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Design of Infrared Code Lock Based on Single Chip Microcomputer

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Abstract: Each kind of shortcoming which and Integral part security request locks in view of the traditional machinery, proposed that one kind based on infrared remote control's combination lock design proposal, may satisfy the secure request through this project design's combination lock electric circuit, can also adapt the special environment use demand .This article introduced that one kind the control circuit which realizes by the 8051 programming, has the pressed key to instruct, control unblinking, control warning, functions and so on remote control unblinking, the infrared remote control combination lock's applied research has mainly applied the infrared code and the decoding technology, and realizes the password establishment, the revision and the recognition function through the monolithic integrated circuit. The designed circuits mainly by the infrared encode circuit, the infrared decoding unblinking electric circuit and the keyboard and demonstration electricity the road is composed. Has secret, the flexibility is high, the applicable scope is broad, especially qualify family, garage, places and so on factory.
Keywords: AT89C51, Combination Lock, Infrared Monolithic

I. INTRODUCTION

With the advancement of science and technology and the development of social economy, the replacement of traditional mechanical locks by electronic code locks has become an inevitable trend[1][2]. In the past, the password lock system based on single-chip microcomputer directly stored the already programmed password program in the on-chip EPROM, but it is not easy to implement the password modification; if the password modification function is to be completed, the off-chip serial E2PROM is often used. This paper researches and designs an infrared remote control electronic password lock based on single-chip microcomputer, which not only has the characteristics of ordinary password lock intelligent control lock, unlock, alarm, etc., but also can realize the arbitrary modification function of 8-bit password without expanding E2PROM. This saves hardware resources and reduces system size, which is an innovative point of this design. In addition, the feature of remote unlocking has been added. Therefore, the system is not only low in cost and strong in confidentiality, but also suitable for special occasions that are not suitable for normal human bodies, such as high-radiation areas and high-infectious areas[3].

At present, the development of the main direction of the password lock system at home and abroad is: contact type password lock system, contactless code lock system, intelligent identification code lock system, but they all have different disadvantages such as: contact type lock system cost The lower, smaller size, the card itself does not require a power supply, but it is not convenient to use, and there is contact wear[4]. In contrast, the cost of the infrared remote control code lock system is comparable to that of the contact type lock system, and it can be remotely controlled and used very conveniently.

At present, in the western developed countries, the technology of electronic code lock is relatively advanced and complete in variety. The electronic code lock has been widely used in intelligent access control systems to realize the management of the door through a variety of safer and more reliable technologies[5]. The overall level of electronic locks in China is still around the international 70s. The cost of electronic code locks is still very high. The market is still dominated by push-button electronic locks. The push-button and card-key electronic locks have been introduced to the international advanced level. There are several factories producing supply markets. However, the electronic lock developed by the country itself has not yet formed its market structure, and its application is still not extensive. Many domestic enterprises have also introduced advanced technologies from the world, and the development prospects are very impressive[6]. It is hoped that through continuous efforts, electronic code locks can be widely used in China. At present, the more advanced smart locks on the market have IC card password lock, RF card password lock, infrared remote control password lock, fingerprint identification password lock and pupil identification password lock, etc. The IC card password lock has low cost, small size, and the card itself does not need power. The advantages occupy a certain market share, but due to mechanical contact, contact wear will occur, and the use is not convenient, which limits its application to a certain extent: RF card lock is a contactless password lock, and the cost is not too high. The volume is equivalent to the IC card password lock. The card uses the induction power supply, the weight is very light, and the technology is mature. It has been widely welcomed, but compared with the IC card password lock,

the cost is high; the fingerprint identification code lock and the pupil identification code lock are High reliability and safety are the highest in the current access control system, but the cost is high. The cost of the infrared remote control code lock system has not been entered into the popular use stage. The cost is similar to that of the contact type lock system, and it can be used for remote control and remote control[7]. It is much larger than the remote control distance of the RF card lock. It has low low consumption and can be powered by ordinary alkaline batteries. Very convenient. The infrared remote control code lock system of the design has low cost, and the cost is about 100 yuan/set. If the design is optimized, the cost can be further reduced. Infrared remote control password lock has a broad market prospect.

II. OVERALL DESIGN OF THE SYSTEM

This design is mainly based on AT89C51 single-chip microcomputer. The hardware design circuit is mainly composed of 3×4 matrix keyboard, 74LS164 chip, digital tube, LED, LED, electromagnetic relay, alarm, etc., and has two major software designs. , including remote control transmitter and host receiving part. The timer is used to transmit a signal through the timer T1 (P3.5) port. The function of the timer 1 interrupt service program is: the signal transmitted by the infrared tube needs to be transmitted through the high frequency (using 38.5KHz) modulated carrier, and the timing function of the timer 1 is used to pass the timing to the P3 when the high frequency pulse is transmitted. The reversal operation of the .5 port causes the transmitted signal to be modulated to a high frequency of 38.5 kHz and then transmitted through an infrared transmitting diode with a transmission distance of 8-10 meters. When receiving, use the falling edge of P3.2 port (external interrupt 0) to trigger the interrupt to receive the signal, and judge the high and low level through the P3.3 port. The function of the interrupt service routine of external interrupt 0 is to verify the code width of the first bit (start bit) code after triggering the interrupt by receiving the falling edge of the first bit code. If the pulse width of the first low level code is less than 2ms, it will be treated as an error frame. When the high-level pulse width of the interval bit is greater than 3 ms, the reception is ended, and then the corresponding functional operation is performed according to the number of pulses in the accumulator A.

