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Enhancing Rail Transit Efficiency through the Integration of Internet Payment and Automatic Fare Collection Systems

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Abstract: With the advancement of Internet payment technology, its application has extended beyond everyday transactions and consumption to infiltrate the rail transit industry. The integration of intelligent payment systems, grounded in Internet technology, is set to become increasingly significant within this sector. In addressing the technical challenges inherent in current systems, an intelligent mobile ticketing and payment system utilizing two-dimensional (2D) codes has been introduced, facilitating convenient rail transit payments through 2D code technology.

Keywords: Internet payment; afc system; two-dimensional code ticket; nfc.

1. Internet Payment

With the development of Internet technology, Internet payment, as an emerging micropayment method, has been recognized by the general public, and the coverage of its payment application is increasing. Internet payment is a form of online transaction, mainly in the form of online banking.Third party paymentMobile payment as an Internet payment. Internet payment belongs to the kind that requires special "care". Because at the micro level, Internet payment directly involves the personal interests of users, such as the security of the property, from the macro level, it is also related to national finance. The stability of the system.

At present, in addition to typical online shopping applications, Internet payment functions are gradually developing into finance, transportation, and life services. From the current application of other industries, the combination of Internet payment and traditional consumer industries has a certain society for both parties. Benefits and economic benefits.

2. Afc System

The full name of the afc system isAutomaticFare Collection System, which is centrally controlledby a computerAutomatic ticketing(including semi-automatic ticketing), automatic ticket checking, and closed automation network system for automatic charging and statistics.

In the field of public travel, urban rail transit is a convenient and fast public transport vehicle with high carrying efficiency, which can greatly improve the travel sharing rate of public transportation. At present, the domestic urban rail transit network has basically realized afc automatic. Coverage of the ticket inspection system. With the development of Internet paymenttechnology, Internet payment technology is not only widely used in the daily payment and consumption field, but also gradually develops into the rail transit industry. The application of intelligent payment technology based on Internet technology will be applied in the rail transit industry. It has an increasingly important position. The main applications of smart payment technology in rail transit are the following two

scenarios: Scene 1, Internet electronic payment, purchase of subway one-way ticket, the main forms are "online purchase, offline ticket collection", on-site When purchasing tickets, use Internet electronic payment instead of cash payment; scenario 2, smart payment directly through the gate.During the peak hours of rail transit, the passenger flow is large and the order is not easy to maintain. The smart payment directly in the above scenario 2 will significantly improve the passenger flow speed, reduce the backlog of personnel, reduce traffic pressure, and effectively reduce passengers' automatic ticket sales. The queuing time in front of the machine saves passengers' time and costs, and reduces the pressure on the operating organization. The above payment method enables passengers to travel without having to carry cash to purchase tickets and improve the passengers' travel experience. Therefore, the payment method in scenario 2 has a broad Market prospects. Passengers have high demand for the application of emerging payment technology in rail transit. The demand of passengers determines the flexibility and diversity of the rail transit ticketing system. It is currently the combination of rail transit network operation and information age. At the stage, the diversity of external payment environment and the rapid development of new technologies and new industries have put forward new requirements for the development of the rail transit industry.

3. Nfc Function

The popularity of smart phones also facilitates smart payment for rail transit. Smartphones usually have NFC function. NFC is the abbreviation of Near Field Communication, which is short-range wireless communication technology. NFC developed by Philips and Sony is a kind of non- Contact recognition and interconnection technology enables close-range wireless communication between mobile devices, consumer electronics, PCs, and smart control tools. Simply put, what is the nfc function? What is the use of the nfc function? In fact, NFC provides aA simple, touch-based solution that allows consumers to exchange information and access content and services simply and intuitively. NFC technology allows non-contact point-to-point data transmission between electronic devices, exchanging within ten centimeters (3.9 inches) Data, its transmission speed is 106Kbit / sec, 212Kbit / sec or 424Kbit / sec. By understanding what nfc function is, we have a deeper understanding of mobile payment, mobile phone swipe, etc.

NFC-enabled devices can exchange data in active or passive mode. In passive mode, devices that initiate NFC communication, also known as NFC-initiated devices (master devices), provide RF-fields throughout the communication process. Another device, called an NFC target device (slave device), does not have to generate a radio frequency field, but uses load modulation technology to transmit data back to the initiating device at the same speed. This communicationmechanism is based onISO14443A, MIFARE and FeliCaContactless smart cardCompatible, therefore, the nfc initiator device in passive mode can use the same connection and initialization process to detect and establish contact with the contactless smart card or nfc target device.

4. Design of the Ticket Payment System

4.1. Design Content

In order to solve the technical problems existing in the prior art, the present invention provides an intelligent mobile ticket payment system based on two-dimensional code, which realizes convenient payment of rail transit based on two-dimensional code.

