Design and Implementation of Face Recognition Electronic Password Lock based on 51 Main Cypher Unit

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Abstract: With the continuous development of China's national economy, the need for security and confidentiality is increasing. Electronic password lock based on modern computer technology has become an important trend in the development of security lock. In this paper, based on 51 MCU, according to the design of face recognition electronic password lock, the hardware and software design principles of the system were described in detail; in order to ensure the smooth implementation of various functions of the system, various anti-interference measures were proposed. The design of this system is beneficial to the design and application of electronic password lock, and has a certain reference for the design of similar systems.

1. Introduction

With the continuous development of the national economy and the increasing material wealth, people are increasingly demanding locks that can play a role of confidentiality, and their performance has become a common concern. The original password lock is based on metal keys or mechanical turntable, the design form and function of which are relatively single, and there are many security risks. In view of this situation, in this paper, a new lock design scheme combining face recognition technology, radio frequency remote control technology and electronic cryptography technology was proposed. Combining the advantages of fixed keyboard type electronic password lock and remote control type electronic password lock, users can not only transmit unlock password through remote control, but also unlock it through traditional fixed keyboard or face recognition installed in locker cabinet. In this way, the unlock function can be realized through fixed keyboard even if remote control is lost, thus to achieve the purpose of both convenience and safety.

2. System Design Principles

2.1. Principles of hardware system design

For the design and use of system MCU, it is generally considered in the following two aspects: one is the configuration and link of MCU and peripheral equipment. According to the functional requirements of the system, appropriate peripheral equipment is selected and connected with MCU through the design of interface circuit to exchange data processing information [1]. In this system, the peripheral devices that need to link with MCU are keyboard, LED data display, EEPROM memory, etc. The other is the extended application of MCU. If the system unit of MCU itself can't satisfy the need of equipment configuration, the function modules can be added by external expansion equipment. The main problem here is still the design of reasonable and effective interface circuit between MCU and external expansion equipment [2]. In this system, 51 MCU can fully meet the design requirements, so it was not necessary to consider this design.

The basic principles that should be followed in the design and use of system MCU are as follows: in the design of interface circuit, attention should be paid to standardization, routinity and practicability, and on the basis of ensuring the viability and durability of the circuit, the design process should be more standard and perfect [3]. For the use of MCU ports, the interface configuration is based on the principle of sufficiency, that is, there are some standby ports for future

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debugging and improvement of the system. For the MCU designed in this paper, there were 32 I/O ports in total, but in practical application, only 26 and 17 ports were used in the receiving circuit and sending circuit of the password lock, leaving 6 and 15 I/O ports for future system expansion. In order to make the device components used in the whole system design coordinate and unify in their own performance, power consumption and other indicators, such as the MCU used here is a low-power product, so that the principle of low power consumption should be taken into consideration when selecting other connected devices. Hardware design and software design of the system are interrelated and inseparable. When determining the design scheme, the two should be combined and considered together [4]. In a system, if there are more software functions, it will simplify the hardware circuit; if there are more hardware functions, it will correspondingly improve the speed of information processing. Therefore, in practical application, only by combining the two functions reasonably and harmoniously can the application of the whole system achieve the best state. Because the system involves the transmission of remote control signals, it is very important to ensure that the signals are not distorted in the transmission process, thus requiring the improvement of the reliability of the system in the design of anti-interference ability of the system. In this paper, the remote transmitting part and the remote receiving part of the system were all 5V voltages obtained by 220 volts through transformer rectification and stabilization. Therefore, every component used in the transmitting and receiving system must have the ability to carry 5V voltage.

2.2. Principles of software design

In the process of software design, it is necessary to follow the basic principles of rationality, standard, conciseness and practicability. The specific design ideas are as follows: The software design process is well organized and the design structure is simple and clear. According to the functional division of the system, the design of each module should be perfected and the operation should be smooth to be convenient to link, debug and modify later [5]. Reasonable allocation of information storage units in storage area can not only save storage capacity, store more content in limited space, but also make information call fast and convenient. In the process of program design, a special marking state is set up for designers to check, which can be used to intervene reasonably in the validity, running position, system links, feedback results and so on. Adding special anti-jamming capability design to the system is a good guarantee to improve the reliability of MCU application.

3. System Anti-Jamming Technology

3.1. Main methods and means to avoid interference.

The source of interference refers to some tangible or intangible things that can produce interference signals, such as cables, some high-power silicon-controlled devices, lightning and so on. In our system design materials, there were also corresponding devices which can produce interference by themselves, such as 12MHZ crystal oscillator [6]. Sensitive devices refer to some components which are strongly sensitive to the interference signals generated by the system, such as: 51 MCU used in this design. The way of interference propagation refers to the medium that can transmit interference signals, such as wire, antenna and other tangible transmission, as well as the space transmission which plays a strong intermediary role in the transmission of intangible signals (wireless signals). The system in this paper involves the space propagation of radio frequency signal in the process of signal transmission. The ideal signal propagation situation is that the final received signal of the system must be closely unified with the original transmitted signal of the transmitter. However, there are many difficulties in the realization of this ideal state. There are many restrictions that hinder the complete unification of the two ends of the signal. Generally speaking, there are two main factors:

Performance of communication equipment. There are many problems in the quality and performance of all kinds of communication equipment selected by the system, which can't guarantee that all components are of high quality, thus causing more or less impact on the whole

design. Therefore, in order to avoid the existence of such adverse effects as far as possible, good equipment must be selected as the application object in the selection of devices to avoid the interference caused by the equipment as far as possible [7].

