The Interior Navigation of the 4th Floor of

Jishi Building

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Introduction

By studying GIS indoor map and related operations, this project realized the navigation APP on the 4th floor of Jishi Building on the Android Studio platform, with basic map operation, map display, query, positioning and other basic functions. This APP has a good user interface and rich interactive functions, which can provide users with a spatial guide and geographic information introduction on the 4th floor of Jishi Building, with convenient and comfortable services. In the user interface, we combined the principles of fluid navigation to explain our interface and interaction design, and put the knowledge learned in class into practice.

Design process

1. Indoor map data design

We collected the geospatial information on the 4th floor of Jishi Building, and drew a 2D indoor map on SuperMap software to organize different types of elements in layers. Through the analysis of structural characteristics and element characteristics, the hierarchical and typed structure of each room and each area in the indoor environment is realized, which is distinguished by the color of the area. As is shown below.

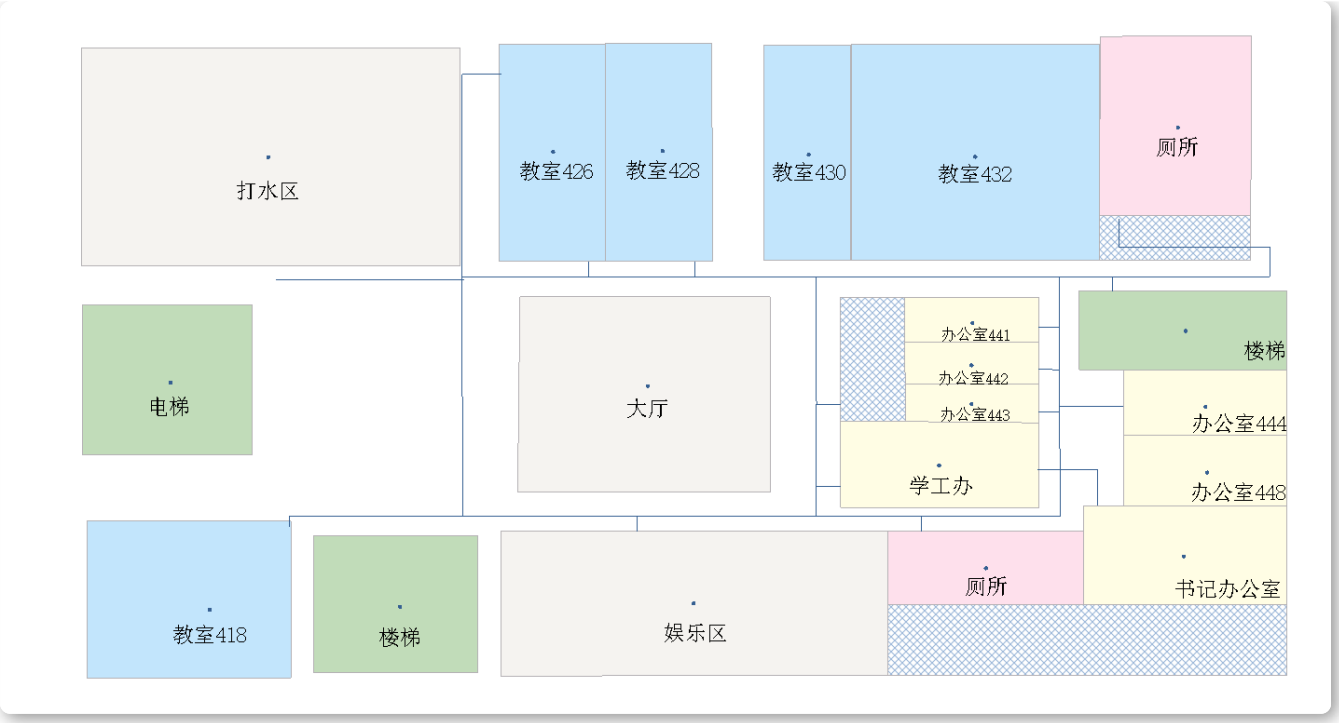

Figure1 Map overview

2. Layer dataset design

We made a corresponding dataset for the most important room layer (surface layer). When using the search function, the searched keyword field corresponds to the attribute in the graph.