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based on Internet technology will be applied in the rail transit industry. It has an increasingly important position. The main applications of smart payment technology in rail transit are the following two scenarios: Scene 1, Internet electronic payment, purchase of subway one-way ticket, the main forms are "online purchase, offline ticket collection", on-site When purchasing tickets, use Internet electronic payment instead of cash payment; scenario 2, smart payment directly through the gate.

During the peak hours of rail transit, the passenger flow is large and the order is not easy to maintain. The smart payment directly in the above scenario 2 will significantly improve the passenger flow speed, reduce the backlog of personnel, reduce traffic pressure, and effectively reduce passengers' automatic ticket sales. The queuing time in front of the machine saves passengers' time and costs, and reduces the pressure on the operating organization. The above payment method enables passengers to travel without having to carry cash to purchase tickets and improve the passengers' travel experience. Therefore, the payment method in scenario 2 has a broad Market prospects. Passengers have high demand for the application of emerging payment technology in rail transit. The demand of passengers determines the flexibility and diversity of the rail transit ticketing system. It is currently the combination of rail transit network operation and information age. At the stage, the diversity of external payment environment and the rapid development of new technologies and new industries have put forward new requirements for the development of the rail transit industry.

The technical solution adopted by the present invention to solve the technical problems existing in the prior art is: a smart mobile ticket payment system based on two-dimensional code includes a microprocessor; and includes a ccd camera, an lcd display, a sdram synchronous dynamic random access memory, and a flash. a memory, the ccd camera is electrically connected to the microprocessor through a video decoding circuit, the lcd display, the sdram synchronous dynamic random access memory and the flash memory are electrically connected to the microprocessor; and the clock and the watchdog circuit are further included, the clock and The watchdog circuit is electrically connected to the microprocessor.

This design provides a smart mobile ticket payment system based on two-dimensional code. It uses dynamic QR code as the ticket card medium to realize a new payment method, especially for mobile devices without nfc components. Safe payment method.

Also includes a power supply and reset circuit, the power supply and reset circuit are electrically connected to the microprocessor.

4.2. Implementation

In this embodiment, the intelligent mobile ticket payment system further includes a power supply and a reset circuit, and the power supply and the reset circuit are electrically connected to the microprocessor.

The intelligent mobile ticket payment system generates an encrypted two-dimensional code by using a specific app, and the passenger enters the track of the rail transit to scan and read the two-dimensional code information, and after passing through the system safety certification, conforming to the passing standard, the passenger is released and released. Use the same method to generate the QR code to scan out the gate. The system financial information QR code data information is uploaded to the clearing center, the clearing center matches the relevant inbound and outbound data to determine the fare, and finally from the passenger's registered account. Complete the deduction.

The cost of the two-dimensional code is very low, and the key is updated online in a certain period. Since the two-dimensional code can be copied and forwarded, it is necessary to solve the problems of security authentication, effective time limit, copying counterfeiting, etc. in the process of using the two-dimensional code payment. It realizes that the mobile device (mainly mobile phone) can be turned over without using the nfc function. It is a one-way process and can be used by smart phones.

The use process is divided into mobile end process (passenger) and equipment end process (gate):

Mobile terminal process,

(1) Start and obtain its own public key from the file certificate;

(2) identifying the two-dimensional code a generated by the device end;

(3) decrypting the information of the two-dimensional code a using the device public key, and acquiring the random number and the local station information generated by the device end;

(4) Debiting the wallet;

(5) Combine the deduction information, the wallet serial number and the random number, and use the mobile phone private key to sign, and generate the corresponding two-dimensional code b to display on the mobile phone;

(6) End.

Device-side process,

(1) Start and detect whether there is a mobile phone insertion, if the mobile phone is not detected, repeat the detection step;

(2) If the mobile phone is detected, a random number is generated, and the random number, site information and the like are digitally signed by the device private key to generate the above two-dimensional code a;

(3) The camera of the device (ccd camera) collects the two-dimensional code b displayed on the mobile phone end;

(4) Verify the deduction information, compare whether the random numbers are consistent, if they are consistent, release them, if they are inconsistent, generate an alarm prompt;

(5) End.

5. Conclusion

This thesis expounds a two-dimensional code-based intelligent mobile ticket payment system, which uses dynamic two-dimensional code as the ticket card medium to realize a new payment method, especially for mobile devices without nfc components. Safe payment method can significantly improve the passenger flow speed, reduce the backlog of personnel, reduce traffic pressure, effectively reduce the queue time of passengers in front of the automatic ticket vending machine, save passenger time cost, and reduce operational organization pressure.

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