

Design related to home life based on RFID technology

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Abstract

This article will complete how to make a simple access control system that can be used in home life. From the basic smart card (IC card), the theoretical knowledge of RFID technology, the hardware introduction to STC89LE52RC, MFRC522 chip, and finally the program is written. Since it is an access control system installed at home, It can realize the information reading of IC card, LCD display, key password authentication, simple operation of password modification, and the cursor shift and confirmation function through the key. Avoid returning home to use the key to use the key to the case where the key cannot enter the house. Although there are only three buttons, one-button is multifunctional, but is still higher than the key, it is still more efficient and more security..

Keywords

RFID technology, STC89LE52RC, MFRC522, access control system.

1. Introduction

Smart card, namely integrated circuit card (ICC), is a card made by embedding one or more integrated circuit chips on a plastic substrate. The integrated circuit in the card has the functions of data storage, calculation and judgment, and can exchange data with the outside. The overall dimension of the card conforming to the definition of ISO ID1 is 85.6mm × 53.98mm × 0.76mm, which is the same as the magnetic card used by banks, but can also be encapsulated into special shapes such as radio frequency tags, buttons, keys, ornaments, and collectively referred to as smart (IC) cards[1-10].

Before the introduction of smart cards, from a worldwide perspective, magnetic cards have been widely used. In order to make a smooth transition from magnetic cards to smart cards, and also for compatibility, magnetic strips are usually still pasted on smart cards. For this reason, the position of integrated circuit chips encapsulated in cards is limited by the position of magnetic strips. Figure 1-1 shows the appearance of the IC card. The small box in the middle of the front is packed with integrated circuit chips, and the signature bar is below it; The bottom part is the embossed character, which is used to stamp the bill; There is a magnetic strip on the upper part of the back. The front can also be printed with various words, patterns, photos, etc[9-15]. The size of the card, the position and purpose of the contact, the position of the magnetic strip and the data format are clearly specified in the corresponding international standards. There is no doubt that the smart card itself cannot be directly used alone. It must be combined with relevant equipment to jointly form an application system that meets certain requirements. Then, what constitutes a complete smart card application system, and what kind of structure mode can be adopted. A standard smart card application system, the most basic components are: smart card, smart card interface device (smart card reader and writer), microcomputer system, and larger systems also include communication network and host computer.

Radio Frequency Identification (RFID) is a kind of automatic identification technology. It uses radio frequency to conduct non-contact two-way data communication, and uses radio frequency to read and write recording media (electronic tags or radio frequency cards), so as

to achieve the purpose of identification and data exchange. It is considered as one of the most promising information technologies in the 21st century[12-19].

Radio frequency identification technology realizes non-contact two-way communication through wireless wave non-contact fast information exchange and storage technology, wireless communication combined with data access technology, and then connects to the database system to achieve the purpose of identification. It is used for data exchange and connects an extremely complex system. In the recognition system, the reading, writing and communication of electronic tags are realized through electromagnetic waves. According to the communication distance, it can be divided into near-field and far-field. Therefore, the data exchange mode between the reading/writing device and the electronic tag is also divided into load modulation and backscatter modulation correspondingly[20-23].

The basic working principle of RFID technology is not complicated: after the tag enters the reader, it receives the RF signal sent by the reader, and sends the product information stored in the chip (passive tag, passive tag or passive tag) with the energy obtained by the induction current, or the tag actively sends a signal of a certain frequency (active tag, active tag or active tag), and the reader reads the information and decodes it, Send to the central information system for relevant data processing[24-26].

A complete RFID system is composed of a reader and an electronic tag, namely the so-called transponder and application software system. Its working principle is that the reader transmits radio wave energy of a specific frequency to drive the circuit to send out the internal data. At this time, the reader will receive and interpret the data in order and send it to the application for corresponding processing. The communication and energy sensing between RFID card reader and electronic tag can be roughly divided into inductive coupling and backscatter coupling. Generally, the first mode is used for low-frequency RFID, while the second mode is used for high-frequency RFID. The reader can be a read or read/write device according to the structure and technology used. It is the information control and processing center of the RFID system. The reader is usually composed of coupling module, transceiver module, control module and interface unit. The half-duplex communication mode is generally adopted between the reader and the tag for information exchange. At the same time, the reader provides energy and timing for the passive tag through coupling. In practical applications, the collection, processing and remote transmission of object identification information can be further realized through Ethernet or WLAN[27-36].

2. Common chips for smart home

MF RC522 is a member of the high integration read-write card series chips used in 13.56MHz contactless communication. It is a low voltage, low cost and small size non-contact read-write card chip launched by NXP for the "three meters" application. It is a good choice for the research and development of smart instruments and portable handheld devices. MF RC522 utilizes advanced modulation and demodulation concepts and fully integrates all types of passive contactless communication modes and protocols at 13.56MHz. Support multi-layer application of ISO14443A. The internal transmitter part can drive the communication between the reader antenna and the ISO 14443A/MIFARE card and the transponder without other circuits.