1. Remote control launch

The remote control transmitter is mainly composed of AT89C51 single-chip microcomputer, infrared emission diode, rectangular keyboard, digital display tube and reset circuit.

2. Host receiving

The host receiving part is mainly composed of AT89C51 single-chip microcomputer, infrared receiving head, rectangular keyboard, digital display tube, alarm, electromagnetic lock and reset circuit.

3. Infrared emission signal coding

The infrared remote control signal is a series of binary pulse codes. In order to protect it from other infrared signals during wireless transmission, it is usually modulated on a specific carrier frequency and then transmitted through the infrared light-emitting diode. The infrared receiving device filters out other clutter only. A signal of the particular frequency is received and restored to a binary pulse code. In the infrared remote control system, the carrier frequency of the infrared signal is 38 kHz.

4. Receive signal decoding

The key to receiving decoding is how to identify '0' and '1'. The system uses an integrated infrared receiver for infrared signal reception. When there is no signal, its output is high, and when there is signal, it is low. Level, so its output signal level is exactly opposite to the remote control transmitter. From the above discussion, it can be found that the '0' and '1' of the remote control transmitter start at a high level of 0.56ms, the difference is the width of the low level, '0' is 0.565ms, and '1' is 1.69ms. Therefore, it is necessary to distinguish between '0' and '1' according to the width of the low level. The system implements signal transmission from the receiving head to the MCU in an interrupted manner. As shown in Figure 3.7, the output of the IR receiver is connected to the INT0 pin of the microcontroller. When the output of the receiving head has a low level signal output, the interrupt of the microcontroller is caused. The MCU responds to the interrupt and performs signal reception and decoding. The decoded signal becomes the corresponding remote control button code, which can become the password for the password lock.

5. LCD display

The LCD 1602 is used as the display device output information in the system. Compared with the traditional LED digital tube display device, the liquid crystal display module has the advantages of small size, low power consumption, rich display content, and the like, and does not require an external driving circuit. Now the liquid crystal display module is already the most commonly used display device in the application design of

the single chip microcomputer. It is. LCD1602 can display 2 rows × 16 characters, has 8-bit data bus D0-D7, and RS, R / W, E three control ports, operating voltage is 5V, and with character contrast adjustment and backlight settings. Refer to Appendix A for the connection diagram of LCD1602 and MCU.

III. SYSTEM SOFTWARE DESIGN

A. Main program

The software program of this system mainly includes several major module programs: main program, receiving decoding program, password judgment and alarm program, password modification program, and remote control learning recognition program.

The main program is first to initialize the program, and then wait for the low level of the output end of the infrared receiving head. The low level indicates that the remote control has a key press, and the external interrupt is set to the falling edge trigger, so the MCU enters the interrupt service routine to receive and decode the signal. . The system enters the password input interface, and after receiving the eight-digit password, it starts running the password verification program. When the password is entered correctly, the operation of unlocking, locking or changing the password can be performed. When the password is entered incorrectly, the password input reminder program will be prompted to remind the user to re-enter the password. When the password input is accumulated to 3 times, the system will alarm and lock.

B. Receive decoding program

The key to infrared receive decoding is how to identify the '0' and '1' codes. My approach is to identify them based on the different high-level widths of the '0' and '1' codes.

Turn off the interrupt after entering the infrared receiving program. The next task is to avoid the 9ms high level, 4.5ms low level boot code, and determine whether to interfere with the signal or repeat the signal. As mentioned earlier, the output level of the integrated infrared receiver is opposite to that of the remote transmitter.

C. Password judgment, alarm and modification procedures

The software programming of the electronic code lock is mainly divided into two aspects, namely, the judgment and alarm part and the password modification control part after receiving the password.

First introduce the password judgment and alarm procedures. The received key code is displayed and saved to the receive buffer receive_code[8] until the 8-digit key code is received. Then compare with the original password cache origin_code [8] to determine whether the password is correct. If the password is correct, the flag bit_right=1 will be flagged; if it is not correct, the alarm will be entered and the password will be entered incorrectly for the number of times wrong_num++, and then the number of errors has been determined to 3 times. If so, the program enters the infinite loop lock.

IV. CONCLUSIONS

This paper studies an infrared remote control code lock that uses an MCU chip to control an infrared remote control system to have a remote control function. By mastering the principle and control process, a hardware circuit is designed, and the hardware circuit is cooperated with the students. Related software designs work together to complete this graduation project. The ultimate goal is to learn to independently check the data selection program, independently select and shape the device, consolidate the knowledge, design the single-chip hardware circuit, print circuit layout capability, improve computer graphics, master an electronic special software design electronic circuit, and strengthen the electronic. The ability to make hands. Through this graduation design, I realized that I lacked my professional knowledge, and the professional knowledge I learned was not enough in practical application. I should work harder in practical applications in the future.

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