ISSN 2618-1584 Vol. 7, Issue 4: 40-46, DOI: 10.25236/FMSR.2025.070405

Design and Development of Medical Equipment Decision System Based on Myeclipse

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Abstract: *With the rapid development of the medical industry, the management requirements of medical equipment are becoming increasingly complex, and traditional management methods can no longer meet the requirements of efficient and standardized management. This paper proposes a design and implementation scheme for a medical equipment management system based on MyEclipse. The system integrates the equipment bidding process and covers functional modules such as login management, user management, equipment information management, parameter demonstration management, bidding parameter management, and classification catalog management. Through modular design and functional integration, the system realizes the information management of the entire life cycle of medical equipment, improves the efficiency and accuracy of equipment management, and provides strong support for the procurement, use, and maintenance of medical equipment.*

Keywords: *Myeclipse; Medical Equipment Management; Bidding Process; Parameter Demonstration; Information Management*

1. Introduction

Medical equipment is an important material basis for the normal operation of medical institutions. The scientific and standardized management of medical equipment directly affects the quality and efficiency of medical services. With the continuous increase in the types and number of medical equipment, the traditional manual management method can no longer meet the needs of modern medical management[1]. The information management system can realize the rapid entry, query and update of equipment information, and support the full process management of equipment procurement, use and maintenance. The medical equipment management system based on MyEclipse integrates the equipment bidding process, realizes the standardized management and efficient management of equipment technical parameters, and provides a comprehensive equipment management solution for medical institutions[2].

2. System Design

2.1 System Architecture Design

This system adopts B/S (browser/server) architecture, uses JSP and JavaScript technology in the front end, uses Java Servlet and JDBC for data processing in the back end, and uses MySQL as the database. MyEclipse, as a development tool, provides good code editing, debugging and deployment functions to ensure efficient development and stable operation of the system[3].

2.1.1 Presentation layer (front end)

The presentation layer is the interactive interface between the user and the system, which is implemented using JSP and JavaScript technology. JSP is used to develop dynamic web pages and can combine HTML and Java code to generate dynamic content. JavaScript is used to implement interactive functions of the page, such as form validation, dynamic update, etc. HTML/CSS is used to ensure the beauty and consistency of the page and provide a good user experience. The system adopts responsive design to ensure a consistent interactive experience on different devices[4].

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2.1.2 Application layer (back end)

The application layer is the business logic layer of the system, which is implemented using Java Servlet technology. Servlet is responsible for processing HTTP requests and responses and implementing business logic. The application layer calls the functional modules of the business layer, processes user requests, and returns the results to the presentation layer. This layered design makes the business logic of the system clear and easy to maintain and expand. The application layer is also responsible for handling user session management and permission control to ensure the security and stability of the system[5].

2.1.3 Business Layer

The business layer is responsible for specific business processing and data interaction, and uses JDBC technology to interact with the database. JDBC provides an interface for communicating with the database, and implements data storage, query, update and deletion functions[6]. The business layer ensures the integrity and consistency of data and is the core part of system data processing. The business layer ensures the atomicity and integrity of data operations through transaction management mechanisms to prevent data loss or inconsistency. The system is designed based on the B/S architecture model, including a four-layer architecture of presentation layer, application layer, business layer and data layer, as shown in Figure 1.