序号	SmUserID	CO_TYPE	ColorID	ROOMNUM	ROOMNAME	ROOMPERSON	ROOMSTATE
1	0	办公室	1	441	办公室441	沈莹	正常
2	0	办公室	1	442	办公室442	赵钦佩	正常
3	0	办公室	1	443	办公室443	黄杰	正常
4	0	出口	3		出口		正常
5	0	办公室	1	444	办公室444	朱宏明	关闭
6	0	办公室	1	448	办公室448	赵生捷	关闭
7	0	办公室	1	451	办公室451	陈荣	正常
8	0	厕所	4		厕所		正常
9	0						正常

Figure2 Layer dataset

3. APP design

First, we introduce the corresponding SDK and related dependencies of the supermap function in Android studio, and import the supermap map interface in the layout interface to design the main page. Place the map page in the center, and place map-related operations above the map, including viewing room information and search functions. The bottom right is the zoom operation on the map.

The SDK version used by this platform is 28, and the JDK version is 1.8.

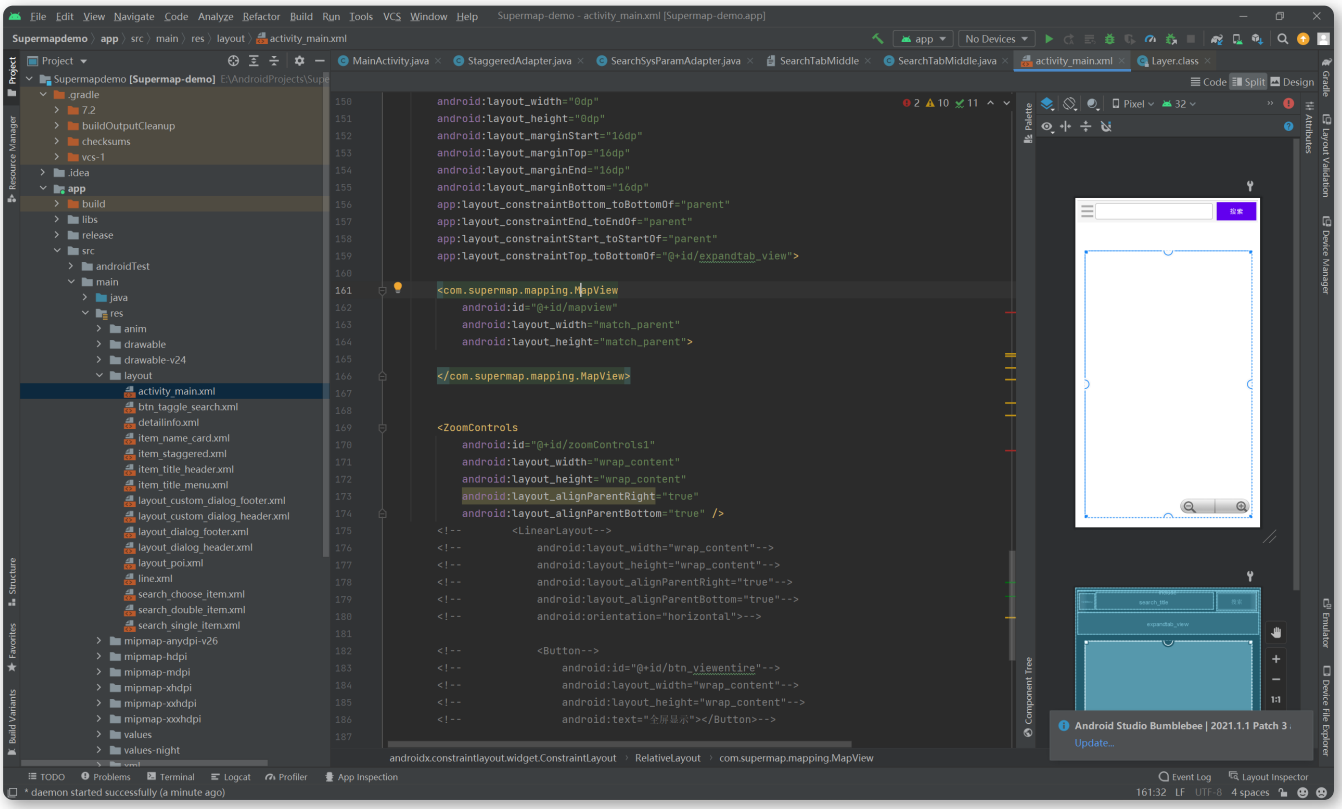

Figure3 Android Studio design interface

Function

- **map operation**
  - Zoom operation. You can click the button in the lower right corner, or use gestures to operate
  - Moving map
  - View room information. After clicking a room location button, a pop-up box will appear to display the room number, room name, personnel, and status
  - Display the map in full screen
  - Distance measurement
- **Search operation**
  - Search by **room number**（e.g. "441"）. If it exists in the dataset, the map will be located to the corresponding location

    - Search by **room name**（e.g. "Academic Affairs Office"）. If it exists in the dataset, the map will be located to the corresponding location
    - Search by **people**（e.g."Chen Rong"）If it exists in the dataset, the map will be located to the corresponding location.

