Design of Bus IC Card Management Service System

Ke LIU, Haofan BAI, Shidong WANG, Gege LIU, Zhengyang Chen, Xingchen ZHANG, Xueqian HU, Huaping SONG, Huanhuan HUO, Pingchuan ZHANG
School of Information Engineering, Henan Institute of Science and Technology, Henan, China
Corresponding Author: PingChuan ZHANG

ABSTRACT:

This experimental software products mainly use the Microsoft Visual Studio 2019 C # winform form in the design and production, through the packaging FindCardReceive, send and other methods and card reader for serial connection and send and receive head data, through the communication protocol, send data instructions to make the card reader for test connection, card reading, recharge and other operations. When the card reader returns the data to the software, and then operates the database through the method of the SQLHelper class, changes the data, and finally reads the content in the database to the DataGridView of the winform form through the Update class. More intuitive display to the user.

I. INTRODUCTION

Bus is an important means of transportation for people to travel in urban traffic. Most buses are intelligent, remote and real-time, and the traditional bus management system can no longer meet the requirements of the Internet of Things era. This experimental work uses and optimizes the bus credit card system, which can reduce the flow of hand-held cash, facilitate citizens' travel, and improve the business efficiency of operating units. This experiment is based on code programming to design and implement a management system that simulates bus card swiping. By connecting the card reader with the host computer through serial port (that is, connecting with USB socket), the information of each cardholder and the card balance can be uploaded to the database, which can be used to recharge, report the loss, find and review cardholder information, etc. on the computer, which greatly facilitates people's bus card travel and recharge activities.

So far, IC card service system has obvious advantages, such as speeding up passengers' boarding speed, reducing vehicle stopping time, and speeding up vehicle turnover equals to reducing vehicles. Promote management, strengthen economic reform, grasp the situation of passenger flow in time, and make scientific and reasonable dispatch to create benefits. Improving the service level of public transportation is in line with the goal of building an international city.

Now and in the foreseeable future, it can also facilitate the citizens and reduce the social cash circulation. And fully automatic management of charge statistics, effectively plugging loopholes, and putting an end to possible corruption of managers and false tickets. Improve the information management level of urban municipal traffic, respond to the call of the state to promote urban information construction, enhance the local city appearance, and bring new business opportunities for urban development. Improve the municipal order and do practical things for the citizens.

II. SYSTEM ANALYSIS

2.1 introduction of system functions
The whole system includes several important functional modules, such as serial port connection module, user management module, bus card management module, recharge management module, user registration module, database module and bus card loss reporting management module. The non-evaporated saline returns back to level-controlled tank to pressure it to the collector.

2.2 database services

The experimental data is stored in Microsoft SQL Server 2019 database, and the data types are as follows:
(1) IC Card ID: It is used to store the ID of the card held by the user, which is convenient for the deduction of

fees when the user swipes the card and the change of balance when recharging.

(2) IC card balance: used to store the remaining amount of the card held by the user, which can be deducted or recharged during use.

(3) Name: Cardholder registration is a reserved name, and card information can be searched in the management system by the cardholder's name.

(4) Gender; Gender information of cardholders.

(5) Telephone number: the cardholder's telephone number, which is reserved when the cardholder registers. You can contact the cardholder according to the telephone number.

(6) ID number; Cardholder's ID number.

(7) Remarks: Other information of cardholder.

The attributes and columns of each information in the database are shown in Figure 1.

