Design and Implementation of Intelligent Checkout System Based on RFID

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Abstract

As the saying goes, "hunger breeds discontentment, eating is the most important part of people's life. But in our campus life, queuing, queue jumping, canteens crowded, has become the most common picture. In order to solve the problem of canteen congestion, a smart checkout system based on RFID technology is proposed in this project. In the smart disk tableware bottom implantation of RFID chip card reader at checkout area implantation through the label, reader and antenna for data acquisition and analysis, information will be transmitted to the computer, anti-collision algorithm using multi label data processing, after processing after displayed on a display screen, thus completing the quick closing function, accelerate the efficiency of queuing the meal. The system can be time-consuming and inaccurate problems of colleges and universities to help solve the artificial meal sale process, the maximum extent to the special period restaurant crowding, has great significance and broad application prospect.

Keywords

Checkout, Fast, RFID Technology.

1. Introduction

As the saying goes, "food is the most important part of people's lives". But in our campus life, queuing in line, crowded canteen has become the most common picture. Some students often because the cafeteria queue time is long, and delayed early self-study. In the middle and dinner, many students often choose to eat take-out because of this situation in the canteen. However, the hygiene of take-out food and other conditions are not optimistic. Long-term consumption will do harm to our health.

In order to improve this situation and enhance students' dining experience, it is undoubtedly a good choice to develop a set of fast checkout system. In addition, adopting such a system can not only facilitate the management of the canteen, but also facilitate a more reasonable allocation of resources and personnel. Peak dining queuing crowded phenomenon, at present through analyzing existing supermarket invoicing system understanding, using RFID technology, microcontroller technology and application, etc., in combination with multiple tag collision algorithm, put forward an intelligent checkout system based on RFID, intelligent design and development of a complete set of the checkout process, so as to realize quick checkout.

2. Major technologies RFID

RFID technology is a kind of technology that can automatically identify specific targets through radio frequency signals without manual contact and optics, so as to obtain electronic tag information and complete information input and processing. RFID technology has the advantages that bar codes do not have, such as the ability to read or modify multiple tags at one time, long reading distance, fast

reading speed, high security, large amount of data storage, strong adaptability to the environment, etc., which can well solve the problem of waste of time caused by queuing.

2.1 Data collection (RFID card)

RFID chips are implanted at the bottom of each tableware of smart plate matching tableware, according to the three components of RFID: Tags, reader and antenna, RFID card as an electronic tag is used in the project, the RFID reader has multiple antenna connection, the antenna and the tag respectively built with different dishes and staples at the bottom of the small plate, when after the RFID card (RFID) to read and write device, speaking, reading and writing sent by antenna rf signal, read data stored within, at the same time, RFID card chip information through radio frequency induction current electricity began to information processing, digital signal into the read/write device to achieve the goal of fast complete checkout.