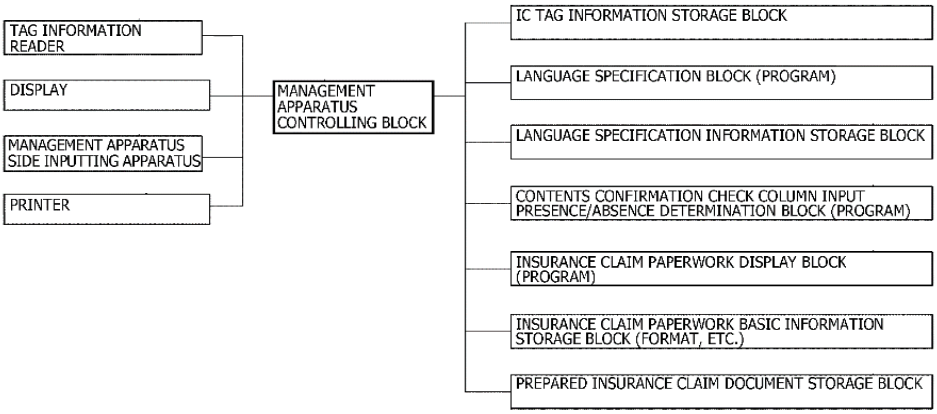

Figure 1 System architecture

2.1.4 Data Layer

The data layer is the data storage layer of the system, which is implemented using MySQL database. The database design includes user tables, equipment information tables, parameter argumentation tables, bidding parameter tables, and classification catalog tables. The integrity and consistency of the data are ensured by rationally designing the table structure and relationships. The efficiency and reliability of MySQL provide guarantees for the stable operation of the system. The database design follows the principle of normalization, reduces data redundancy, and improves data storage efficiency[7].

2.2 Technology Selection

2.2.1 Front-end technology

JSP: used for the development of dynamic web pages and the generation of dynamic content. JSP combines HTML and Java code to dynamically generate web page content based on user requests, improving the interactivity and flexibility of the system[8].

JavaScript: Implement interactive functions of the page, such as form validation, dynamic update, etc. JavaScript provides a rich API, supports complex page interaction logic, and improves user experience[9-10]

HTML/CSS: Build static pages to ensure the beauty and consistency of the pages. HTML is used to define the page structure, and CSS is used to beautify the page to ensure the consistency of the page on different browsers.

2.2.2 Backend Technology

Java Servlet: Processes HTTP requests and responses and implements business logic. Servlet is the

ISSN 2618-1584 Vol. 7, Issue 4: 40-46, DOI: 10.25236/FMSR.2025.070405

core technology of Java Web development, which can efficiently process user requests, support multi-threaded concurrent processing, and improve system performance.

JDBC: interacts with the database to store and query data. JDBC provides a standard database access interface to ensure the universality and portability of the system's database operations.

2.2.3 Database Technology

MySQL: Stores system data and ensures data integrity and consistency. MySQL is an open source relational database management system with high performance, high reliability and ease of use, suitable for small and medium-sized Web applications.

2.2.4 Development Tools

MyEclipse: Provides code editing, debugging and deployment functions, and supports the development of Java Web applications. MyEclipse integrates a variety of development tools and plug-ins, supports code auto-completion, syntax checking, debugging tools and other functions, and significantly improves development efficiency.

2.3 Database Design

Database design is an important part of system design. Reasonable database design can ensure the integrity and consistency of data and improve system performance.

Through the above design, the system can efficiently store and manage relevant information of medical equipment, providing solid data support for the stable operation of the system.

3. System Implementation

3.1 System functional structure analysis

Which mainly includes six modules: login management, user management, equipment information management, parameter demonstration management, bidding parameter management and classification catalog management.

3.2 System Function Module Implementation

3.2.1 Login Management Module

The login management module is the first line of defense for system security and is responsible for user authentication and permission control. Users log in by entering their username and password. After verification, the system assigns corresponding operation permissions based on the user's role. The system provides a secure login interface where users enter their username and password. The system verifies whether the credentials entered by the user are correct by interacting with the database. If the credentials are correct, the system will assign corresponding operation permissions based on the user's role (such as administrator, ordinary user, etc.) to ensure that the user can only access functions and data within his or her authority. This mechanism not only ensures the security of the system, but also ensures the separation of responsibilities between different user roles.

3.2.2 User Management Module

The user management module is one of the core parts of the system management function. It realizes the addition, deletion, modification and query of user information, and supports user role allocation and permission management. Through the friendly management interface, the system administrator can easily add new users, set the user's username, password and role. At the same time, the administrator can query the information of existing users, modify the user's password and role, or delete the user account that is no longer needed. The system provides a detailed user information display, including the user's basic information, role information and permission information. In this way, the system ensures the flexibility and security of user management, meets the different permission requirements of different users in the system, and provides a strong guarantee for the safe operation of the system.