- **Main Gesture Operation**
    - Tap
    - Small swipe
    - Large swipe
    - Pinch and spread (by 2 fingers)

Functional design ideas:

Because this is a mobile application project, the most commonly used interaction methods are **touch** and **gestures**, so we have enriched the functions of each gesture, allowing expert users to navigate quickly. All the above functions are implemented by gesture interaction.

Interface

1. Main layout

We divide the main layout into 4 parts, namely APP title, work bar, map interface and map zoom button.

- APP Theme: Display the title of the app.
- Work toolbar: The main business logic implementation area, for most operations of the map, such as positioning, viewing information, searching and other operations are concentrated in it.
- Map view: The main display area occupies most of the space, which is convenient for users to observe the geographical location.
- Map zoom button: Zoom in and out on the map space, zoom out on the left and zoom in on the right.

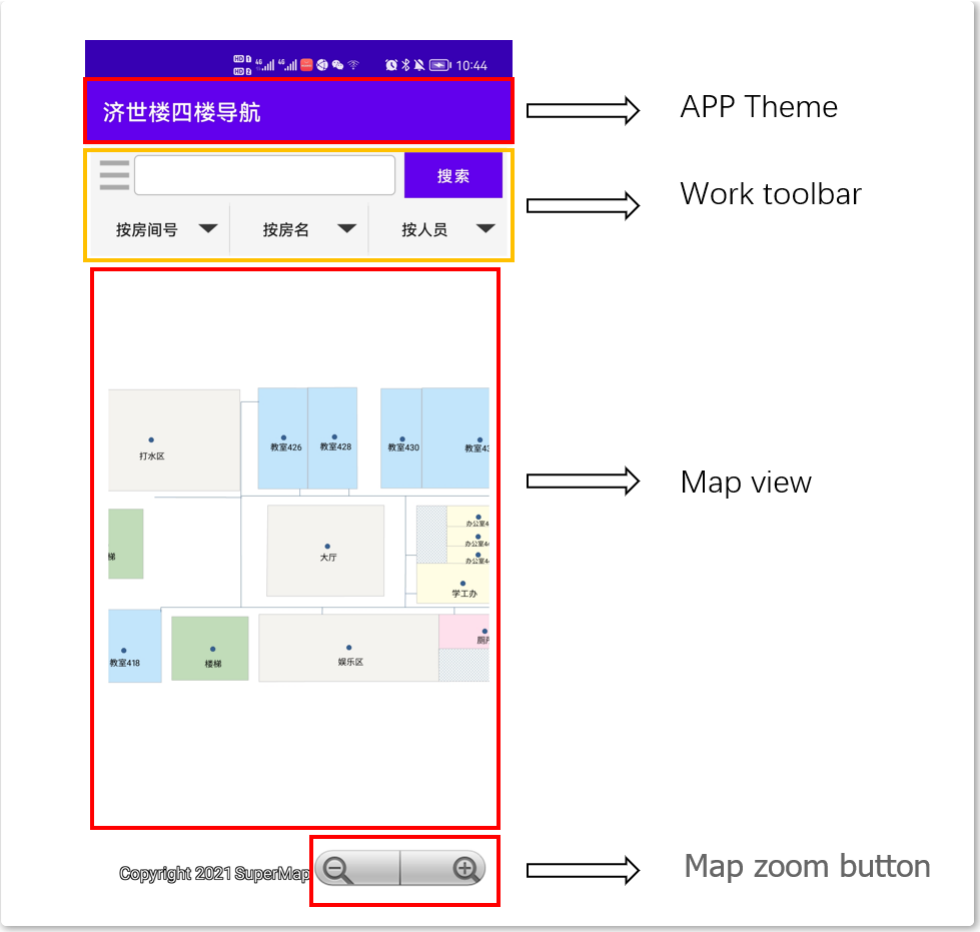

Figure 4 Main layout

2. Work toolbar

The work toolbar is mainly divided into three sub-areas, namely main menu, search bar and label selection bar.