After the rf acquisition card is made, each rf acquisition card has a unique identification, which is determined by the uniqueness of the chip of the rf acquisition card. Each chip has its own unique code. For this unique code, the user can write relevant information, which is the basic information of the user, in order to display the system after the user passes the rfid and facilitate the interaction with the personnel, and the identification code is the medium of interaction with the machine. When transmitting information, there are communication protocols and rules between the system and the rf acquisition equipment, through which the corresponding data are decoded and processed, so that the rfid acquisition card can realize the process from recognition to information confirmation.
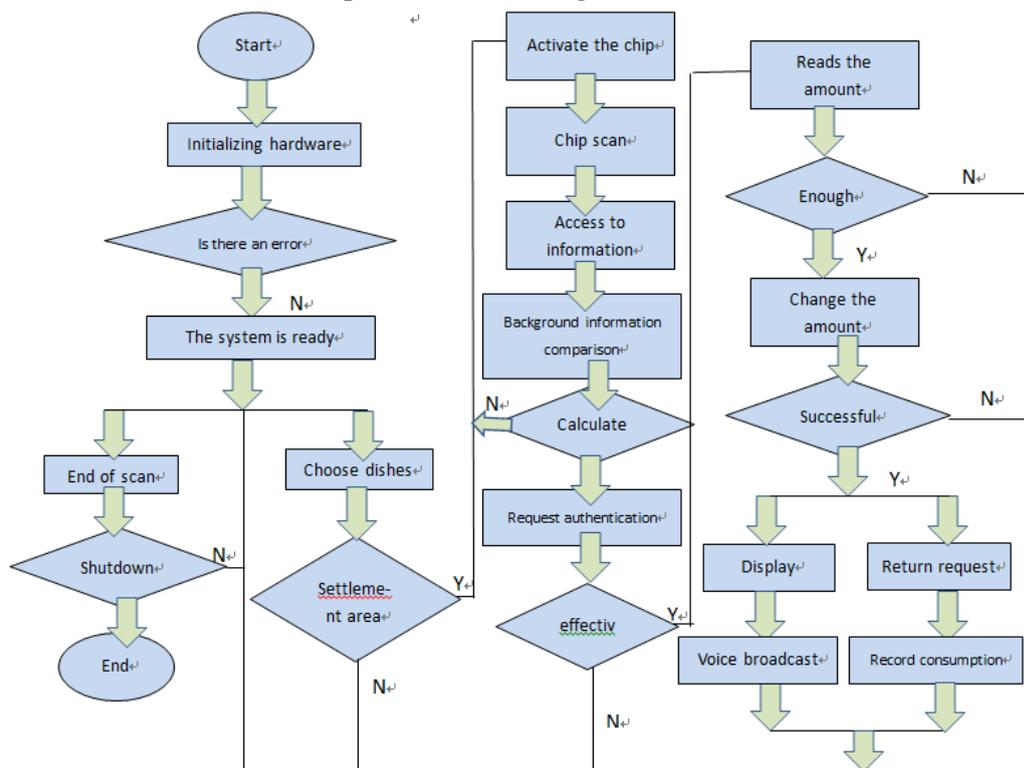
Fig. 1 New dish registration flow chart

When the intelligent plate with chip at the bottom enters the settlement area of the table, the reader built into the settlement area of the table emits electromagnetic wave outwards. The wave frequency is the same as the circuit frequency of the chip at the bottom of the table. Therefore, the circuit resonates, so that the capacitor has charge and inducted current. The current enables the chip to obtain energy and activate the information, such as its own encoding, to be sent out or received from the reader through the built-in sending antenna.

For the newly developed recipes and new dishes, RFID card registration is also required. The process is: system initialization, reading the card number of the video card, whether to register the new card,

after confirming the success of reading the electronic tag, assigning the card (price) to show the success of registration. The flow chart is shown in figure 1:

