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The design of open laboratory management system based on fingerprint detection

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Abstract: **Fingerprint recognition technology has become widely used and safe and efficient identification technology, has a broad application prospects and market value. Based on the fingerprint identification technology to design a simple fingerprint check management system to complete the management of open laboratory tasks. Firstly, the development status of fingerprint recognition technology at home and abroad is summarized, and the design scheme is given based on the comprehensive comparison of the functions to be realized. Taking STC12C5A60S2 as control center, hardware is designed, LCD12864 is used as hardware display, fingerprint module is external fingerprint information acquisition device, and a simple software system is written at the same time. The device uses fingerprint recognition technology, serial communication technology and host computer control technology to complete fingerprint entry, fingerprint registration, storing information and querying information. It is believed that it will become a trend to use fingerprint technology as a personal information certification in the near future.**

Keywords: STC12C5A60S2; LCD12864; Fingerprint module; Serial communication; Host comput-er control

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1. Introduction

The electronic laboratory of the school, as a practical verification platform for the electronic specialty, has modern electronic instruments and equipment, and provides a place for teachers and students to learn and communicate. So very popular with the students, every year a group of students enthusiastically enrolled as a member of the laboratory, began their busy and full of college life. But the laboratory as an open place management is relatively free, and the laboratory members from different classes of different activities and time, which brings great trouble to the management of the laboratory. Based on the fingerprint identification of open laboratory management system design, through the acquisition of fingerprint information to complete the registration to achieve the opening of the laboratory management.

In this era of digitalization, the development of electronic devices towards large-scale integrated circuits, coupled with the increasingly mature algorithm, makes the application of fingerprint recognition technology possible. In recent years, with the development of science and technology, computing speed is faster and faster, so the performance of single chip microcomputer is also higher and higher, which enables single-chip processor to handle the operation and comparison tasks of fingerprint. At the same time, with the continuous research of the program algorithm, the matching algorithm is more mature. So now fingerprint identification technology can be applied to the reality[1].

After learning the basic knowledge of single-chip microcomputer, we organized the knowledge and practice by using this graduation design, and applied it to real life. I hope that the object I designed can accomplish a simple identity authentication task and facilitate the management of open laboratory.

2. The overall design of the fingerprint management system

2.1. System structure

Microcomputer fingerprint check management system mainly by: fingerprint module, display module, 2 × 4 keyboard, management system composed of four parts, the system block diagram shown in Figure 1.

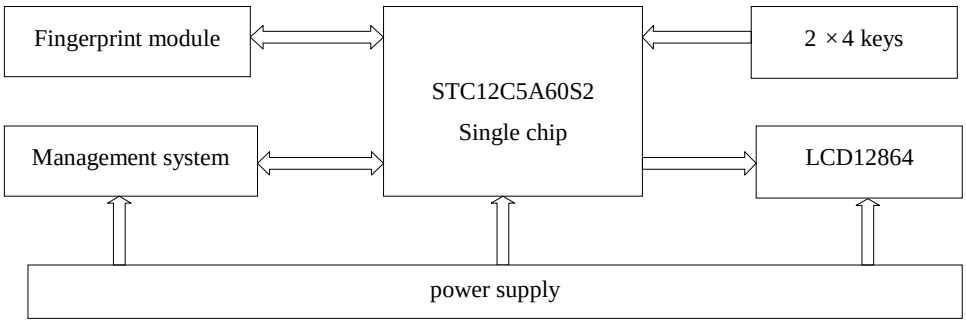

Figure 1. System overall design block diagram.

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Through the dual USB port computer to the entire system power supply, control center control display module real-time display information, fingerprint module, host computer management system and computer to achieve serial communication between the 2 ×4 keyboard control microcontroller to achieve entry, delete, query function, through the serial Communication to help single-chip and host computer to achieve data transmission[2].

