Analysis of passenger flow in and out of Hangzhou subway station

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I. INTRODUCTION

The first is data preprocessing. For this assignment, I decided to implement it in a single thread. The data set we get is very large, and some of the data is not useful to the program, which will not only consume more memory, but also cause the program to crash. Therefore, we filter the data into smaller data sets. Second question, I realized the display of passenger flow data at subway stations on the main window. The main window can also display a histogram of the number of times that different payment methods have been used during the seven days. At the same time, I have added a dialog. In the dialog, you can enter the starting station and the ending station, and click 'find' to find all routes between the two stations.

II. IMPLEMENTATION DETAILS

A. Data Preparation

In the data set, we first filter the user ID and deviceID, which are not useful for the overall analysis. The data set is then divided into 7 large data sets by date. In each large-scale data set, we divide the data set into 160 small data sets, which are the population of passengers entering and leaving the subway station at each station.

B. Building program

1) Build a framework: The theme framework is composed of mainwindow, 'findpath'—dialog and widgets. Widgets are the welcome interface. mainwindow assumes the function of displaying the data analysis table, and is also the guide interface of the dialog interface. Dialog interface is mainly route generation function

2) Mainwindow: Place a graphicsView control on the UI interface as the display interface of the data table. QDateTimeEdit and spinbox controls are placed at the same time, as the user input time, TimeStep, and stationID receiving slot. Place the pushbutton control. When the button control is clicked, the program reads the data in the receiving slot and opens the corresponding data set in the folder. Then read the data and use the chart class in Qt to create a flow trend table and display it in the graphicsView.Two polylines are shown in each table at the same time for the trend of outbound and inbound traffic

C. Dialog

In this dialog box, place two Line TextEdit as receiving slots to receive the start and end stationID. And place the TextEdit

control to display the final result. When we click bushputton, the program receives the data from the lineEdit, and opens the csv file that stores the station's zero-connection matrix, and reads the data into a two-dimensional array. Then call the function to find the route. Finally, all possible routes are displayed on the interface. Finding a route is actually looking for a path between two points in an undirected graph. For this assignment, I used stack and generalized depth-first search methods to explore all possible routes.

III. RESULTS

As shown in the figure1, the program shows the change in passenger flow from station 8 from 0.00 on January 10 to 0.00 on January 11. The blue line is the number of incoming passengers, and the green line is the number of passengers. Time step is 5 minutes Figure2 shows the statistics of passengers
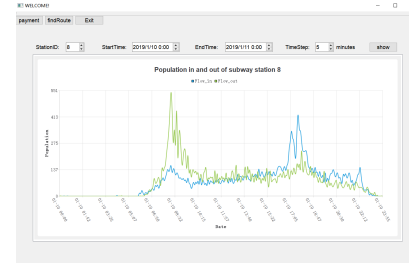

Fig. 1. As shown in the figure, the results of the subway station passenger flow operation

using different payment methods at 80 stations in 7 days. It can be seen that there are relatively more passengers using Method 1 and Method 2.

Fig. 2. Statistics of 4 different payment methods in 7 days

IV. DISCUSSION

A. The performance of my application

a) : In general, the application runs better and there is no program crash. However, this is done in a form that sacrifices
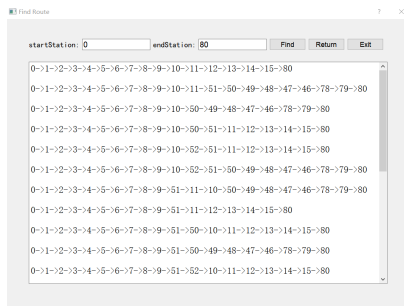
Fig. 3. Route Finding between station0 and station80

a certain function. When I was processing the data, a part of the data had been filtered, which conflicted with the first question of the question. To a certain extent, it did not let the user choose to load the desired data.Not good enough at this point. But applications run relatively fast to load data.

b) : In the design of the Qt interface, I use the UI interface to design the layout, rather than purely code to layout. The UI interface layout is relatively simple in design. Beautification still depends on pure code, and because the resources of the UI interface layout are not many, it is difficult to find reference materials.In terms of interface landscaping, I am still a bit poor.
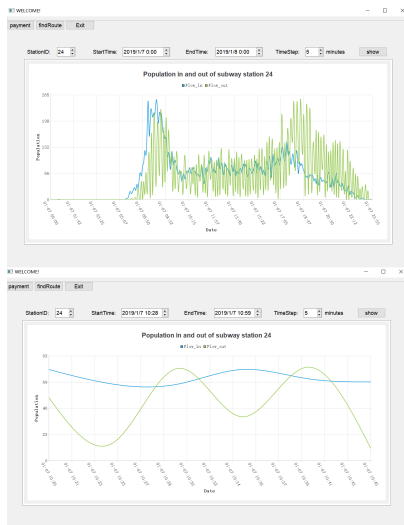
B. Results analysis

Fig. 4. Passenger flow trends at Metro Station 24 on January 7

From Figure 1, you can see that during normal working days, the peak period of passenger flow at subway stations is usually around 8.30 in the morning and 18.30 in the afternoon, which is determined by the working hours. At the weekend, the passenger flow distribution in the subway station is more uniform, which can be observed in Figure 7.