2.2 The data processing

In data processing, because of the RFID application system within the scope of a reader antenna effect, often there are multiple tags at the same time, after sending the query command when the reader, tend to cause multiple tags at the same time response, the response information on Shared wireless channel collision, the response signal is difficult to be reader to recognize, that cause more tag collision. In order to complete the recognition of all tags, the reader should distinguish these colliding tags and communicate with them one by one. The algorithm used by the reader to complete these tasks is the multi-tag anti-collision algorithm. In order to improve the recognition rate of readers when multiple tags are involved in recognition, the multi-tag collision prevention algorithm can improve the accuracy of the total price after ordering and avoid errors caused by collision in multi-tag recognition.
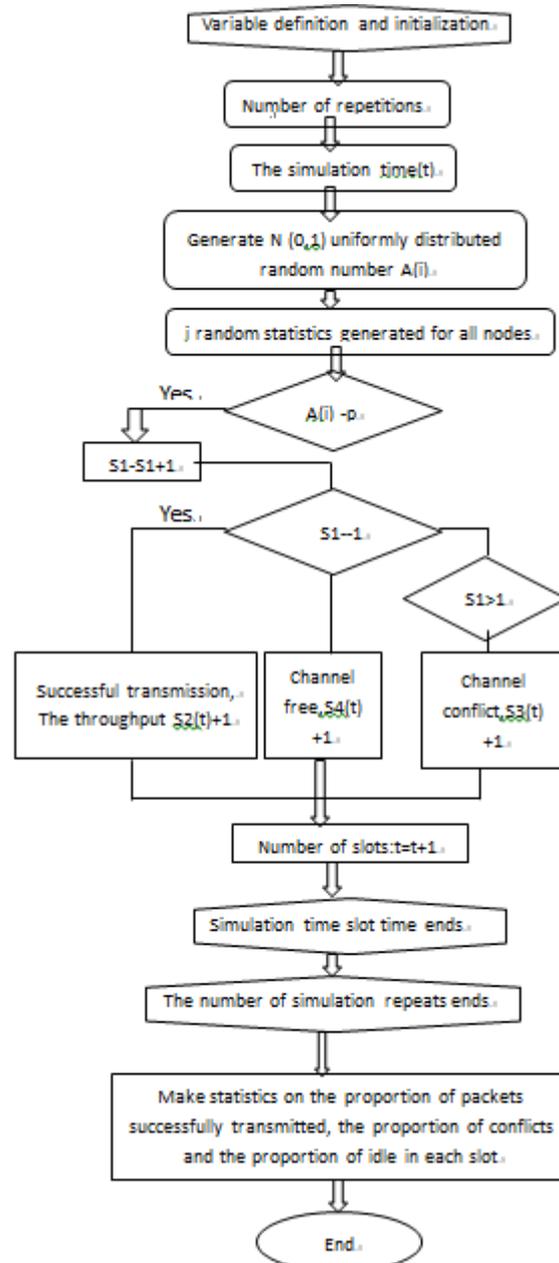
Fig. 2 Time slot ALHOA simulation process

In order to improve the throughput of the access system, the time can be divided into equal time slots, denoted as T0, and the data frame can only be sent at the beginning of the time slot, which is called ALOHA method. When a group arrives at a time slot, it waits for transmission until the next time slot

begins and expects no conflict with other sites. If only one site arrives in a time slot, the group will be transmitted successfully. If more than one group arrives, a collision will occur. The process is shown in figure 2.

In this way, the label is either successfully sent or completely conflicted, avoiding partial conflict of ALOHA method and halving the conflict cycle to T0. However, it has the disadvantage of requiring synchronization of the clock, and the tag can calculate the time slot. The conflict period of ALOHA method is halved, so the relationship between throughput and input load can be obtained as follows

$$S=Ge-G$$

According to the above formula, the maximum throughput rate (S) of packets exchanged at G 1 is 36.8%. Therefore, because of this simple improvement, channel utilization can be doubled. Just like ALOHA, after collision, tags are distributed and redistributed after random delay. The throughput rate S of slot ALHOA system reaches its maximum when the packet quantity G is about 1. If there are many tags in the scope of the reader, if there are already labels that exchange packets in this slot, and additional tags arrive, the throughput rate quickly approaches 0. In the worst case, multiple searches may fail to find the serial number because no unique tag can be sent in a single slot. Therefore, enough time slots need to be prepared, which reduces the performance of anti-collision algorithm.

3. Data display (smart settlement desk)

Intelligent plate settlement platform adopts integrated design, plane integration of radio frequency reading and writing device, card reader, display screen and other equipment, can realize the rapid identification of tableware entering the settlement area in batches. With the tableware of chips into the magnetic field, to receive special radio frequency signal from the reader, can rely on energy gained by the induced current send product information, stored in the chip reader information and decoding, sent to the central information system on data processing, and through the settlement software display on the LCD screen. When the intelligent plate with chip at the bottom enters the settlement area of the table, the reader built into the settlement area of the table emits electromagnetic wave outwards. The wave frequency is the same as the circuit frequency of the chip at the bottom of the table. Therefore, the circuit resonates, so that the capacitor has charge and inducted current. The current enables the chip to obtain energy and activate the information, such as its own encoding, to be sent out or received from the reader through the built-in sending antenna.