- **Main menu**
  - **Main function**

    Click to display the specific operations on the map, including moving the map, viewing room information, full-screen display and distance measurement.（Fig. 6）

  - **Design Principles**
    - **Space constraints** - The limited screen space of mobile devices leads to limited items. We can apply a hamburger menu icon on the view as a button of the fold menu. As the design principle mentioned in fluid navigation, we can design dense menus with many small icons.
- **Search bar**
  - **Main function**

    Fill in the specific location keywords to be searched in the text box, and click the search button on the right to search and locate.

  - **Design Principles**

        - **Simultaneous presentation** - simultaneous presentation refers to a sequence of interdependent menus can be used to guide users through a series of choices. The search bar and the label selection bar are interdependent. They work together to search for geographic information, which are displayed vertically.
- **Label selection bar**
    - **Main function**

    Before searching, you must select a tag type to search, and only one type of tag can be selected, and then the corresponding SQL code can be generated in the back-end for database searching.

    Three room label options are available here: Room number（e.g. 441）, Room name（e.g. "Academic Affairs Office"）and Person（e.g. "Chen Rong"）. A List view will pop up after each tab is clicked(Fig. 7). There are some important items that are often searched for by users in it. If you want to search for other room numbers, click "Other" in it, and then fill in the text view.

    - **Design Principles**
        - **Content organization** - We apply a horizontal linear sequence to organize the content of the selection bar. The classification is explicit and distinctive, without causing confusion to users.
        - **More breath, less depth** - We expand the types of searches and reduce the depth of the menu, because broad–shallow is better than narrow–deep. Each menu has only one depth, making it more comprehensible for using.

