

# Design of Intelligent Library Seat Selection System

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**Abstract**—The problem of occupying seats in college libraries is difficult to prohibit, and the existing library seat selection system can't meet the needs of seat allocation. This system has applied multiple sensors associated with the WeChat applet to reflect the occupancy status of seats accurately and in real time, simplify the steps of seat selection and therefore solve the problem. This system uses QR code technology and information platform to manage seat usage.

**Index Terms**—library seat selection; WeChat; sensor; information management

## I. INTRODUCTION

Occupying seats is a common phenomenon in Chinese university libraries, almost all universities have different degrees of occupying seats. In this regard, universities have taken corresponding measures in succession, some solutions to the phenomenon of library occupancy have been worked out, the existing seat selection system has little effect. College library, as the students' preferred place to study. At present, most seating systems only provide online reservation service, students choose seats in the system, but there is no obvious sign on the library seats [1]. The application of seat selection system is not mandatory, which results in the information gap between online reservation and actual situation on site. The students at the library can't determine whether the seat was reserved, and it occurs frequently that on-site students directly use a seat that has been online booked. Unnecessary conflicts between students arise and bring trouble to librarians. The problem of occupying seats can't be fundamentally tackled. Library has limited seats, the existing seat selection system has little effect [2], and the problem of occupying seats is inevitable, which seriously affects the normal learning and life of students [3].

## II. FUNCTION DESIGN OF SEAT SELECTION SYSTEM

### A. WeChat Booking Seat Function

Start WeChat, select Smart Library - Select Reserved Seats. Students can choose the campus, reading room and time period. At this time, the seating arrangement of the selected reading room and the available seating distribution will appear in the system. Reserved seats can show the heads of boys and girls. Select your favorite seat and click on the reservation to select a seat. WeChat

reservation is completed. The seats in the reading room have different numbers for students to find. After completing the online reservation and seat selection, arrive at the reservation reading room within the specified time to find the seat number reserved by yourself. When the students arrive, they should scan the QR code to check-in and confirm, thus are the seats successfully selected. If students do not sign in 30 minutes, the seats will be cancelled and the seats will go into the list of spare seats.

On WeChat, students can book library seats online in a simple and free way. However, students must arrive at their seats within the prescribed time limit and scan the QR code to sign in, otherwise the reservation will be cancelled. With the help of the library cloud server and WeChat public number, the intelligent library system can recommend library collection information and empty seat information to students so that they can select seats for study. In addition, by using the smart campus cloud server and WeChat platform as the import port, more convenient services can be provided, such as booking books, subscribing to e-books, introducing new books in the library, and making necessary announcements.

### B. On-Site Use of QR Code to Reserve Seats

After the reading room is opened, students can scan the two-dimensional code of the empty seat. If the seat is not reserved, students can choose to use the seat in WeChat program. The seat will be removed from the empty seat list. If the seat has been reserved by someone else, the system will display "This seat has been reserved" and the student will need to choose another seat.

### C. Seat Retention and Renewal Functions

When a student need to leave his seats temporarily, he can enter the applet to select "leave temporarily", the system receives the application for temporary departure, and starts recording the pause time. After you leave temporarily and return to your seat, choose "Continue" to resume your seat.

If the pause time is more than 30 min, the seat will be cancelled and added to the optional list. Under each seat is equipped with a small weighing sensor to avoid students' leave without choosing "rest" and occupy the seat in disguised way [4]. The seat selection system input the normal body weight range in advance, and can detect the weight on it in real time. The student chooses "temporary" and the sensor will be temporarily closed. If the student does not choose "temporary" and leaves the

seat, the sensor will feed back to the background of the system. In order to prevent system misjudgment when students get up, bend or similar movements, weighing sensor will wait for five minutes, when gravity does not return to the normal range, the sensor will feed back to the system.

### III. MODULE DESIGN OF SEAT SELECTION SYSTEM

The architecture of the seat selection system module is shown in Figure 1.

