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ON THE TAXI INTELLIGENT CALL SYSTEM BASED ON ANDROID PLATFORM

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ABSTRACT
With the advancement of urbanization, how to make the city taxi system efficiently operate is an important problem in public transportation. The traditional cruise or point-point type guest-looking ways lead to the waste of resources, high operation cost and long passengers' waiting time. This is because the information transmission between the taxi and passenger is not real-time. This paper implements a taxi calling system based on intelligent mobile terminal, by which the passengers and the taxi driver can exchange information anytime. It can analyze the randomly appeared personalized passenger transport demand and timely transfer it to the appropriate service provider (cab), so as to fully use the existing taxi service potential, promote the improvement and development of city bus system, improve the quality of urban residents and promote the quality of the city. This paper tests the city taxi calling system through the actual system and simulation methods. The experimental results show that the use of the system can reduce the taxi empty loading rate by 68%, and the average passenger waiting time by 73%.

Key words: *Taxi call, Intelligent, Android Platform, Cab*

1. INTRODUCTION

The city taxi system is responsible for about 20% of the passenger capacity domestically, and along with the acceleration of urbanization and urban public transport system, the passenger capacity of the taxi takes will further improve. However, the growing user needs of taxi system bring heavy pressure. Due to the shortcomings of management and usage way, the existing taxi system operation cost is higher, and the passenger efficiency is low.

The traditional ways looking for guest include

1. Cruise type: the taxi blindly cruises among blocks to look for tourists. It is lack of clear purpose. Although it has a chance to find passengers, the schedule time is too long, resources will be wasted, the operating costs will be increased, and the economic benefit will be reduced. What's more, it can increase the road congestion.

2. Point-point type: the taxi parks in the potential area to wait for passengers. This way can disturb the order of parking areas, and the speculative approach also often leads to a long wait but no tourists, causing the waste of time.

The defects of the above two ways can not establish real-time contacts between the passengers and the driver. Thus, the demanders and service providers can't completely master real-time supply and demand, so lead to the resources idle, and there are waiting and inconvenience.

The existing taxi calling and scheduling methods can be classified into the following several kinds:

1. Manual call: the passengers call a taxi company service through the communication equipment, and then the service counter inquires and informs the free taxi near the position of the passengers. This way can not locates accurate, and the labor cost is higher.

2. Fixed site type: the recently proposed taxi calling systems can be called as the fixed site type. The taxi company or the traffic management department in the city build many fixed stations, so the passengers in need of a taxi can walk to the nearest taxi station, then send the station numbers to the taxi site dispatching center, or call the dispatch center. The dispatching center assigns the nearest free rental vehicles to serve the passengers. But the taxi stops set in the city blocks may not too much, and the passengers in need of service are often not near the site. Thus, that increases the passengers' waiting time, and reduces the taxi agile convenience.

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This paper implements a taxi calling system based on intelligent mobile terminal, by which the passengers and the taxi driver can exchange information anytime. It can analyze the randomly appeared personalized passenger transport demand and timely transfer it to the appropriate service provider (cab), so as to fully use the existing taxi service potential, promote the improvement and development of city bus system, improve the quality of urban residents and promote the quality of the city. This paper tests the city taxi calling system through the actual system and simulation methods. The experimental results show that the use of the system can reduce the taxi empty loading rate by 68%, and the average passenger waiting time by 73%.

The contents of this paper are arranged as follows: chapter 2 presents the system architecture and key technology; chapter 3 analyzes and evaluates by using the experimental data; chapter 4 is the summary.

2. CHAPTER 2: SYSTEM ARCHITECTURE AND KEY TECHNOLOGY

The system is composed of a taxi car node, passenger hand-hold terminal node and the monitor node.

The structures of taxi car nodes and passenger hand-hold terminal nodes are the same, and they are made up of the following several modules: a car GPS module is mainly used to record the current user's geographic location information; Taxi display interface is used to display the geographical position in Baidu map; Taxi condition monitoring module is mainly used to manage the changes of user's state; The wireless connection module is mainly used to exchange information between the client terminal and server; Taxi terminal software is mainly used to adjust the integration of the client terminal position information and baidu map information. The server monitoring node is mainly composed of wireless connection module and historical information storage inquires. The former is responsible for the exchange of data between the client and the server data; the later is responsible for recording and inquires the historical information module.