Fig. 1 Each column properties database

III. SCHEME DESIGN

The purpose of this experiment design is to get familiar with serial port connection and database connection codes through practice, and show them through appropriate ways. In the design, data transmission is the focus of this experiment, such as serial port selection, connection code and data sending and receiving, all of which need to be tested by analog serial port and serial port debugging assistant to ensure that the data is correct. The principal block diagram of this experiment is shown in Figure 2.
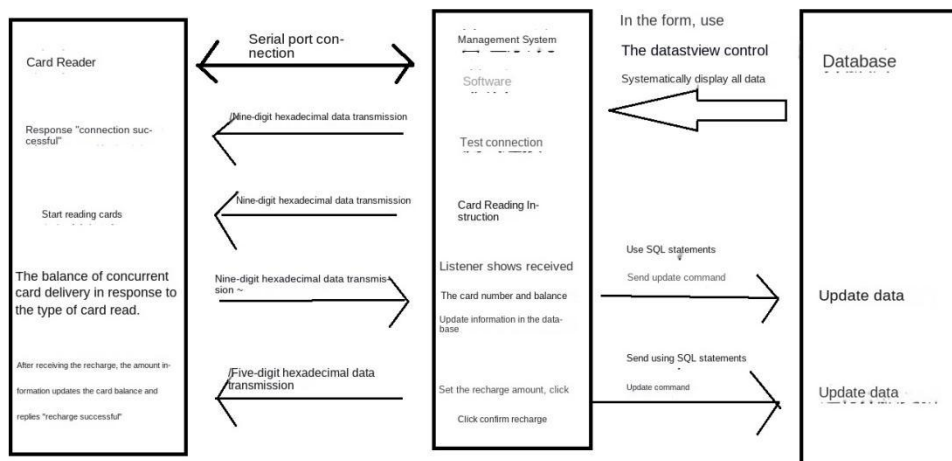

Fig.3 Schematic diagram of the system operation instruction

VI.SYSTEM SOFTWARE DESIGN

In the process of developing the bus card management system, one of the most important requirements is that the developed system must be simple to use. On the basis of simplicity and practicality, there are some other

necessary requirements for the system.

The performance of a designed bus card management system must have certain stability. The running foundation of the whole bus card system must have a reliable running environment. The bus card management system must be able to backup and restore the database. This function can ensure that the database can be restored at the first time when the system has problems, and reduce the losses caused by the failures. A good bus card management system must have certain response ability. The reaction time of the system should also be as short as possible.

4.1 User information management module

The administrator can browse the information of all cardholders on this page, which contains functions such as adding user information, modifying user information, deleting user information, querying user information, and many jumping interfaces. It is one of the core pages of this system, and most of the operations about the database are completed on this page. The user information management interface is shown in Figure 3.
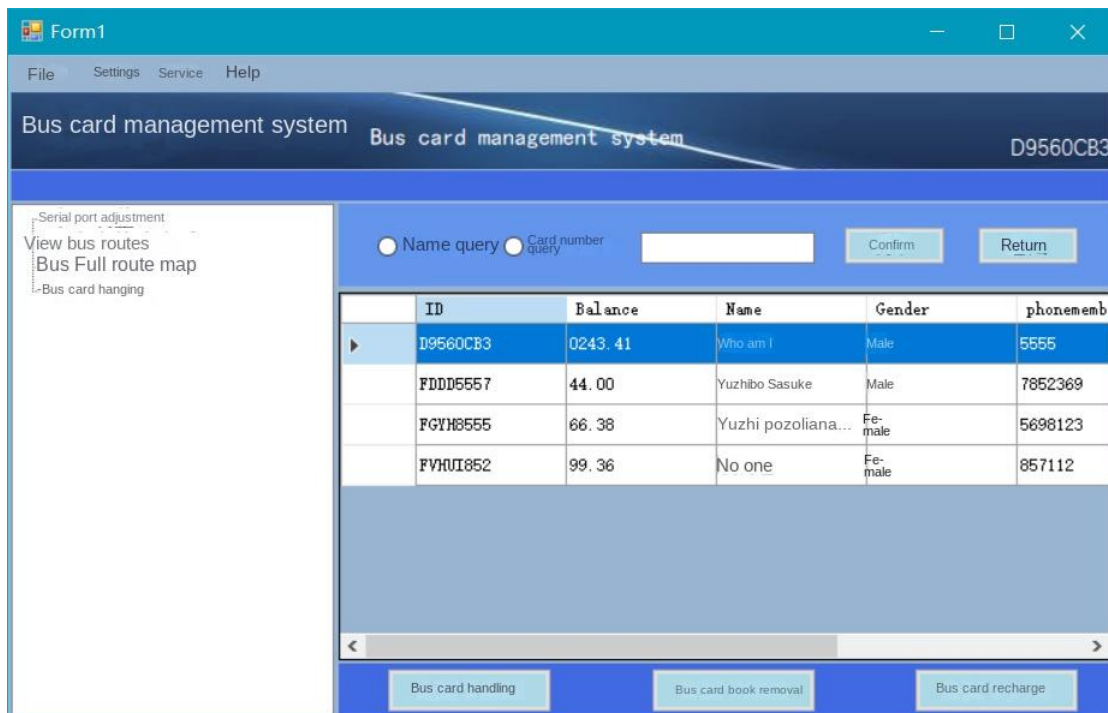