3.2. Reducing sources of interference

Reducing interference sources is a very effective measure to avoid interference, which is simple to implement but has good effect. Therefore, in the design of anti-interference ability, great attention should be paid to it and priority should be given to it. In this system, parallel capacitors, series inductors or resistors, and additional continuous-current diodes can be used to achieve better results. The specific design scheme is as follows:

In order to reduce the influence of IC on power supply, a high frequency capacitor (0.luF) or 100uF electrolytic capacitor is connected in parallel between IC power supply and ground (note that each IC power supply and ground should be added one by one) as decoupling capacitor. The wiring and connection of high frequency capacitors should be as close as possible to the power source and as short as possible. Otherwise, the equivalent series resistance of capacitors will be increased, and the good filtering effect will not be achieved. In order to reduce the influence of power supply on IC, 100 uF electrolytic capacitor and 0.1 uF ceramic capacitor must be connected to the input end of power supply as decoupling capacitor. When the coil of the system is disconnected, it is easy to produce the interference of instantaneous back-EMF, so that in order to avoid this interference, the use of continuous-current diodes is added to both ends of the electromagnet in the circuit. In addition, when wiring, it is necessary to ensure smooth wiring and avoid 90 degree polygonal angle. Otherwise, it will easily produce high-frequency noise [8].

3.3. Reducing the influence of interference signal on sensitive devices

Through the reasonable design of the system circuit and the adoption of some equipment devices with strong anti-interference ability, the purpose of reducing the adverse impact of interference signal on hardware equipment can be achieved. In addition, even if there is some distortion in the process of signal transmission, the system structure should be studied and designed to return to the original transmission state. Only in this way can the stability of system performance and the authenticity of signal be guaranteed. The first is wiring, which mainly includes two principles: One is to minimize the induction noise, the specific method of which is to reduce the surrounding area of the wiring circuit; the other is to minimize the coupling noise, which is to select the thick wire as much as possible for the power supply and ground wire when selecting the wiring. Another advantage of this method is to reduce the voltage drop. Secondly, 12MHZ crystal oscillator is selected for the selection. Thirdly, the port is not suspended, that is to say, all the idle I/O ports on 51 MCU need to be grounded or connected to the power supply; for the idle IC terminal, without changing its system logic, it is also handled in a sample way. Fourthly, the connection of IC devices avoids using IC pedestal, but fixes IC devices by welding IC devices directly on the circuit board.

3.4. Cutting off the path of interference propagation

The transmission of interference includes wired and wireless modes. The so-called wired interference is conductive interference, which refers to the direct transmission of interference signals through wires or wires. The main method of isolating this kind of transmission signal is to increase the isolation spectrum with strong performance on the conductor or connection which produces interference propagation. In the design of this system, the first consideration was to prevent the interference signal from being power noise. Specific to the design of this system, the main methods are as follows:

The first is to deal with power noise. The MCU used in this system is very sensitive to the noise of power supply, so the quality of power supply and the size of noise signal generated by it are the most important factors affecting the occurrence of system interference signal. The first problem to be solved here is to minimize the noise of power supply. The main means of treatment are: The LC filter circuit composed of inductor and capacitor is used to separate the ICs and minimize the mutual interference among them. In particular, RC filter circuit should not be used here because the

voltage generated by the power supply itself is very small, only 6V. If the resistance divider can produce a larger voltage drop, then the actual voltage on the IC can no longer meet the needs of the IC, thus affecting the performance of the whole system.

In the process of crystal oscillator wiring, attention should be paid to making the crystal oscillator and MCU pin as close as possible to each other, but the clock area should be separated from the wire, and the crystal oscillator shell should be grounded and fixed well. In the design of PCB, the corresponding zoning operation is carried out, such as separating the strong signal from the weak signal and separating the digital signal from the analog signal to make the source of interference (such as electromagnet) and the sensitive components (such as MCU) objectively weaken the impact effect from the distance. The digital part and the analog part are separated by wires, the digital part and the analog part must be separated, and the remaining point is connected to the power supply.

4. Conclusion

In this paper, according to the needs of the system design, the design principles of hardware and software were proposed, and the functions of remote control password lock and face recognition unlock were mainly realized. For the hardware design, the configuration and connection of 51 MCU and peripheral equipment should be considered. From the point of view of software design, the basic principles of rationality, standard, conciseness and practicability should be followed. In order to realize the functions of the system smoothly, it is necessary to use anti-interference technology to ensure the safe use of the system. In this study, more systematic analysis was carried out from the theoretical demonstration, lacking the performance verification of the system function realization, thus needing further research.

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