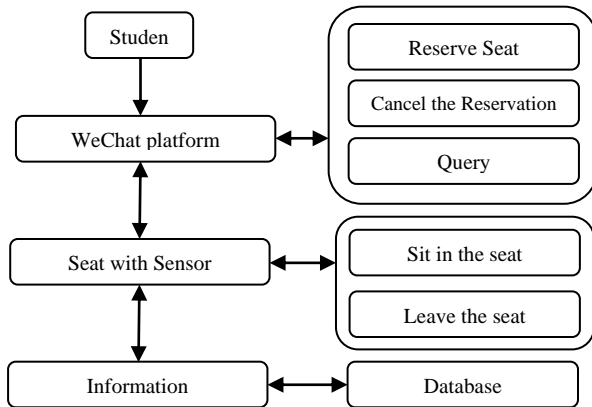


Figure 1. System Module Structure Diagram.

#### A. WeChat Program Section

As the main information service center, college library needs to establish an information service platform urgently to meet the needs of the times. WeChat is a high-tech product that has a huge application demand in library information service [5].

With the LBS attributes of WeChat, we launch location-based applications and services, such as inquiries about schools, hospitals, hotels and other landmarks in the surrounding. For organizations, richer activities and businesses could be implemented, such as student self-study check-in service: when the student walks into the study room, the system automatically checks in for him, and his location information will be shared with friends, which can quickly increase the popularity of this place.

In the WeChat platform, our team applies the certification account, which can realize the functions of nine advanced interfaces, and it provides more possibilities for the construction of the intelligent library seat selection system. For the realization of the intelligent library seat selection system, we need to set up a custom menu in the WeChat applet as a bridge between students, WeChat platform and background database.

Through the equipment account number, the hardware device can connect with the user's WeChat client to easily reach the user. The connection function mainly consists of three parts: binding, discovery and configuration. Intelligent devices can establish corresponding relationships with users through various binding methods such as sweeping code, app jumping and subscription. The third party will be able to accurately

know the user who is using the device except the custom menu function.

QR code scanning technology nowadays is so ripe [6], that students can acquire the situation of the seats with mobile phone scanning. Simple scanning steps conform to the contemporary young people's living habits.

#### B. Mini Weighing Sensor

We apply a capacitive sensor, which works by using the direct proportion of the oscillation frequency  $f$  of the capacitor oscillation circuit to the distance  $d$  between the plates. The plate has two pieces, one is fixed and the other is movable. When the load-bearing platform loads the measured object, the leaf spring flexes, the distance between the two plates changes, and so is the oscillation frequency of the circuit. Measurement of the quality of the measured object on the bearing platform can be determined by measuring the frequency changes. The capacitance sensor has the advantages of less power consumption, low cost and accuracy of 1/200 to 1/500. Resistance, inductance and capacitance are three kinds of passive components in electronic technology. Capacitive sensor converts the measured changes into capacitance changes, which is essentially a capacitor with variable parameters.

With weighing sensor to detect the weight on the seat, it is helpful to prevent the students from being unattended after reservation and occupying the seat in disguised way.

#### C. Information Management Module

The information management module of this system is divided into two parts: foreground management module and background management module. The front-end module includes students' personal information inquiry, seat selection, seat reservation and other functions. The background management module includes student information management, seat information management and manager information management module. The whole system adopts B/S architecture. The background function is realized through Java EE's typical three-tier structure and MVC design pattern [7]. This can reduce code coupling, maintenance cost and maintenance time and make the code structure clear. The main tables contained in the database are shown in Table 1.

Table 1. Database Table.

Database Table Names	Function	Remarks
ReaderTable	Records seat user information (student teacher external staff) and etc.	ReaderID,Name,DeskID,
DeskTable	Record seat number	DeskID
BookTable	Record book collection Information	BookName,ReaderID
TimeTable	Record registration time, occupancy time, leaving time and etc.	SignTime,UsingTime,ReturnTime
MangerTable	Record administrator	MID,Mname,Msex,Mpw

### IV. CONCLUSIONS

The library seat selection system under the intelligent campus is an intelligent integrated system integrating

hardware and software. The main function of the system is clear, that is, to solve the problem of library seat occupation caused by the current shortage of university library seats. This system provides a new technical solution for seat management in university library. The existing library selection system is optimized so that to make full use of the limited seat resources of the library, improve library occupying situation, and create a better learning environment for students.

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