The car GPS module is the first to operate. It is to transmit the location information of the taxi terminal and passenger terminal from the wireless connection module to the backbone, then the server wireless connection module is responsible for receiving, and the final data flow to the server. The server integrates the position information and sends to the other user terminals. Then, the user's position information can be reflected in the other user's Baidu map. At the same time, the taxi condition monitoring module will send the states of the taxi after landing to the server in the same way. The sever processes the data, and according to the state of the place, the data will appear in the taxi control interface. The passengers' states after login includes, listening, responds, make an appointment, the driver's are monitoring and response, make an appointment. The changes of state is handled by the users control interface button. The taxi condition monitoring module will change, and passes the users' current status to the server. The sever processes the data, and passes them to other users to make them known the changes.

Technical principles:

As shown in figure 1, the mobile phone terminals of passengers and the driver are integrated with GPS node equipment. No matter where the users, the satellite positioning can find the accurate position, and reflect it in Baidu map. So the not-taken taxi driver's position and action can be a real time control of the passengers in need of services. Meanwhile, the driver can also know the nearby call of the passengers, which can easily get the position of the passengers.

In addition, the taxi and cell phone can pass the information through the GSM to the backbone. Then, the taxi company and traffic management department can monitor the current city taxi service information, do statistics and analyze, thus for the company and municipal to decide.

The passengers' login interface includes the states of listening, responds, and making appointments.

1. The passengers can observe the driver and passengers users around through the Baidu map, and when needs service, he can send call request to the sever, thus he is into the call request state; when the passenger is to cancel the call request, he will come back to the listening state.

2. Once the passengers' call request has been responded by the driver, the passengers can choose to response his driver by matching, then he is into the reservation status.

3. The passengers in booking condition cancel or cancel after the appointment will return to the listening status.

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4. Passengers in whatever states can exit the corresponding state.

The states of driver after login can be divided into monitor, response, and making appointments.

1. The driver can see other drivers around and the other passengers users. When the passengers send call signal to the server, the driver client will show the coordinates in the flicker, the driver can click on it to try to make an appointment with the passengers. Then, the driver comes into the response state. If the passengers accept, then the reservation is successful, the driver comes into the reservation state; otherwise, the driver goes back to the listening state.

2. When passengers accept the driver's reservation invitation, it means the matching is successful. Before the cancel, the drivers can go to the destination to achieve the appointment, if the passengers cancel the reservation, the driver goes back to the listening state, and he can response the passenger's reservation again.