Fig 3 User information management interface

4.2 Bus Card Handling Function Module

The user registration page is a necessary function when handling the bus IC card for the user. When entering the page, the user is required to enter the required information such as name, gender, telephone number, ID number, etc. If the required information content is blank, it will prompt that the data that has not been filled in cannot be blank. When the information is filled in, click the Confirm Add button to complete the registration, so as to add an input data in the database and jump to the information list interface. When the user clicks the Cancel Add button, the registration page will jump back to the information management page. As shown in Figure 4.

Fig. 4 User registration interface

4.3 Serial connection module

The serial connection page is also one of the core pages of this system. The supervisor of the serial connection page makes serial connection and communication through the card reader connected to the USB port. Read the card number from the card reader for deduction, recharge the IC card, update the wrong IC card balance data, etc. All operations need to be completed through this page.

4.3.1 Serial Communication Protocol

Serial communication protocol is serial communication, which means that the serial port sends and receives bytes bit by bit. Although the serial communication of bits and byte is slow, the serial port can use one line to send data and another line to receive data. Serial communication protocol refers to the specification that specifies the content of data packet, including start bit, main data, check bit and stop bit, and both parties need to agree on the same data packet format in order to send and receive data normally.

The essential function of serial port is to act as a coding converter between CPU and serial devices. When data is sent from CPU through serial port, byte data is converted into serial bits; When receiving data, serial bits are converted into byte data. To use serial port for communication, the application program must apply for resources to the operating system (open the serial port) before use, and release the resources (close the serial port) after the communication is completed. Usually, the serial port is used for the transmission of ASCII characters. The most important parameters of serial communication are as follows:

Baud rate: its expression is a parameter to measure the communication speed, which indicates the number of bits transmitted per second. Because there is no clock signal in serial communication, the communication parties need to agree on the baud rate, that is, the length of each symbol, in order to decode the signal. The common baud rates are 4800, 9600, 115200, etc.

Data bits: Data bits are parameters that measure the actual data bits in communication. When a computer sends a packet, the standard values are 5, 7 and 8 bits. How to set it up depends on your needs.

Start bit, stop bit and parity check: the data packet starts at the start bit and ends at the stop bit. The start signal is represented by logical 0 data bits, and the stop signal is represented by 0.5, 1, 1.5 or 2 logical 1 data bit, as long as both parties agree. The start bit is used to indicate the first bit of a single transmitted data, and the stop bit is used to indicate the last bit. The start bit and the stop bit not only indicate the beginning and end of transmission, but also provide the opportunity for the upper computer to check the data.

For example, if the start bit is the same, start reading the card, and if the stop bit is different, stop reading the card. This can effectively correct the error and avoid receiving the wrong content sent by the system in the transmission process, such as. Parity bit is a simple error detection method in serial communication. There are four error detection methods-even, odd, high and low, or no parity bit.

These parameters must match for the two ports passing through. In this experimental design, we adopt the data specification that the received data is hexadecimal nine digits, including one start bit, one stop bit, four IC card numbers and three balance data. When we recharge, the data sent is of four bits (including a start bit and three data bits).

