Implementation of Large Instrument Sharing Platform Based on District, University and Enterprise

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Abstract. Large-scale instruments sharing platform has been completed based on using Java language to program, and using spring Boot framework technology for building the background project, and using MySQL database to store the data, and using Vue to design the front-page, which will been shared and used in District, University and Enterprise. The test system of eclipse is used for case test to realize the sharing function of large-scale instruments. Through this platform, the instruments’ information and leasing of large-scale instruments can be understood in real time, and the status information, online use records, equipment using experience, and online booking, comments and customer service consultation can also be carried out on the platform, so as to make rational and efficient use of large-scale instruments, reduce the using waste of large-scale instruments, and be more conducive to the sustainable development of economy, science and technology and expand the scope of resource sharing.

Keywords: Large Scale Instrument Sharing Platform, Java, Spring Boot, Vue

1. Introduction
With the growth of scientific and technological strength and the growing maturity of Internet technology, the demand for scientific and technological experimental equipment is also increasing rapidly. From the previous scientific and technological problem that can be solved by one person and one instrument, it has now developed into multi instrument mutual assistance to achieve the goal successfully. With the birth of this phenomenon, some cutting-edge scientific and technological personnel have realized the problem of instrument abuse and waste, and organized relevant small-scale instrument sharing groups [1-5]. Among them, the more typical representative is the instrument rental platform of Tsinghua University, which includes all the existing instruments in Tsinghua University, including the address navigation, instrument introduction, operating instructions, etc [9-11]. After the release of the website, the use effect is very good; it will be in the vicinity of the regional science and Technology Park also included in the system inventory, greatly increasing the inventory capacity and instrument utilization. In view of the current comprehensive management and utilization rate of large-
scale instruments in economic and technological development zones, universities and enterprises, it is very necessary to build a sharing platform for large-scale instruments in order to better improve the utilization rate of large-scale instruments and avoid secondary waste[6-8].

2. System Requirement Analysis

Based on the existing network platform, the design of large-scale instrument sharing platform can enable users to log in and register anytime and anywhere. After logging in, they can search the instrument information, select their own target, lease and place orders, and pay the relevant fees, and then they can enjoy the right to use the relevant instruments. For managers, it has the absolute right to use the platform, and can manage any user and instrument to eliminate some malicious behavior [8-9].

2.1. System Use Case Analysis

The design of sharing platform mainly starts from the relationship between users and instruments. Ordinary users have the functions of viewing, searching, renting and collecting instruments. Administrators have the function of managing ordinary users and instruments. The crowd of the platform is ordinary users, which accounts for a large weight in the project. As shown in Fig.1, the use case diagram of common users is shown, while that of administrators is shown in Fig. 2, which shows the functional category of administrators.

2.2. System Function Requirement Analysis

In the development process of sharing platform, we always adhere to the primary goal of protecting national resources, so we try to avoid the waste and vacancy of instruments. The main functional modules of the platform are: user login registration, user management, instrument information management, lease information management, collection information management and comment management [8-10].

3. Sharing Platform Design

System function module design

There are five functional modules in the sharing platform.

(1) Design of user management module
The functions of ordinary user management module mainly include: personal information view, password modification and equipment rental information, collection, chat with customer service and record view, etc.

(2) Design of instrument information management module
Administrators can modify the addition and deletion of instruments, such as adding a large-scale instrument in the relevant management area, then the instrument can be added into the system through the administrator background to complete the functions of new on shelf instrument information, modifying instrument information and deleting instrument information.

(3) Design of leasing information management module
The design of leasing information management module mainly follows the leasing process. When leasing related large-scale instruments, the user should first initiate a request and fill in the leasing form. When the deposit is paid, it is submitted to the administrator for approval. If the approval is passed, the leasing is successful.

(4) Design of comment management module
When ordinary users view the information of the instrument, they can view other users' comments on the instrument, praise and step on the instrument, and the administrator can delete the comments.

(5) News management module design
Ordinary users can consult the use records of large-scale instruments, completed experimental tasks and real-time news reports. Ordinary users can consult the experimental data information of relevant news from the manager or customer service, so as to better improve the accuracy of the use of the instrument and give better play to the contribution rate of the instrument to the experiment.

Database design
The sharing platform of large-scale instruments uses MySQL database for data storage. The E-R diagram of the whole project logic is made for reference, as shown in Fig. 3.

![Figure 3. E-R diagram design](image)

There are five datasheets created in the project, each of which has primary key and foreign key settings to link other datasheets, so as to establish the connection between datasheets.

4. Implementation of Sharing Platform
The sharing platform has been tested successfully and can be used for trial. The first function of a system must be login and exit function. With login function, the system can remember the user and store all the settings of user operation in the local database or remote database. A successful login interface should be designed to be simple and beautiful, so that people can have a pleasant feeling at a glance, so that someone can enter your system to view it. Of course, when a user logs in, there will be
a user and a password, which is also a part of ensuring the security of the system. When the user's password does not match the database, the system will block your access and protect the privacy and security of individual users.

