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Application and Implementation of Micro-Classroom Reservation System in Universities

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Abstract: **With the development of science and technology, network technology has been widely used and integrated into the micro-classroom reservation system, forming a new Internet-based reservation system. The system can make online reservation and mobile phone reservation at any time and place, providing teachers with a more convenient way to make an reservation. In addition, the teacher-centered system pays attention to the concept of humanization and warmth, which helps to analyze and count the use of the classroom, rationally arrange the practical training classes of normal students, and then improve the efficiency and resource utilization of the micro-classroom. In order to facilitate the teachers, save the reservation time and improve the reservation environment, we developed a micro-classroom reservation system.**

Keywords: **Micro-classroom, Reservation system, Internet, Online reservation, Mobile phone reservation, Humanization.**

I. INTRODUCTION

Micro-classroom is the basis of teaching skills training for normal university students, and is an important place for teacher education experiment teaching center to cultivate the practical teaching ability of normal university students. It is responsible for the important task of experimental teaching and on-campus simulation teaching. With the increasing demand of micro-classroom in universities, there are many problems in the traditional way of reserving, such as tedious process, inefficient operation and untimely information, which bring great inconvenience to students and teachers. The design and development of the classroom reservation management system has become an urgent problem, which can provide teachers with a unified and intuitive operating interface, which is convenient for teachers to inquire and reserve the micro-classroom anytime and anywhere. At the same time, the system can also carry out real-time monitoring and statistics on the use of micro-classrooms, helping schools to better manage and utilize these resources (Wu Wenmin,2018).

This article will explore the relevant technologies and methods of the micro-classroom reservation system in universities from the perspective of design and development. Through research and practice on the requirements analysis, system framework design, and functional module implementation of the system, the aim is to improve the efficiency and convenience of reservation management for micro-classrooms in universities, and create a better learning environment for students.

II. RESERVATION SYSTEM REQUIREMENT ANALYSIS

In traditional micro-classroom reservation in universities, telephone or face-to-face communication is usually used, and teachers make offline reservation after confirming the use of the classroom. Due to the limitation of knowing the information of the classroom reservation, the reservation information is uncertain and blind, and the management of the classroom reservation tends to be complicated. In order to facilitate classroom reservation, there is an urgent need to build an online micro-classroom reservation system (Su Dongwei & Liang Zhijian et al., 2018).

The construction of an online micro-classroom reservation system in universities is very necessary for university management, mainly reflected in the following advantages:

Optimization of Learning Resources

The classroom resources in universities are limited and need to meet the needs of all teachers and students for skill courses. Through the classroom reservation system, classroom resources can be better managed, making them more reasonably and efficiently utilized, avoiding waste and conflicts of resources. At the same time, the system collects data on the use of classrooms to provide decision-making support for university administrators and better plan and manage classroom resources (Ren Haitao, 2018).

Flexible Time Management

The traditional way of reserving often requires users to be present in person or communicate by telephone, which is time-consuming and laborious. The online reservation system provides users with reservation services anytime and anywhere, and users only need to complete the reservation through simple operations, which greatly improves the work efficiency and reduces the errors and omissions of manual operation. Through automatic and intelligent processing, the system can quickly respond to reservation requests and automatically deal with abnormal situations, which improves the convenience and efficiency of reservation.

Accuracy and Reliability

The reservation system can provide open information of classroom use, realize real-time transmission and accurate record of information, and ensure the accuracy and reliability of reservation information. Through the establishment and implementation of the reservation system, the actual situation of classroom reservation can be clearly displayed and queried, and accurate and real-time reservation information can be provided for teachers in the reservation process, avoiding the phenomenon of rearrangement and missing arrangement in the micro-classroom.

Improve Management Efficiency

The reservation system can optimize the management and monitoring function, and the design of the micro-classroom reservation system can help the school to better manage and monitor the use of the classroom. Through the real-time monitoring and statistics function of the system, the utilization rate of the classroom, the busy degree of the time period and other information are understood, which provides a strong basis for the allocation of resources and management decisions of the school. Through the online reservation system, manual operation and paper process can be reduced, work efficiency can be improved, and time and labor costs can be saved.

Therefore, the construction of university classroom reservation system plays an important role in improving university management efficiency, improving resource utilization efficiency and optimizing teaching and learning environment (Yu Jiujiu & Zheng Hao et al., 2022).

