes         |
| 6      | Basic condition | Varchar   | 1000   | yes         |

**Table 1.** Person's information

| Number | Name          | Type of data | Length | Empty or no |
|--------|---------------|--------------|--------|-------------|
| 1      | Instrument ID | Int          | 8      | No          |
| 2      | equipment name| Varchar      | 50     | No          |
| 3      | Manufacturer  | Varchar      | 50     | No          |
| 4      | Instrument model | Varchar  | 50     | No          |
| 5      | Asset code    | Varchar      | 50     | Yes         |

**Table 2.** Equipment information
3.3. System interface design
The system interface adopts a frame design. The left side is the secondary function menu, the upper right side is the function button, the upper left side is the user information display, and the lower right work page area is the current work page. The color of the web page is blue and light gray. The page style is simple and generous, the function menu is expandable, the user operation is convenient, the browser compatibility is good, and it can be compatible with various mainstream browsers.

4. Key technology

4.1. Spring Boot technology framework
The system is developed and implemented using the Spring Boot framework, the front end is developed with HTML and JavaScript, and the back end is developed with Java language. The system uses the MVC design pattern to divide the system into a three-tier architecture. The Model layer uses entity classes written in Java; the View layer is implemented on the front-end interface by using the Layui framework. This layer obtains and displays data; the Controller layer is completed by JavaScript. Logic control part, Java Restful API completes the back-end logic control part. JavaScript responds to interface click events, and the back-end interface completes the data acquisition. The Java Restful API is responsible for exposing methods, implementing operations such as adding, deleting, modifying, and querying requested data, and calling related algorithms.

4.2. Shiro Security Framework Technology
Shiro is a Java open source security development framework of the Apache series, providing authentication, authorization, session management, encryption and other functions, with strong robustness and ease of use. To integrate the Shiro security framework in the web application, first define the Shiro Servlet filter in the web.xml configuration file to realize the integration of the web application and the Shiro framework. Filter all requests sent by users, and perform specific logical judgments based on actual needs. Only when the requests meet certain requirements are allowed to pass, so as to ensure that when users access the Web database, they can judge that they have the corresponding permissions and execute the corresponding business logic. Operate, access authorized database and get data. The database access process is shown in Figure 3.
4.3. **MyBatis technology**

MyBatis is an encapsulation of JDBC, which makes the underlying operation of the database transparent, can customize SQL, stored procedures and advanced mapping, avoiding the trouble of manually setting parameters and extracting the result set. MyBatis uses simple XML or annotations to configure and map primitive information. Through configuration files, it is associated with the Mapper files of each entity class, and the SQL statement mapping required by each class to the database is configured. Using Mybatis' dynamic SQL technology, SQL statements can be automatically generated based on conditions. The following is the BusinessPatientMapper.xml configuration file:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<mapper namespace="com.ruoyi.business.mapper.BusinessPatientMapper">
    <resultMap type="BusinessPatient" id="BusinessPatientResult">
        <result property="id" column="id" />
        <result property="paName" column="pa_name" />
        ......
    </resultMap>
    <sql id="selectBusinessPatientVo">
        select id, pa_name, pa_sex, pa_age, pa_from, pa_situ from business_patient
    </sql>
    ......
    <delete id="deleteBusinessPatientById" parameterType="Long">
        delete from business_patient where id = #{id}
    </delete>
</mapper>
```

5. **Conclusion**

The Java technology platform provides Spring Boot technology framework, Shiro security framework and MyBatis technology to effectively improve the efficiency of information system development and ensure the robustness and security of the system. The tumor center management information system has passed the system test and put into the daily management of the hospital tumor center, realizing the effective management and sharing of tumor equipment, medical process and other information, and has played an important role in promoting the hospital information management.

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