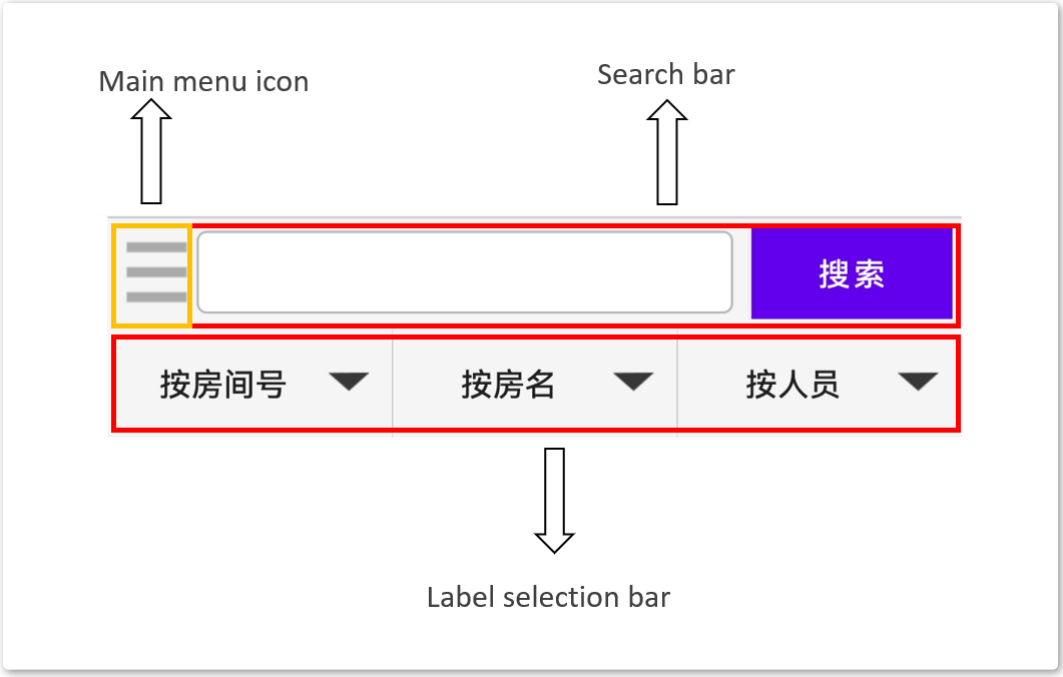

Figure 5 Workbar layout map overview

Figure 6 Action menu

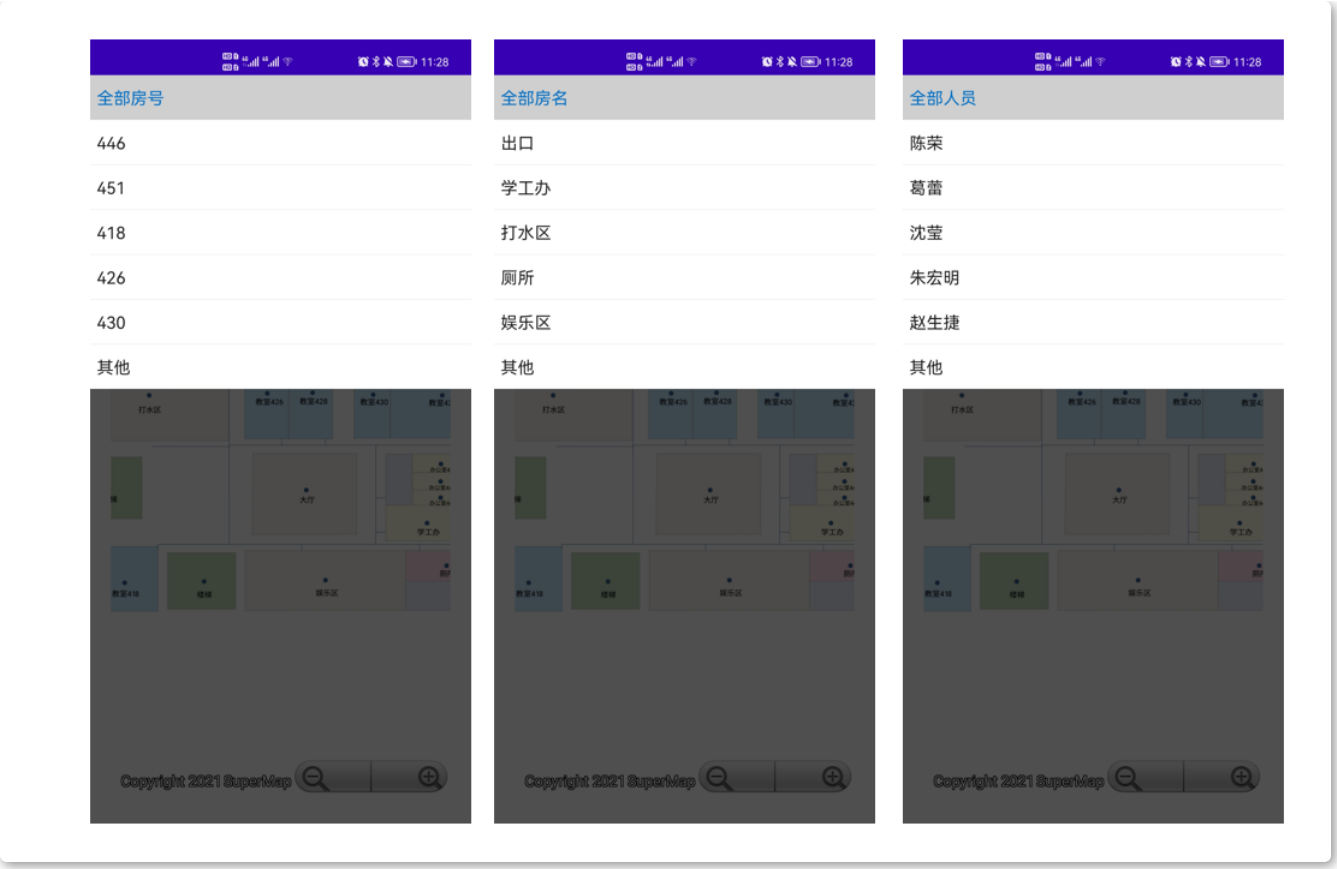

Figure 7 Search tag selection

3. Room information interface

- **Main function**

  First of all, the user must click "View Room Information" in the operation menu at the upper left corner, then the map can display the positioning signs and information buttons of each room.（Shown as Fig. 8）

  Click the black room number button next to the location sign to pop up the room information.(Fig. 9)

  Pop-up menu displays room number, room name, personnel and room status.

  Click the close button in the upper right corner of the pop-up menu to close the room information display.

- **Design Principles**
  - **Pop-up menus** - When the user clicks or taps the room number button, the menu will appear. What's more, our pop-up menu depends on the cursor position, which is called context menu as well. Pop-ups don't take up any real-estate on the our view when it is folded. They are created purely from code, and appear at the current location of the cursor.
  - **Escape button** - We created a escape(close) button in the upper right corner. Users can turn off pop-up menu at any time.