3. The driver in whatever states can exit the corresponding state.

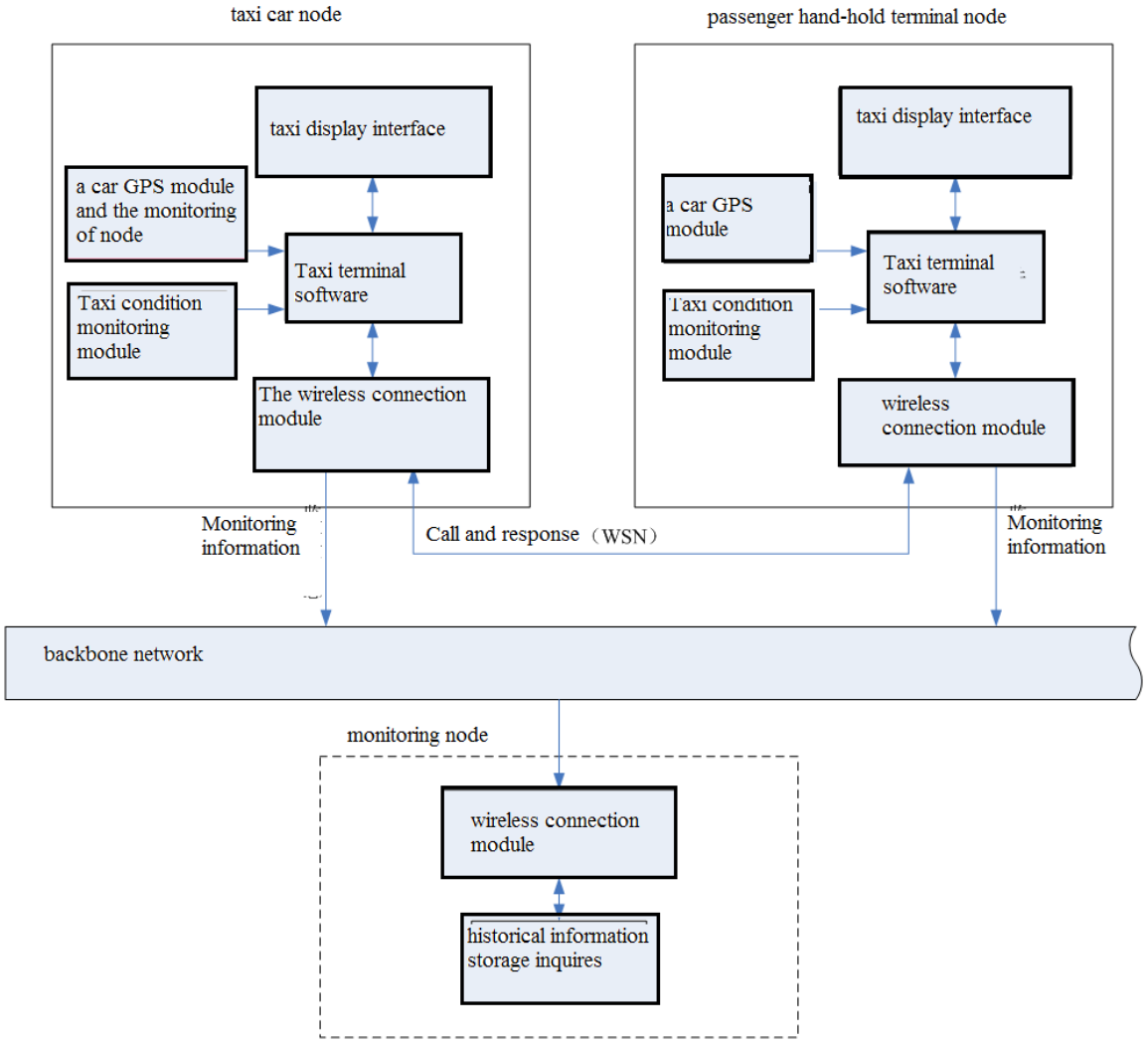

Figure 1. Structure of taxi intelligent call system

3. CHAPTER 3: EVALUATION

Analyze on the Average Passenger ' s Waiting Time

In the test process, there are three variables: the number of taxis, passengers' appear rate, and call radius. Here, we fix the taxi input quantity, and the passengers' appear rate, and then simulate call radius for variable parameters.

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Example: we set the taxi number is 200, the passengers' appear rate is 2 per hour. The call radius is for 100, 200, 400, 600, 800, 1000 respectively as a parameter to simulate. The simulation time is 1000. At the same time, we simulate the passengers' average waiting time when the taxi number is for 220, 240, 260, 280, 300, 320.

Through the test, record the data of the four groups variables (simulation time, average passenger waiting time, not-taken taxi number, number of passengers waiting) at the excel data analysis.

From figure 2, it can be seen, when the number of taxis in a certain area increases, the average waiting time will be reduced.