III. FRAMEWORK AND FUNCTION DESIGN OF RESERVATION SYSTEM

According to the demand analysis, the framework design of the micro-classroom reservation system includes front-end user interface, server-side data and logic processing and database composition. The front end can take the form of a web or mobile application and communicate with the server through API. The server side needs to process the user's request, call the database for data operations and perform business logic processing. The database needs to store user information, course information, classroom information, reservation information and other data (Wang Jian&Huang Chao et al.,2019).

Interface Analysis and Functional Design

The interface analysis of the online reservation system is to deeply understand the user's expectations and needs for the system, so as to design functions and interfaces that meet the actual use scenarios of users. The following are some aspects that may be involved in user needs. In practical application, it is also necessary to combine specific schools and use scenarios to determine the most suitable functional design.

- **Friendly interface, simple and easy-to-use reservation process**

It is necessary to design a friendly, simple and easy to operate user interface, so that users can intuitively use the system to complete the operation of classroom reservation. First, the reservation process should be designed to be as simple as possible, reducing the user's steps and waiting time. Through the form verification, auto-fill and intelligent prompt technology, reduce the user's error rate during the reservation process. Secondly, provide a variety of reservation methods, such as single reservation and regular reservation, to meet the needs of different users. In addition, it provides personalized interfaces and functions based on user roles and permissions, such as a management panel for administrators to facilitate classroom management, data statistics, and permission Settings. Through continuous user feedback and optimization, constantly improve the design of the interface and reserving process, improve user satisfaction and utilization rate, and ensure that users can easily reserve the required classrooms (Wang Yifei & Tan Yukai et al., 2023).

- **Visual display of classroom reservation information**

The Visual classroom reservation design is designed to make it easy for users to reserve the required classroom through an intuitive interface. The design uses modern graphics and colors to enhance the user experience. Users can quickly browse the availability of classrooms and select the desired date, time and location. Once the reservation is successful, the system will send an reservation confirmation notification through the page reminder. At the same time, the system has a flexible classroom scheduling function, allowing users who have made a reservation to modify or cancel the classroom they have reserved. In addition, the administrator can manage the classroom and set user permissions through the background management interface to ensure the normal operation of the system. This design not only improves the efficiency of the classroom, but also provides users with a convenient reservation experience.

- **Operating flexibility**

In order to meet the needs of different users, the system should provide rich operation options and custom functions. Firstly, users should be able to freely choose the reservation time and location, and the system should support cross day, cross week, cross month, or cross semester reservations, so that users can make reservations based on their own learning plans and schedules. Secondly, the system should allow users to edit and modify reservation information, including reservation time, location, and notes, so that users can flexibly adjust and correct them during the reservation process. In addition, the system should also support cancellation and re reservation functions to cope with temporary changes in users. Through these flexible operational designs, the university classroom reservation system can better meet the actual needs of users, improve their user experience and satisfaction. At the same time, it also helps to improve the utilization and management efficiency of classroom resources (Yang Pingping&Bai Yanru, 2023).

- **Notification and reminder functions**

The notification and reminder function plays an important role in the university classroom reservation system, ensuring that users are timely informed of the reservation status and related information updates. Firstly, the reminder function should have the characteristics of timing and customization, which can be personalized according to the actual needs of users. For example, reminding users at a certain time before the reservation starts, or promptly notifying users when the reservation status changes. Secondly, the content of notifications and reminders should be clear and include necessary information points, such as reservation status, time, location, etc., so that users can quickly understand the relevant situation and take corresponding actions. In addition, when there is a message regarding the submission of classroom reservation information, approval of reservation submission results, or change of reservation information, the system will send notifications to relevant users and provide corresponding prompts. At the same time, the system needs to have a notification information release function to timely release information related to classroom reservations, classroom arrangements, and classroom usage.

- **Security management and data statistics table generation**

The reservation system has security mechanisms such as user authentication and permission control, which can strictly prevent data leakage and theft, ensuring that only users with legal permissions can make classroom reservations. In addition, the system administrator has the authority to view all classroom reservation records, perform data statistics on reservation

information, and manage and make decisions on generating reports. At the same time, they are responsible for maintaining the system and updating information to ensure system stability and data accuracy (Wan Lingna, 2022).