4.3.2 Serial port connection page

The serial port page is the serial port selector and baud rate selector at first. When you click serial port detection, the system will automatically detect the serial port connected to the computer. After selecting the serial port connected to the card reader, you can successfully connect with the card reader by setting the baud rate to the default 115200. After selecting serial port connection, you can send data to and from the card reader after the connection test is successful. The data transmission can be viewed in real time by the device connection viewer machine, i.e., the listener, made by textbox control on the right. When the back button is clicked, the program will return to the information list interface.
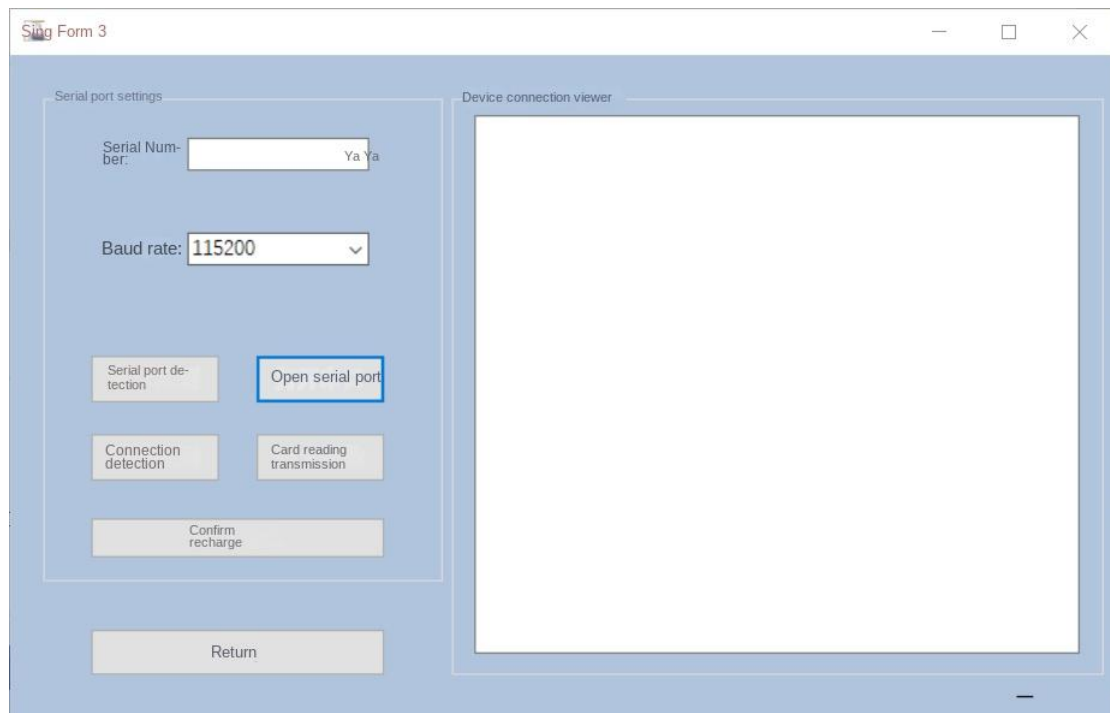The specific interface layout is shown in Figure 5.

Fig. 5 Serial connection interface

4.4 Recharge system module

The system module can mainly recharge the bus card, and query and count the recharge information after recharging.
In the information list interface, first click on the bus card to recharge, and the hidden panel containing the recharge system will jump out. After entering the recharge amount and clicking OK, jump to the serial connection page and click OK to recharge again. If you receive a voice broadcast, the recharge will be successful. After successful recharge, the page jumps to the card information list of the bus card, and displays the card information after recharge. The recharge interface is shown in Figure 6.
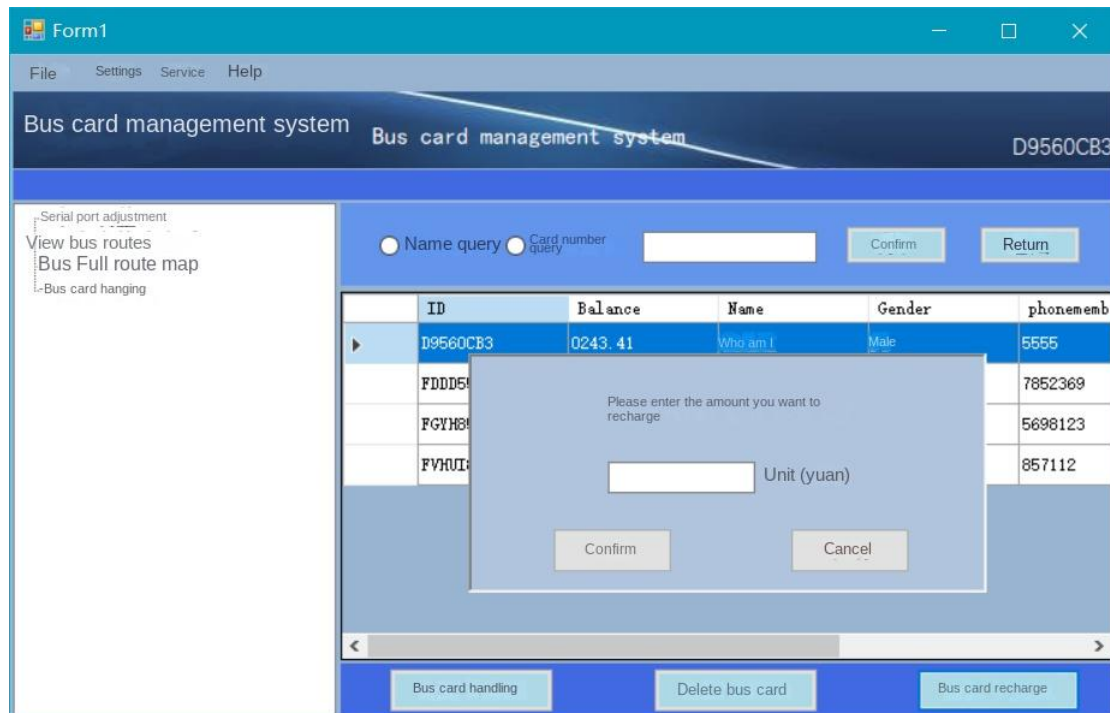
Fig. 6 recharge system interface