2.2. System hardware design

The core of the system peripherals is the fingerprint acquisition module, FM-70 is an optical sensor fingerprint image device, its own digital signal processing device with good performance, fast, the receiver is a fingerprint sensor, the device does not require software control, The device itself can achieve fingerprint input, sorting collection library, contrast images and detection and preservation functions[3].

FM-70 module works: the body's fingers on the surface of the skin with a variety of textures, these irregular stripes constitute a human fingerprint, that is unique and stable fingerprints. Image recognition consists of fingerprint input and fingerprint matching. These two steps complete the fingerprint image acquisition image and match the image.

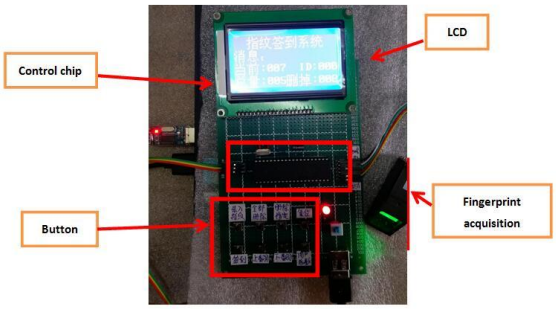

Figure 2. Hardware system diagram.

Hardware operation: first write the program to the microcontroller, press the power button, the power indicator light; LCD12864 display the corresponding prompt, then press the "input fingerprint" button, the fingerprint module lights up, the finger on the fingerprint image scan head to enter the fingerprint Press the "delete all" button to delete all the data, press the "delete specified" button, press the "delete" button to delete all the data, press the "delete" button, press the "delete all" Press the "Reset" button to reset the system to correct the misalignment operation. Press the "Total User" button to check the total number of the current fingerprint data. Press the "Reset" button to delete the specified fingerprint. Hardware device shown in Figure 2.

3. System software design

3.1. System software design analysis

Application development is divided into the application of fingerprint identification module development, LCD display development, key procedures, the host computer control development. In the hardware design, the use of Keil as a single-chip software development environment, because the C language to facilitate modular programming, so the source program can be divided into several modules, and then generated by the compiler final document. Debugging tools for program writing and simulation debugging, it can be easily written and tested, and finally downloaded to the microcontroller register for testing. First single-chip power to initialize the microcontroller, while the main program must also be initialized LCD, key module, fingerprint module, host computer communication serial port. When a function button is manually activated, then the control center to control the LCD display function prompts, the control chip also uses the serial interface to manage the fingerprint module[4].

3.2. Host computer management system design

Fingerprint check management system is written in VB, which uses a serial control, radio button controls, image controls, text box controls. Operation of the software system: Open the lab attendance sign-in system → enter the password → (123456) → login→ open the serial port

and debug success → enter the personal ID, student number, name and save → press the button to sign → place the finger sign → receive 'ID' → click to confirm the receipt → data storage. Data management, you can add leave, absenteeism, you can query, delete information. The flow chart is shown in Figure 3 above.

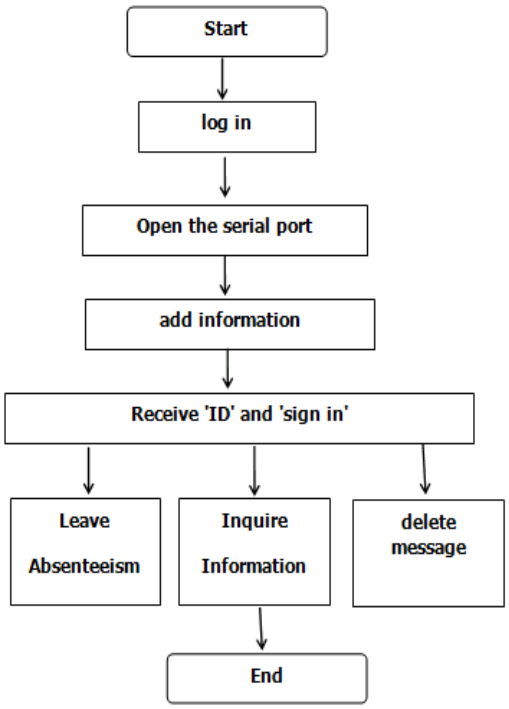

Figure 3. Host computer management flow chart.