Management Module Division and Functional Design

The management module of the reservation system is designed for the convenience of students, teachers or other personnel to reserve micro-classroom. When implementing such a management module, the following functions need to be considered:

User identity management: Support students, teachers and administrators to enter the system to operate, and give each user has different operation rights and functions. Including registration, login and personal information management for students, teachers and administrators.

Classroom information management: provides basic classroom information maintenance functions, including classroom name, capacity, class time and equipment facilities, including viewing, adding, editing and deleting classroom reservation information, as well as classroom equipment and class capacity management functions.

Classroom reservation management: Users can select and reserve specific classrooms on the system according to their scheduled dates and time periods. In this process, the system will check the availability of the classroom and the user's reservation permission in real time to ensure that the user can reserve the appropriate classroom within their permission. In addition, the system also provides a series of convenient course information management functions, including viewing, publishing, editing and querying course information. Through these functions, teachers can easily manage key information such as course name, class time and required classrooms, and improve the efficiency and accuracy of teaching management (Hu Zhihui & Wang Jiayao, 2022).

Reservation rule management: The administrator sets reservation rules, such as reservation time range, duration of each reservation, limit the number of reservations, etc. Students and teachers can reserve appropriate classrooms according to course needs, including selecting time, classroom and purpose of use, and can edit and cancel their own reservations.

Administrator permissions: To ensure the integrity and rationality of the system, it is necessary to set corresponding permissions for different users. For administrators, they have extensive permissions and functions to manage the entire system. Administrators can approve user reservation requests, modify and delete information about reserved classrooms, and view reservation statistics to comprehensively grasp the usage of classrooms. In addition, administrators also have the authority to manage classroom and course information, making it easy to update and adjust relevant information. In order to enhance system security, administrators can also view system operation logs, track and monitor system usage, and ensure the normal operation of the system and data security. (Ye Ye, 2020).

Notification reminder: The system will promptly send various important information to users in the form of a page window, including notifications of successful or failed reservations, approval results, change notifications, etc., to ensure that users can quickly understand the reservation status and related details. Especially when there are temporary changes to the scheduled classroom, the system will quickly notify users so that they can adjust their plans in a timely manner. At the same time, in order to maintain transparency and timeliness of information, the system will also release notifications and announcements within the system, helping users understand the latest developments and updated content of the system.

System Basic Framework Design

When designing the framework, it is necessary to consider the scalability, security, and usability of the system to meet the actual needs of the university classroom reservation system. At the same time, it is also necessary to consider the user permission management, logging, and backup functions of the system to ensure its stable operation and security.

Front end interface framework design: The front end interface is a direct bridge between users and the system, so designing a friendly and user-friendly interface is crucial. The system framework needs to provide rich component libraries and development tools to make front-end development more efficient and easy to maintain. In terms of interface design, we should follow the principles of simplicity and intuitiveness, providing clear operating procedures and a friendly user experience. At the same time, it is necessary to ensure that the interface responsive design can adapt to the screen size and resolution of different devices to ensure a good user experience. Adopting responsive design, supporting access to different devices, including interfaces for students, teachers, and administrators (Huang Zhenjian&Chen Hongchang, 2020).

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Back-end server framework design: The back-end is the core part of the entire system, which is an important part for processing business logic and data interaction. Adopting a distributed framework, including modules such as user management, classroom management, and reservation management, to ensure the stability and performance of the system. The design of server-side framework functions should focus on data processing, user authentication and authorization, interface development, error handling, load balancing, caching mechanisms, and security protection. These features can ensure the stable operation, high performance, and security of the system, meet user needs, and improve management efficiency. Through reasonable design and implementation, the server-side framework can provide strong support for the university classroom reservation system.

Database framework design: Based on requirements analysis, the design of the database should follow the third paradigm to reduce data redundancy and improve data consistency and integrity. Based on the results of the requirement analysis, the database is designed with the following main database tables: user table, classroom table, reservation table, notification table, and log table. User table stores user information; Classroom table stores classroom resource information; The reservation table stores reservation information, including user information, classroom information, reservation time, etc; The notification table stores notification information, including receiving users, notification content, etc; The log table stores log information, including log time, operation content, etc. By designing a reasonable database table structure, effective management of classroom resources, user information, reservation information, etc. can be achieved.