Users enter the website interface through the link, and then fill in their user name and password and other information. After entering, the user logs in successfully. Users can log in to the website interface to view the home page, instrument information, forum, personal center, background management and other functional modules for corresponding operation. By clicking the instrument information, users can view the instrument number, name, type and other information.

Through the instrument classification management module, the administrator can view, modify and delete the instrument type online; through the instrument lease management, the administrator can view the lease details of the instrument online and carry out corresponding operations; through the forum management, the administrator can add, delete, modify and query the Forum; the system management module can obtain the ID through the list In addition, my collection management can get collection ID, collection name, collection picture and other information through the list to view, detail, modify or delete; administrator management can modify, add, delete and other operations for the backend management users.

5. Sharing Platform Test

5.1. Function Modules Test

There are many points that need to be tested in the sharing platform of large-scale instruments between schools and enterprises in the district. First of all, the functions of users are tested in batches, which are the login and exit functions of ordinary users. If the login is not successful, you can register on the website, and log in after successful registration. After successful login, you can test the user's search and view instrument information, and test the leasing function of the instrument. The second is to test the administrator's background function. The test content includes modifying the user's information, modifying the instrument's information and so on. In the functional test, we must be precise and careful, and we can't let go of any error. The function modules test is shown in Table 1.

| Test Requirements          | Test Point                | Requirements Met   | Result |
|----------------------------|---------------------------|--------------------|--------|
| User login                 | Enter account password    | Demand fulfillment | Pass   |
| User registration          | Create a new password     | Demand fulfillment | Pass   |
| Login failed               | Modify the success        | Demand fulfillment | Pass   |
| Modify the information     | Add, delete, change &search | Demand fulfillment | Pass   |
| System management          | Add, delete, change &search | Demand fulfillment | Pass   |
| Organization & management  | Add, delete, change &search | Demand fulfillment | Pass   |
| Search query management    | Add, delete, change &search | Demand fulfillment | Pass   |

In the system test, the various functions of the system are fully tested, and the test data are recorded in detail, so as to avoid the operation defects that may affect the system performance. The results of the test have greatly exceeded the original expectations. There is no problem in the operation of the system, and each functional aspect can link up naturally.

Performance test

The so-called performance test is in the click area school enterprise large sharing platform page, the system according to the degree of code optimization, according to the user's prompt to the database to obtain the relevant data response speed. Half of the way, there are thousands of ways to achieve a function, but to choose the fastest and most efficient way is also an embodiment of the test. After that, it's time to consider the configuration requirements of the test environment. A good performance test must arrange the most suitable hardware configuration for running the project, because only in this way can the small deviation brought by the hardware be reduced to a greater extent [1-3, 8, 10].
6. Conclusion
With the development of science and technology, it is an inevitable trend to change from one person one system to sharing platform system. The so-called sharing platform is to make a sharing website by collecting statistics of large-scale instruments in a region. This project is based on the Development Zone, school, enterprise large-scale instrument sharing platform development, not only to meet the needs of users, and even reduce the difficulty of management and maintenance of these large-scale instrument staff, improve their work efficiency. And the sharing platform, ultimately users can use these resources transparently and remotely, give full play to the use efficiency and utilization rate of large-scale instruments and equipment, bring output value for scientific research or experiment, and provide a better construction idea for the use and management method of large-scale instruments and equipment.

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References
[1] Cai Ying, Li Yubin, Zhao Hui, Li Chengpeng, Huang Na, Zhang Guoguang. Discussion on the construction of instrument and equipment open sharing platform in Secondary Colleges of universities [J]. Experimental technology and management, 2020,37 (02): 15-18, 23
[2] Qiu Ruixia, Bai Weibin, Yu Bing. Preliminary research on the construction of valuable instrument sharing platform [J]. Light industry science and technology, 2020,36 (02): 124-125
[3] Wu tongkai. Research on constraints of sharing large precision instruments under cloud platform [J]. Geology and mineral resources of South China, 2019,35 (04): 497-503
[4] On the establishment of an information sharing platform for modern instruments
[5] Jiang Yuxiang. Cross regional scientific research instrument resources will be shared [n]. Hefei evening news, December 5, 2019 (A02)
[6] Wang Lu. The necessity of building large-scale instrument sharing platform in life science [J]. Education and teaching forum, 2019 (45): 84-85
[7] Wang Hairong. I can also use other people's instruments [n]. Shenzhen business daily, October 26, 2019 (A02)
[8] Zhao Jian, Yao Xu, Ling Ping, Yang Tao, Wu Zhigang. Construction experience of large scale scientific instrument sharing service platform in Liaoning Province [J]. China Science and technology information, 2019 (20): 95, 97, 14
[9] Wang Aiyin. Analysis of intelligent operation and management of large instrument sharing platform [J]. Science and technology innovation guide, 2019,16 (27): 177-178
[10] Wang Liqing, Mao Rong, Liu Qing, Wang Chao. Analysis of the current situation and causes of the open sharing of large-scale instruments in industrial universities [J]. Laboratory science, 2015,18 (04): 181-184.
[11] Information on http://samp.cas.cn/