SYSTEM TEST

The steps for bus card management and bus card recharge are as following:
(1) Serial connection: when the bus card is charged or recharged, the card reader connected to USB should be turned on first, and the data can be transmitted only after the connection is checked correctly. The data transmission process can be assisted by the serial simulator and serial debugging assistant to debug the system software.
(2) Bus card recharge: the user can recharge the bus card by inputting the correct bus card number and recharge fee; otherwise, it will be prompted that the bus card number does not exist and cannot be recharged.
(3) Bus card inquiry: You can choose to enter the correct bus card number and or the cardholder's name to inquire the bus card, which is convenient for administrators to modify and delete data.
(4) Bus card addition: through the information provided by the user, the administrator can complete the addition of the bus card by entering the registration information, and the user can use the bus card normally. This function strictly requires the user to provide correct information before adding, otherwise, the addition cannot be completed.
(5) Delete the bus card: After the administrator selects the unnecessary IC card for deletion, all information will be deleted in the database as well.
Test process: first open the software, detect and connect the serial port connected by the card reader on the serial port connection page, then click to open and connect the serial port, and wait for the card reader to send a voice prompt of "successful connection" for the next operation. After successful connection, click Receive Data. At this time, the card reader can read the card number and balance in the IC card and display it on the monitor.
After testing, the program can fulfill the intended function. And there are no other abnormalities and errors, and the program can run normally. However, the process of the bus card is not well considered in the program, such as the charging and usage rules of the bus card, the function debugging sequence and the numerical display. We need to learn slowly in future practice, and then do more optimization on the system.

VI. CONCLUSION

The IC card control system of public transportation completed in this paper greatly simplifies the work of charging, selling and recharging cards in the public transportation industry, and is more open. The automatic recharge and charging process of contactless IC card takes a short time, which greatly improves the work efficiency and reduces the burden of staff. In addition, the service life of the contactless IC card is long, so it is unnecessary to change the card frequently. This kind of toll collection system based on contactless IC card has a wide application prospect.

REFRENCES

[1]. ogin 1based remote -card-CI na fo tnemecnahne ytiruceS"[2007] .Chen Chang-San Lee and Chin-Jung ,Fang Cheng-Ting .118-101.pp,9Issue :51 .Vol ,mechanism"Computer Networks

[2]. ,et ,Salah Mandil ,Takashi Takahashi ,Arwa Alkhateeb[2004] "Computer Methods ,The changing role of health care IC card systems Vol ,and Programs in Biomedicine. 60: September ,2Issue

[3]. Hung .H.Y,. ,Chang .H .Huang and C .L.M [2006]"oIC for micro HDD process based on Taguchi methods ptimizing the controller", Vol ,Microelectronics and Reliability.46 : .7Issue

[4]. ,Microcontroller Thorough Research Practice 8051.Lin Shenmao [2004], "s Post and Telecommunications Publishing House'People"

[5]. HU Xuehai.[2005] " Microcontroller principle and application systemdesign" Publishing House of Electronics Industry

[6]. ..ZHANG Yigang[2004], "Harbin Institute of Technology Press ,The principle of microcontroller is extremely applicable"