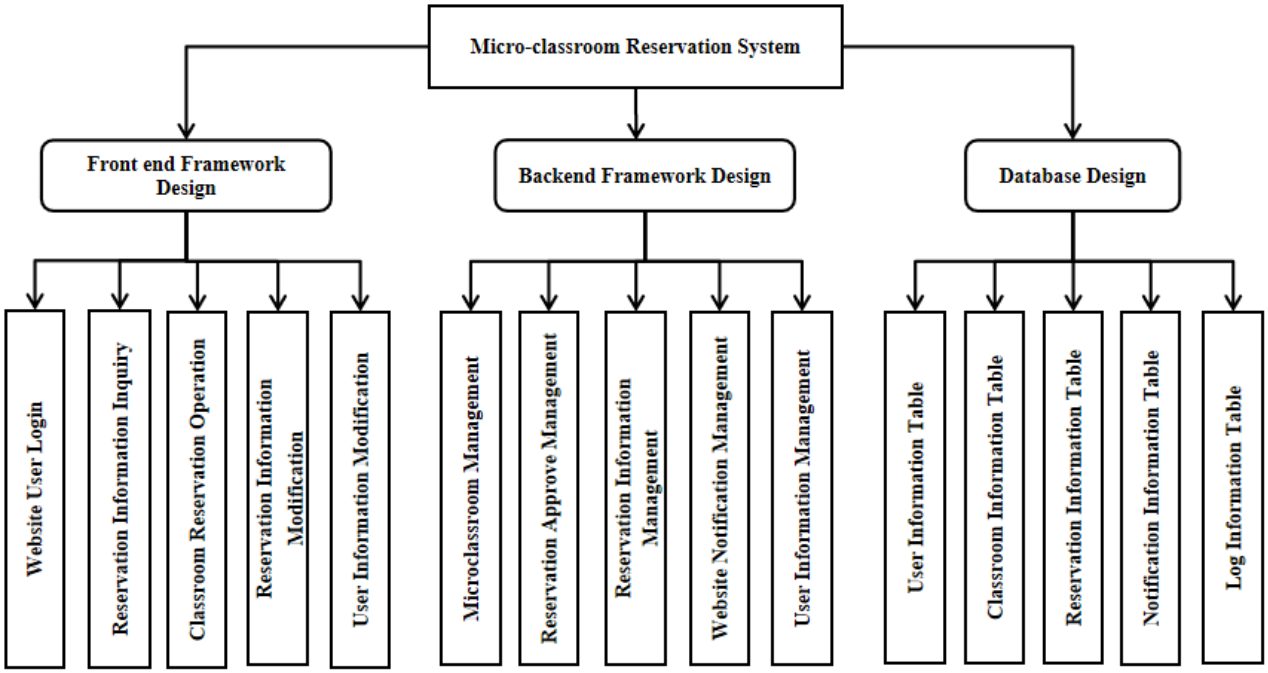

Figure 1: Framework of the reservation system for micro-classrooms in universities

System Security Design

The university classroom reservation system involves user personal information and school classroom resources, so security is crucial. In the system design process, security issues such as data encryption, permission control, and prevention of malicious attacks should be fully considered.

Firstly, data encryption is an important means to ensure the security of data transmission. Sensitive information and transaction data of users should be encrypted to prevent data leakage and tampering. Secondly, permission control is an important measure to ensure system security. Corresponding permissions should be assigned based on user roles to restrict access to sensitive operations. At the same time, administrators should have advanced permissions to configure and manage the system. In addition, preventing malicious attacks is also an important aspect of security design. Effective security measures should be taken to prevent potential security risks, such as firewall settings, regular security vulnerability scanning and repair, etc. Finally, data should be regularly backed up to prevent data loss or damage (Yu Xianping, 2018).

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In database design, we need to consider the integrity and security of data. To ensure data integrity, it is necessary to establish appropriate primary and foreign key constraints on database tables, and use transaction management to ensure data consistency.

IV. IMPLEMENTATION OF RESERVATION SYSTEM

The micro-classroom reservation system in universities is very convenient to operate, and provides teachers and administrators with convenient reservation information query and management functions. Through the system, teachers can easily check their reservation status, classroom information and schedule, etc., in order to better arrange their work. At the same time, administrators can also view and collect statistics on all reservation records through the system, so as to better manage classroom resources. The classroom reservation operation process of the micro-classroom online reservation system is as follows:

● The user first logs in, and the system can automatically identify the identities of teachers, administrators, and passers-by. Through identity identification, the corresponding identity is automatically assigned to complete the required task.