Figure 8 Room location sign

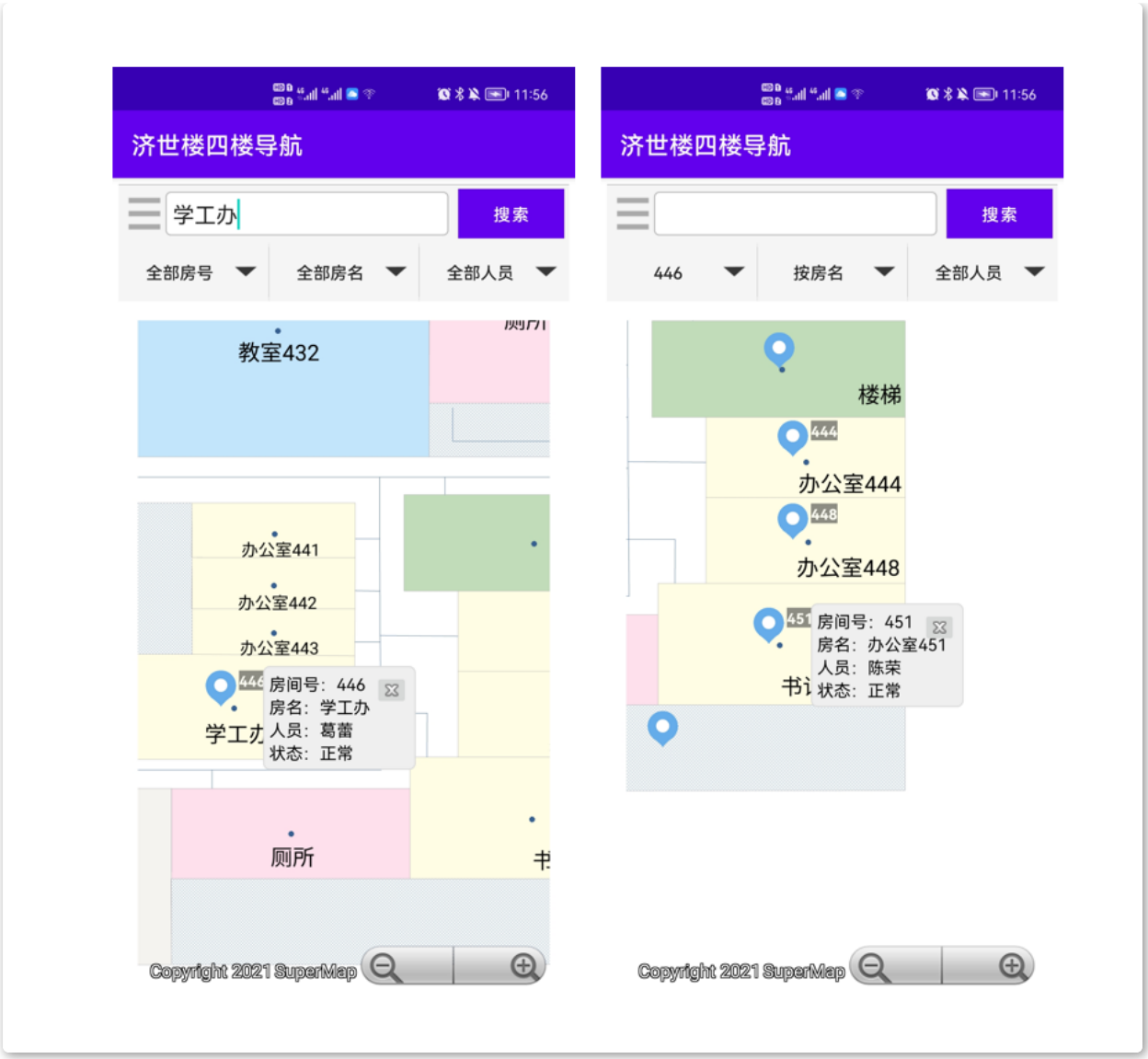

Figure 9 View room information

Summary

In this project, I learned the basic operations of collecting map data and making maps with GIS, independently made a 2D map on the 4th floor of Jishi Building, and finally deployed it to the mobile terminal for interface design and logic design. In the design, I combined the principles of fluid navigation taught in the class, designed the interactive interface, and expanded and enriched the functions of the software to provide users with a better operating experience. All in all, I think the innovations of this software are as follows:

- Our software can implement the basic indoor navigation functions, and be applied to the actual scene, which has strong practical significance.
- Our software provides a wealth of map operation functions, by which users can have a good sense of experience.
- Our software combines with a variety of fluid navigation methods, integrates the functions under a single-depth navigation, and arranges them neatly, which can

make the interface look simple and elegant.
- Careful design and use of gestures can bead to fluid navigation for expert users.

Operation demo

Here I have prepared a 2-minute operation video, you can observe the detailed usage process of this software.