As a new member of the 13.56MHz high integration read-write card family, MF RC522 has many similarities with MFRC500 and MF RC530, but also has many characteristics and differences. The communication between it and the host adopts serial communication with less connections, and one of SPI, I2C or serial UART (similar to RS232) modes can be selected according to different user needs, which is conducive to reducing the connection, reducing the volume of PCB board and reducing the cost. The receiver part provides a robust and effective demodulation and decoding circuit for processing the ISO14443A compliant transponder signal.

The digital part processes ISO14443A frames and error detection. In addition, it also supports fast CRYPTO1 encryption algorithm for verifying MIFARE series products. MFRC522 supports MIFARE's higher speed contactless communication, and the bidirectional data transmission rate is up to 424kbit/s.

STC89C52 is a low-power, high-performance CMOS 8-bit microcontroller produced by STC, with 8K byte system programmable flash memory. STC89C52 uses the classic MCS-51 core, but many improvements have been made to make the chip have the functions that the traditional 51 single-chip microcomputer does not have. On a single chip, it has a smart 8-bit CPU and in-system programmable Flash, which makes STC89C52 provide a highly flexible and efficient solution for many embedded control application systems. It has the following standard functions: 8k byte Flash, 512 byte RAM, 32-bit I/O port line, watchdog timer, built-in 4KBEEPROM, MAX810 reset circuit, three 16-bit timers/counters, a 6-vector 2-level interrupt structure, and a full-duplex serial port.

The 128×64 with Chinese font on the LCD12864 chip is a kind of dot-matrix graphic LCD display module with 4-bit/8-bit parallel, 2-line or 3-line serial interfaces, and contains the national standard level 1 and level 2 simplified Chinese font; Its display resolution is 128 × 64, built-in 8192 16 * 16-point Chinese characters and 128 16 * 8-point ASCII character sets. With the flexible interface mode and simple and convenient operation instructions of the module, the human-computer interactive graphic interface in Chinese can be formed. 8 can be displayed × 4 lines 16 × 16 dot matrix Chinese characters. The graphic display can also be completed. Low-voltage and low-power consumption is another notable feature. Compared with the same type of graphic lattice LCD module, the LCD display scheme composed of this module is much simpler regardless of the hardware circuit structure or display program, and the price of this module is also slightly lower than that of the graphic lattice LCD module of the same type. One hundred and twenty-eight × There are three kinds of controllers for 64 dot matrix LCD, namely KS0107 (KS0108), T6963C and ST7920. The main difference between the three controllers is that the KS0107 (KS0108) does not have any font, and the T6963C has ASCII code. If the first two LCDs are used to display Chinese characters, they need to use the font software to extract the Chinese characters and then compile them to display them, while the ST7920 has a national standard second-level font (about 8000 Chinese characters), which can automatically display Chinese characters. Therefore, 12864 using ST7920 controller is more popular when Chinese characters need to be displayed.

3. Introduction to common software

KeilVision4 was released in February 2009. KeilVision4 introduced a flexible window management system, enabling developers to use multiple monitors, and providing a visual surface to fully control the window position anywhere. The new user interface can make better use of screen space and organize multiple windows more effectively, providing a clean and efficient environment to develop applications. The new version supports more of the latest ARM chips and adds some other new features. In March 2011, ARM released the latest integrated development environment, Real View MDK development tool, which integrates the latest version of KeilVision4. Its compiler and debugging tool achieve the best match with ARM devices.

The latest KeilVision4 IDE is designed to improve the productivity of developers and achieve faster and more effective program development. UVision4 introduces a flexible window management system that can be dragged and dropped anywhere in the view, including support for multi-display windows. UVision4 in μ On the basis of Vision3 IDE, more popular functions have been added.

4. Conclusion

In recent years, smart cards and RFID technology have developed rapidly. It has formed an emerging technology industry involving many famous e-giants in the world. Its applications are available throughout telecommunications, financial, commercial, transportation, medical, tax, identity certification and supply chain management, industrial production and Many fields such as safety management. In the field of identity authentication, the access control system has long surpassed the simple doorway and key management, which has gradually developed into a complete access management system. With the development needs of society and economy, the intelligent identification system began to be used in many industries. It plays a large role in administrative management in working environment, personnel attendance management, especially in the industry (bank, secret agencies, door control industry, etc.), the convenience and safety of smart access control make it more and more attention. This paper mainly introduces a simple access control system that can be used at home based on RFID technology. During the whole process, the following functions can be realized: reading IC card, displaying card number information, password input, password verification, and password modification.

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