4. Hardware design module

According to the intelligent settlement system should have the function and management medium (rf card) to determine, and then according to the overall system frame diagram and system flow chart, we design the hardware system of the intelligent settlement system block diagram, the whole design strive to introduce, enough, open, modular design ideas. The hardware circuit of the system is divided into microprocessors composed of STC11F60XE single-chip microcomputer MUC, FT232RL download interface conversion circuit, USB interface circuit, keyboard input circuit, reset circuit, buzzer circuit, RFID read-write driver consumer card circuit, bluetooth technology extension circuit, LED display circuit and LCD12864B liquid crystal display circuit. The block diagram of hardware basic structure of intelligent settlement system is shown in figure 3:
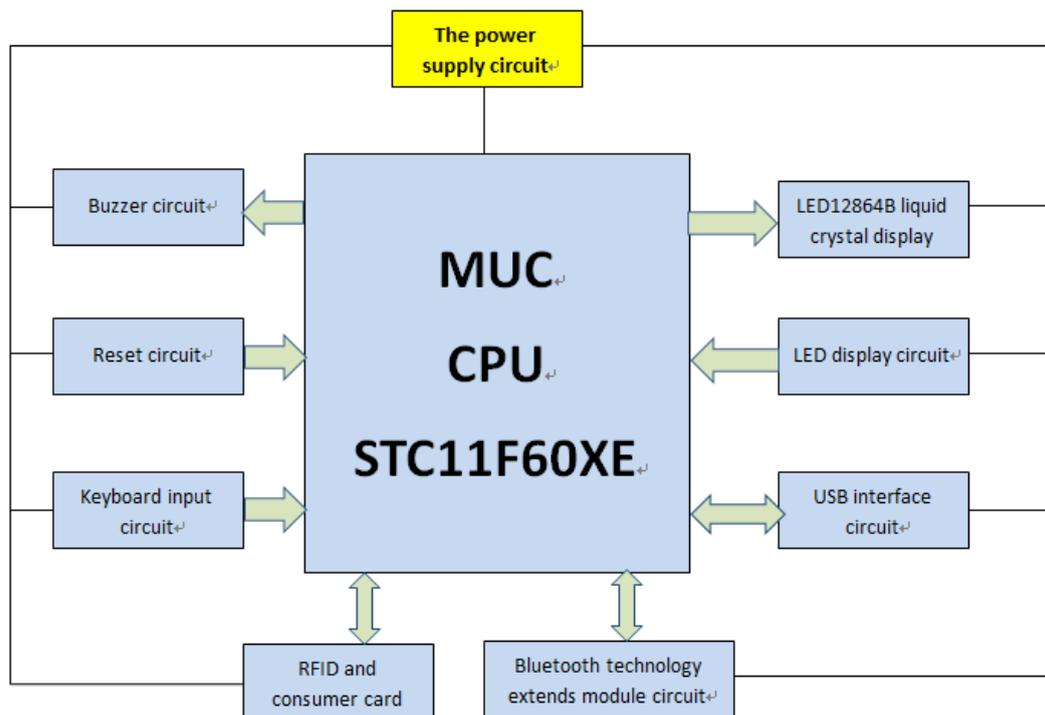
Fig.3 Intelligent settlement system hardware basic structure block diagram

5. Conclusion

Compared with traditional check-out queues, the intelligence of the system based on RFID invoicing system can maximize the checkout time, improve the restaurant's work efficiency and save labor quantity, reduce operating costs, enhance the performance of management, improve service quality, which fully embodies the intelligence in the application of life, realize the man-machine interaction very well.

Acknowledgments

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