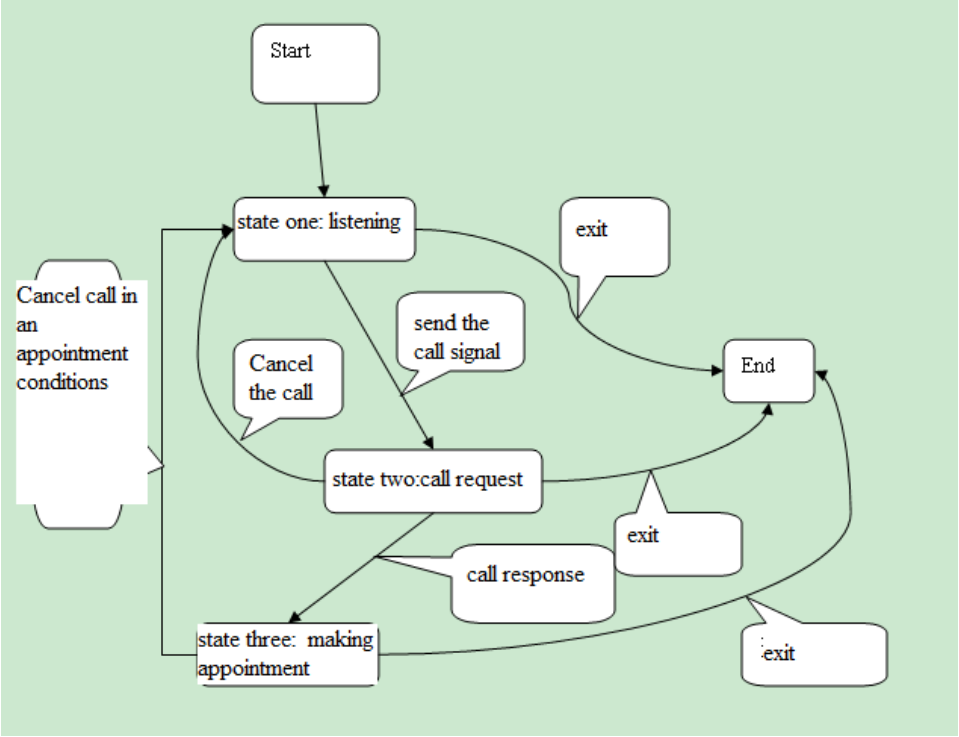

Figure 2. State of taxi call

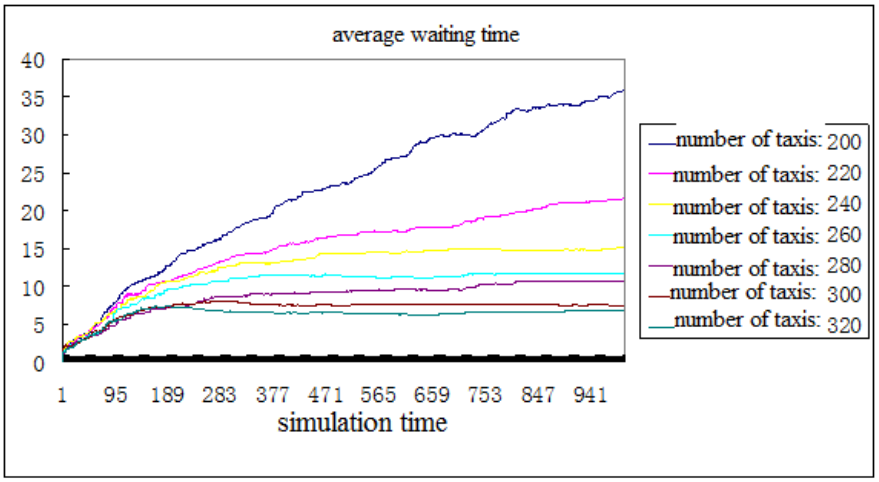

Figure 2 passengers' average waiting time

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Analysis on the Number of Not- taken Taxi

In the test process, there are three variables: the number of input taxis, passengers' appear rate, and the number of not-taken taxis. Here, we fix the taxi input quantity, and the passengers' appear rate, and then simulate number of not-taken taxis for variable parameters. We set the taxi number is 200 to 320, the simulation time is 1 to 941. Let's see the changes of number of not-taken taxis.

When the operation is stable, the number of not-taken taxis will increase as the the number of taxi in operation increases. It is shown in figure 3.

Figure 3 Number Of Not-Taken Taxis.

4. CHAPTER 4: CONCLUSION

This paper implements a taxi calling system based on intelligent mobile terminal. The experimental results show that the use of the system can reduce the empty loading rate by 68%, and the taxi passenger average waiting time reduce by 73%. This system is a prototype system, so its further work is to increase the reliability of information transmission.

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