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4. System test

The device is divided into hardware and software control system in two parts. Hardware device is controlled by the microcontroller to achieve fingerprint entry and check-in. The host computer is mainly to achieve fingerprint registration information management and query. System debugging through each module one by one debugging[5].

4.1. Debugging of hardware devices

Debugging control chip Basic system: STC12C5A60S2 single-chip, clock source circuit, initialization reset circuit, welding a good basic circuit, the use of multimeter to test the basic system to meet the basic work, write a brief small program to see whether the corresponding pin changes , If the corresponding clock signal circuit and control chip to work properly. Manual reset button to test whether the external reset can be properly initialized.

Debug the fingerprint module: first refer to the FM-70 fingerprint module data sheet, the fingerprint module pin and the corresponding control of the microcontroller pin connection, use a multimeter test connection to ensure that the hardware circuit is connected correctly. To the microcontroller power, observe the fingerprint module initialization is correct, and then press the function button to see whether the fingerprint module to perform the corresponding function, whether to achieve a simple fingerprint input, contrast control. Repeat the debugger until the fingerprint module is running correctly.

Debug the LCD module: first show the module with the corresponding microcontroller pin connection is good, and use the multimeter test pin is connected correctly. Power on to observe the LCD display is clear, if too dark, you need to adjust the potentiometer to the appropriate brightness. And then LCD12864 program into the microcontroller, see the display of the display is correct, if not correct, you need to debug the program until the display is the same as the desired display, LCD debugging is complete.

4.2. Analysis of the operation of the management system

The choice of serial port can be selected by querying the computer device manager; through the hardware device to enter the need to store the fingerprint, you need to store the fingerprint interface, And then enter the appropriate identity information in the management interface, including:ID, student name, name, and then click the Add button;when the 'sign "button,if the fingerprint has been stored in the microcontroller, the host computer system will be through the serial port feedback fingerprint ID, click on the' sign confirmation ', will sign success. Figure 4 above for the management system interface[6].

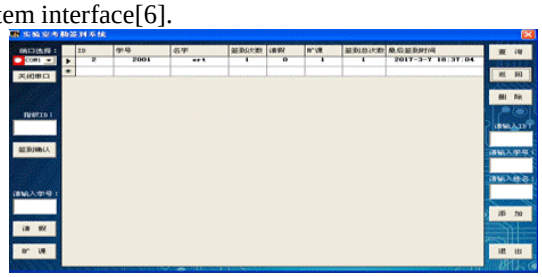

Figure 4. PC software management system.

Summary

This project is designed for open experiment management system. The functions of system hardware are: fingerprint information collection, information comparison, and display the results on LCD screen. The host computer is mainly used for information query and management of the whole system. As of now, the control system can meet the basic functionality, can be tested using the system, but there are still many imperfect places, such as fingerprint fingerprint module sometimes is not sensitive. The PC system is sometimes carlton. The next period of work is to continue to improve the above functions, to find and debug the failure of this design and to further improve the stability of the system.

References

[1] S. Liang Shan. Changsha: Central South University. 2011.
[2] Q. Yu. Zhejiang: Zhejiang University of Technology. 2011.
[3] X. Tao. Graduate University of Chinese Academy of Sciences. 2012.
[4] L. Niu Liang. Xi'an: Xi'an University of Electronic Science and Technology. 2011.
[5] Ushmaev, S.O. Novikov, Pattern Recognition And Image Analysis, 18 (2010) 152-155.
[6] J.M. Wang, X.G. Li, J. Zhang. Guangzhou: Sun Yat-sen University Press, 6 (2015) 206-253.

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