1) : It can be observed from Figure 4 that at station 24, the passenger traffic throughout the day is relatively dense, especially the number of outbound people has a large jitter. Calculating the time difference between the two peaks

according to the fluctuations in the number of passengers at the station can also be deduced that the difference in arrival time of each train is about 11 minutes. From Figure 5, it can
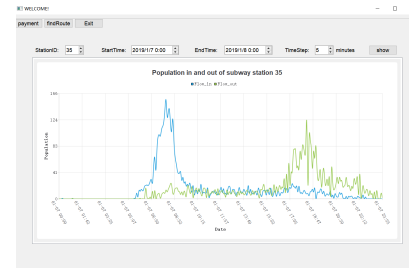

Fig. 5. Passenger numbers at subway stations 76 and 35 on January 7

be observred that at subway station 35, the number of people entering the station reached the highest peak of the day at around 8.00 in the morning, while the number of passengers leaving the station reached the highest peak at 18.45. It can be inferred that there is likely to be a residential area near No. 35 subway station.
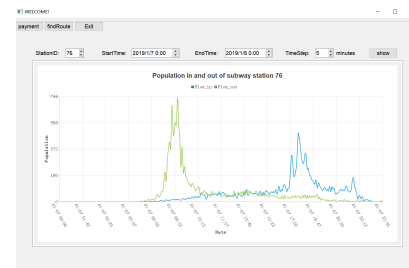

Fig. 6. Passenger traffic on Metro Station 76 on January 7

As can be seen from Figure 6,a office area is likely to lay in Metro Station 76. Because the number of people who leaving the station reached the highest peak at around 8.30 in the morning and the number of people who enter the station at the peak of about 17.30 in the afternoon.
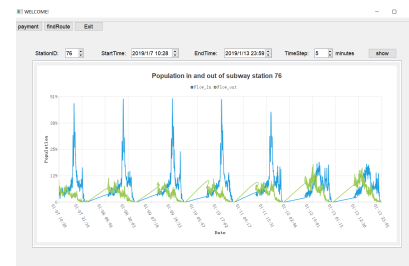

Fig. 7. One week's passenger flow at subway station 35

Figure 7 shows the change in the number of passengers at subway stations during the week. It can be observed that the number of passengers entering and leaving the station at Metro Station 35 during the weekend is obviously decreasing. It can also be inferred that this is an office area.

By observing the changes in passenger flow of No. 24 subway station in figure 8 ,there are more people during working days
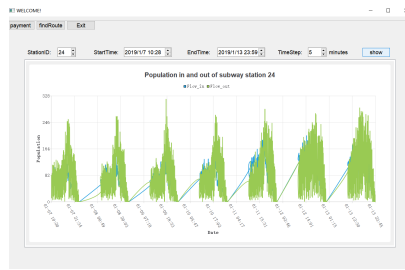
Fig. 8. One week's passenger flow at subway station 24

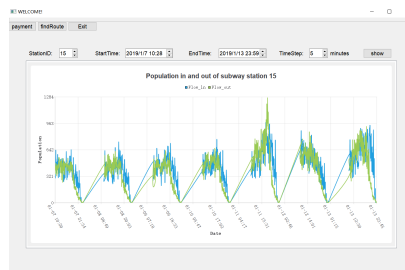than weekend. It can be inferred that this may be a bustling business district.

Fig. 9. One week's passenger flow at subway station 15

As figure 9 shown,the number of passengers at subway station 15 increased significantly over the weekend. Note that there may be a crowd entertainment place here. However, it is not excluded that it is a transfer line outside the station. Because No. 15 is connected to the 80 subway station.

V. CONCLUSION

The assignment was relatively good this time. However, due to time, it is very regrettable that no knowledge of threads and databases is used. If you use a database and multi-threading may not be so troublesome in processing data. And it's not very good at beautifying. Overall, I still learned a lot this term. Although sometimes I ca n't understand the knowledge taught by the teacher in the class, but after my own exploration, I have made great progress after class. I am fortunate to take this course. Finally, thank my teachers and teaching assistants for helping me in Academic.