● In the process of user login, the system will automatically identify passers, that is, unregistered users, unregistered users only have the right to browse and view all classroom reservation information, but cannot make classroom reservation operation.

● After logging in to the system, the teacher user can make an reservation for the required classroom, and modify or delete the reservation information within a certain period of time to ensure the accuracy of the reservation.

● The administrator can review and manage the reservation information, including reviewing the reservation, modifying the reservation, deleting the reservation, viewing all the reservation records, conducting data statistics and generating reports.

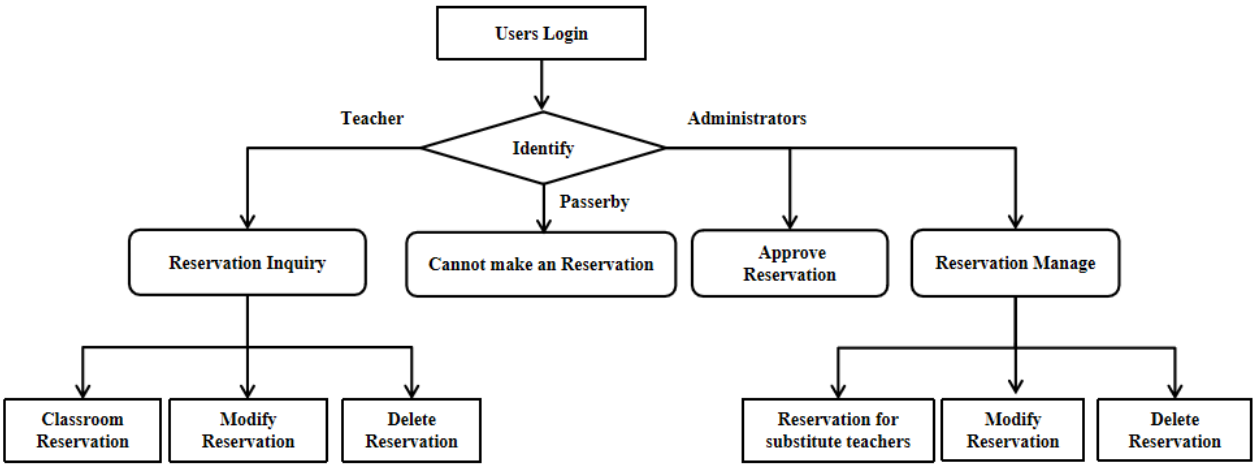

Figure 2: Operation steps of micro-classroom reservation system in universities

In the query function of the reservation system, users can input corresponding information for querying, and the system will display all the reservation records of the user. Users can also filter out the data they need based on information such as classroom names and reservation times, in order to better arrange their time and schedule. In addition, users can also view their reservation status, including approved, pending review, rejected, etc., in order to timely understand their reservation status (Xu Yongli&Li Xiaoguang, 2023).

The administrator can view and collect statistics on all reservation records in the reservation system to better manage classroom resources. Administrators can view the details of each reservation, including user information, reservation time, class name, etc., for review and management. Administrators can also modify or delete approved reservations to ensure fairness and rationality of the reservations.

In addition, the administrator can set an reservation reminder to notify users before the reservation starts so that users can make preparations. This helps increase user productivity and satisfaction, and also reduces the number of times users miss important opportunities because they forget to make an reservation.

The application effect of the university classroom reservation system is significant, bringing various benefits to universities, such as improved management efficiency, user experience, resource utilization, enhanced security, and the promotion of educational informatization. With the rapid development of technologies such as cloud computing, big data, and artificial intelligence, university classroom reservation systems will continue to introduce new technologies to improve system performance, stability, and intelligence level (Zeng Jing&Wu Gengxin, 2020).

V. CONCLUSION

With the deepening of information construction in universities, the sharing and coordination of educational resources have become an inevitable trend. The university classroom reservation system will become an important platform to promote resource sharing and collaborative work between different departments and different colleges. Through information sharing and resource integration, the utilization efficiency and management level of educational resources can be improved. The future development of the university classroom reservation system will usher in more opportunities and challenges. Through continuous technological innovation, improving user experience, expanding functions and application scenarios, strengthening security and promoting the sharing and collaboration of educational resources, the system will provide strong support for the development of universities and become an important force to promote the process of education informatization (Liu Huari & Cui Dafang, 2018).