3.2.3 Device Information Management Module

The device information management module is one of the core functional modules of the system. It

ISSN 2618-1584 Vol. 7, Issue 4: 40-46, DOI: 10.25236/FMSR.2025.070405

supports the entry, query, modification and deletion of device information and provides device status tracking function. Users can enter detailed information of new devices in the system, including device name, model, manufacturer, purchase date and status, etc. The system provides a powerful query function, allowing users to search device information by keywords and find the required device records conveniently and quickly. Users only need to enter keywords in the query box, and the system can quickly return a list of matching devices. In addition, users can also modify the information of existing devices, update the device status, or delete the scrapped device records to ensure the accuracy and completeness of the device information. This comprehensive device information management function provides a solid foundation for the full life cycle management of the equipment.

3.2.4 Equipment parameter information verification management module

The parameter demonstration management module is a key module to ensure the accuracy and standardization of the technical parameters of the equipment, and realize the demonstration and review process of the technical parameters of the equipment. Medical engineers can submit the technical parameter documents of the equipment, and the system submits these parameters to the demonstration process. The demonstration process includes three stages: preliminary review, re-review and final review. At each stage, there are corresponding auditors to review the parameters. The system supports the submission, review, modification and query functions of parameters to ensure that the parameters can receive timely feedback and necessary modifications at each stage. Auditors can view parameter documents in the system, put forward review opinions, and request to modify or confirm the accuracy of parameters. Ultimately, the accuracy and standardization of parameters are ensured, providing a reliable technical basis for equipment procurement and use.

3.2.5 Equipment bidding parameter management module

The bidding parameter management module is an important module of the system to support the equipment procurement process. It supports the setting and management of bidding parameters and provides the tracking and management functions of the bidding process. The system converts the verified technical parameters into bidding parameters, which include the technical requirements, performance indicators and budget information of the equipment. Users can set and manage these bidding parameters in the system to ensure the standardization and transparency of the bidding process. The system also provides the tracking function of the bidding process, recording the key steps such as the release of the bidding notice, the receipt of the bid and the determination of the bidding results. Users can check the progress of the bidding process at any time to ensure the fairness, equity and transparency of the bidding process, and provide comprehensive management and support for the bidding process.

3.2.6 Equipment catalog classification management module

The classification catalog management module is an important tool for the system to improve the efficiency of equipment management. It realizes the maintenance and management of the equipment classification catalog and supports classification query and statistical functions. System administrators can add, query, modify and delete equipment classification information to ensure the accuracy and completeness of the classification catalog. The system provides an intuitive classification management interface, and administrators can easily perform classification operations. The system provides a classification query function, and users can quickly find the required equipment information through classification to improve query efficiency. In addition, the system also supports classification statistics functions to help administrators understand the number and distribution of various types of equipment and provide data support for equipment management and procurement decisions. This classification management function makes equipment management more organized and efficient.

4. System Testing and Application Effects

4.1 System Testing

System testing is a key link to ensure system quality and stability, including functional testing, performance testing and security testing. Through comprehensive testing, it is verified whether the system functions meet the requirements, evaluates the system's performance, and ensures the security of the system.

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4.1.1 Functional testing

The functional test uses a black box test method to verify the functions of each module one by one. The test results show that all functional modules can operate normally and meet the design requirements. The specific test results are shown in the following Table 1:

Table 1 Functional test results

Module Name	Number of test cases	Pass Rate	Remark
LoginManagement Module	10	100%	All use cases pass
User Management Module	15	100%	All use cases pass
Deviceinformation management module	20	100%	All use cases pass
Equipmentparameterinformationdemonstration module	12	100%	All use cases pass
Equipment bidding parameter management module	10	100%	All use cases pass
Equipment catalog classification management module	8	100%	All use cases pass

4.1.2 Performance Testing

The performance test uses the JMeter tool to simulate multi-user concurrent access and test the system's response time and throughput. The test results show that the system can still maintain good performance under high concurrency conditions. The specific performance indicators are shown in the following Table 2:

Table 2 Performance test indicators

Test indicators	Test conditions	Test Results	Remark
Response time (average)	50 concurrent users	1.2 seconds	Meeting erformance requirements
Throughput (requests per second)	50 concurrent users	1200	Meetingperformance requirements
Response time (average)	100 concurrent users	1.8 seconds	Meetingperformance requirements
Throughput (requests per second)	100 concurrent users	2000	Meetingperformance requirements
Response time (average)	200 concurrent users	2.5 seconds	Meetingperformance requirements
Throughput (requests per second)	200 concurrent users	2500	Meetingperformance requirements

4.1.3 Security Testing

Security testing includes aspects such as user authentication, authority control and data encryption. The test results show that the system can effectively prevent illegal access and data leakage. The specific security test results are shown in the following Table 3:

Table 3 Security test results

Test items	Number of test cases	Pass Rate	Remark
User Authentication	10	100%	All use cases pass
Permission Control	15	100%	All use cases pass
Data encryption	8	100%	All use cases pass
PreventingSQLinjecti	5	100%	All use cases pass
PreventingXSSattacks	5	100%	All use cases pass

4.2 Application Effect

After the system was put into trial operation in a tertiary hospital, it significantly improved the efficiency and accuracy of equipment management. The specific application effects are as follows:

4.2.1 Equipment information entry time

Before the system was launched, the average time for entering device information was 30 minutes per device. After the system was launched, the time for entering device information was shortened to 15 minutes per device, increasing efficiency by 50%.

4.2.2 Equipment Procurement Cycle

Before the system was launched, the average equipment procurement cycle was 60 days. After the system was launched, the procurement cycle was shortened to 42 days, a 30% reduction.

4.2.3 Equipment maintenance response time

Before the system went online, the average equipment maintenance response time was 4 hours. After the system went online, the maintenance response time was shortened to 2.4 hours, a reduction of 40%.

ISSN 2618-1584 Vol. 7, Issue 4: 40-46, DOI: 10.25236/FMSR.2025.070405

4.2.4 User Satisfaction

After the system was launched, hospital managers and equipment users conducted a questionnaire survey on their satisfaction with the system. The results are shown in the following Table 4:

Table 4 User satisfaction results

Satisfaction Index	Very satisfie	satisfy	generally	Dissatisfied	Very dissatisfied
System usability	65%	30%	5%	0%	0%
Functional completeness	70%	25%	5%	0%	0%
Performance	60%	35%	5%	0%	0%
Security	75%	20%	5%	0%	0%

The system has been well received by hospital managers and equipment users, who believe that the system has significantly improved work efficiency, simplified work processes, and provided strong support for equipment management.

5. Discussion

This paper designs and implements a medical equipment management system based on MyEclipse. Through modular design and functional integration, the informatization and standardization of equipment management are realized. The system shows good performance and stability in practical applications, and significantly improves the efficiency and accuracy of equipment management. However, the system still has some shortcomings, such as insufficient mobile terminal support and weak data analysis functions. Future work will focus on optimizing these aspects to further improve the system's functions and user experience.

6. Conclusion

Based on MyEclipse 6.5 software and Java language, this paper designs and implements a medical equipment technical parameter management system. The system focuses on the core business of medical equipment market research and technical parameter production, and builds six functional modules including user management, equipment bidding parameter management, equipment information management, equipment parameter demonstration management, equipment catalog classification management and supplier management. Through B/S architecture and hierarchical design, the system realizes the information management of the entire life cycle of the equipment, and improves the efficiency and accuracy of equipment management.

The system test results show that all functional modules can operate normally and meet the design requirements. The performance test shows that the system can still maintain good performance under high concurrency. The security test verifies the effectiveness of the system's data security and user authority control. In the trial operation of a tertiary hospital, the system significantly improved the efficiency and accuracy of equipment management, shortened the equipment information entry time by 50%, shortened the equipment procurement cycle by 30%, and reduced the equipment maintenance response time by 40%, which has been well received by hospital managers and equipment users.

Although the system has shown good performance and stability in practical applications, there are still some shortcomings, such as insufficient mobile support and weak data analysis functions. Future work will focus on optimizing these aspects to further enhance the system's functionality and user experience. At the same time, with the continuous development of the medical industry and the continuous advancement of information technology, the medical equipment management system will also face new challenges and opportunities. We believe that through continuous improvement and innovation, the medical equipment management system will provide medical institutions with more efficient, convenient and intelligent equipment management solutions, and contribute to the modernization of the medical industry.

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