The application and realization of micro-classroom reservation system in universities have improved the utilization rate of micro-classroom. The automatic reservation system is applied to the mobile client, and the micro-classroom reservation can be completed anytime and anywhere, which solves the problem that teachers and students can easily complete the automatic classroom reservation through online. The development and application of the system reflects the teacher-centered, humanized and warm concept, which is helpful to analyze and calculate the use of the laboratory and arrange the experimental class reasonably. With the further development of information technology, the micro-classroom reservation system will play a greater role in providing more convenient and efficient services for the training of normal students. At present, the construction of the system is still in its infancy, and continuous in-depth study of efficient demonstration methods can ensure that the construction of university laboratories is more orderly, and lay a good foundation for the development of China's scientific cause. We look forward to more technological breakthroughs and innovation of educational concepts, and jointly contribute to the development of universities and the improvement of education quality.

REFERENCES

[1] Wu Wenmin.Study on the Construction of Translation Flipped Classroom Teaching Model Based on Micro Class[J].International Journal of e-Education, e-Business, e-Management and e-Learning. 2018,8(02):91-96.

[2] Su Dongwei, Liang Zhijian, He Qiuli, et al. Design and Implementation of an reservation System for Open Laboratories in Universities Based on WeChat Platform [J]. Information Communication, 2018, 11 (1) 160-161.

[3] Ren Haitao. Open Management of Teacher Education Experimental Teaching Center Based on reservation System [J]. Laboratory Research and Exploration, 2018,37 (05): 168-171.

[4] Yu Jiujiu, Zheng Hao, Zhang Jishan, Chen Yun, Wu Ning, Mei Yingying. Construction of Laboratory reservation System for Adult Universities [J]. Laboratory Research and Exploration. 2022,41 (04): 246-250.

[5] Wang Jian, Huang Chao, Wang Lidan. Construction and implementation of an open laboratory management system at the college level [J]. Laboratory Research and Exploration, 2019,38 (01): 228-231.

[6] Wang Yifei, Tan Yukai, Zhu Lijia, Li Qiang. Design and implementation of an experimental reservation management system based on HTML [J]. Science and Innovation. 2023 (22): 146-148.

[7] Yang Pingping, Bai Yanru. Design and implementation of a low code university laboratory reservation system [J]. Experimental Science and Technology. 2023,21 (05): 149-153.

[8] Wan Lingna. Design and Implementation of a Web-based Laboratory reservation System [J]. Modern Computer Science, 2022, 28 (23): 92-96.

[9] Hu Zhihui, Wang Jiayao. Design of a professional laboratory reservation system [J]. Fujian Computer. 2022,38 (08): 108-110.

[10] Ye Ye. Design and Implementation of an Open Laboratory reservation System Based on WeChat Mini Programs [J]. Information Technology and Informatization. 2020 (08): 172-173.

[11] Huang Zhenjian, Chen Hongchang. Open Laboratory reservation System Based on QR Code [J]. Modern Computer. 2020 (18): 156-160.

[12] Liu Suzhuan, Wu Weijiang. Design and development of an open reservation system for laboratories [J]. Education and Teaching Forum, 2018, 26 (16): 275-276.

[13] Yu Xianping. Design of a Laboratory reservation System Based on ASP NET [J]. Electronic Technology and Software Engineering, 2018 (12): 61-67.

[14] Xu Yongli, Li Xiaoguang, Li Fuping. Research on Open Laboratory Management Based on Cultivating College Students' Innovation Ability [J]. Journal of Higher Education. 2023,9 (14): 61-64.

[15] Liu Huari, Cui Dafang, Ye Zhichan, Chen Zhimin. Design and application of a mobile client for an Android based open reservation management system in university laboratories [J]. Laboratory Research and Exploration, 2018, 37 (07): 275-277.

[16] Zeng Jing, Wu Gengxin, Huang Zhifang. Design of a multi-mode automatic reservation system for laboratories based on UML [J]. Modern Electronic Technology, 2020,43 (07): 173-177.