

Design of Home Burglar Alarm System based on GPRS

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Abstract: There are many problems in the current security system, such as poor reliability, easy damage, easy handling of false positives and time delay problem, this paper proposes a design scheme of alarm system based on GPRS security. The system uses sensors to monitor home accommodation. When a warning occurs, the sensor transmits the pulse signal to the microcontroller to achieve the goal of interrupting the program. While using light and sound to intimidate the thief, the SCM sends the alarm message to the preset number. Therefore, the owner can take further security measures to protect the safety of life and property.

Keywords: Home burglar alarm; Passive pyroelectric infrared sensor HC-SR501; Singlechip STC89C52RC; GPRS module SIM300

1. Introduction

At present, with the rapid growth of the floating population, security issues have become increasingly prominent, and household anti-theft has become a hot topic of society. Because the design of the burglar alarm system is not reasonable at present, it is impossible to stop the clever means of the criminals. People urgently need an intelligent home burglar alarm system, and the rapid development of modern technology provides a powerful technical support for the birth of GPRS home anti-theft alarm system [1-3].

At this stage, all kinds of anti-theft alarm system at home and abroad are based on the Infrared, camera and magnetometer. In China, many families still rely mainly on anti-theft doors and windows, such products are not only unsightly, but more importantly, can not play a very effective anti-theft role. Burglarproof doors and windows have many disadvantages, such as being easily damaged. Even if the use of electronic anti-theft device, which also exist misstatements, false positives and other issues [4-6].

Home burglar alarm system based on GPRS, which is a very advanced technology, and is relatively mature security technology. This technology does not rely on wired telephone networks, but rather through mature GPRS mobile networks. The system is a kind of automatic burglar alarm system with infrared sensor as the detection element, SCM as the control core, and GPRS module as the sending unit, which enables the host to keep the situation in the home in a timely manner. When the infrared sensor detects illegal personnel intrusion, it will send the alarm to the microcontroller, and the system will start the local sound and light alarm. The system also uses the GPRS module to send alarm messages to preset numbers in short messages, or to automatically call preset numbers. The system is relatively flexible in installation and rela-

tively low in price, so it has a lot of room for future development. Modular approach, which can not only facilitate the system debugging, maintenance and upgrading, but also meet the different needs [7-9].

2. System Module Review

The design involves sensors, microcontroller, GPRS module, AT instructions and serial communication and other related technologies [7]. The design uses the electric infrared sensor HGSR501 produced by Czech Technology Co., Ltd., Germany imported IHI778 probe and BISS0001 signal processing chip. The utility model has the advantages of high sensitivity, strong reliability, simple installation and convenient debugging, so the utility model can be installed in all the fortified positions, such as doors and windows, balconies, walls, etc.. The design uses automatic induction device, when illegal personnel invasion, the sensor will be triggered, and output signal [10-11].

According to the cost performance of the product, after comprehensive consideration, the design selects the STC microcontroller STC89C52RC produced by Shenzhen macro Crystal Technology Co., Ltd. as the main control chip of the anti-theft alarm system. According to the actual needs of the system, the high performance GPRS module SIM300 produced by Simcom company is chosen as the wireless transmission equipment of the anti-theft alarm system [8].

As the system design requires the use of AT Attention instructions, so here's a brief introduction to the AT instruction. The AT directive is generally used for connections and communications between terminal devices and PC applications. The user can control the mobile station by sending the AT command, and can communicate with the USM network service interactively.

Table 1. The Design of the System is Mainly Involved in the AT Instructions

AT instruction	Function description
ATD	Make a call
AT+CLIP=1	Set caller ID function
AT+CNMI=0,1	SMS prompt while status is OK reply
AT+CNMI=2,1	TEXT mode sends, and the state has OK reply
AT+CMGF=1	PDU mode sends, and the state has OK reply
AT+CMGF=0	Send text messages to the entered number (TEXT mode)
AT+CMGF=n	Send SMS (PDU mode) to the specified number

3. System Design

3.1. System design idea

The purpose of the system design is to make the GPRS home anti-theft alarm system to achieve the desired performance indicators, and to deepen the understanding of sensors, SCM and GPRS modules and understanding.

Specifically, the system uses infrared sensor alarm technology, when the alarm situation occurs, it can detect the infrared radiation of human body, and transform it into a voltage pulse signal. The system design includes 2 parts, hardware and software [9]. The hardware design mainly includes infrared sensor circuit design, SCM minimum system design, GPRS module circuit design, sound and light alarm circuit design, microcontroller and GPRS module serial communication circuit design. The software design mainly includes initialization subroutine, interrupt subroutine, sound and light alarm subroutine, SMS warning subroutine and telephone alarm subroutine.

3.2. System design diagram

The system diagram is shown in figure 1.

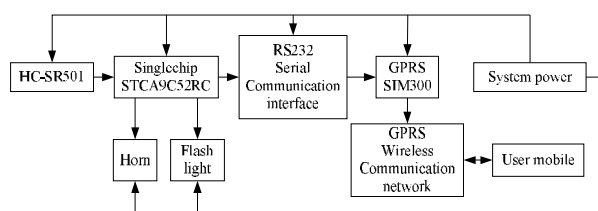


Figure 1. Block diagram of home burglar alarm system based on GPRS

3.3. System hardware design

System hardware design includes 5 parts: the design of circuit and serial communication circuit design of sensor circuit design, SCM system design, GPRS module and its peripheral circuit design, sound and light alarm, and each part is a necessary condition for normal operation of the system.

The pyroelectric infrared sensor usually outputs a DC voltage of 0-5V. When a heat source is moved from one side to the visiting range, the output signal will have a jump process. The jump signal is small, only about 1mV, and the frequency is 0. 1-10Hz. Because the system uses interrupt 0 in the software design process, it is necessary to add an inverter to compare the shaping circuit and the microcontroller, so that the circuit can perform the relevant actions. The design diagram of passive pyroelectric infrared sensor circuit is shown in figure 2. In the system design, in order to simplify the circuit, so the low-frequency amplification and comparison process are processed by the BISS0001 chip.



Figure 2. Design diagram of passive pyroelectric infrared sensor circuit

SCM minimum system using 5V power supply, it also joined the human clock circuit and reset circuit, so the smallest single-chip microcomputer system [10].

3.4. System software design

Software design mainly includes 3 parts: sound and light alarm subroutine, SMS alarm subroutine and telephone alarm subroutine. First of all, the software design flow chart is introduced, and then the key parts involved in the design process are explained.

The purpose of the system software design is to control the GPRS module by using single chip microcomputer, so as to realize the function of anti-theft alarm. The software design adopts C language, and it is written and debugged in the Keil C51 environment, and then all modules are debugged. The flow chart of the system software design is shown in figure 3.

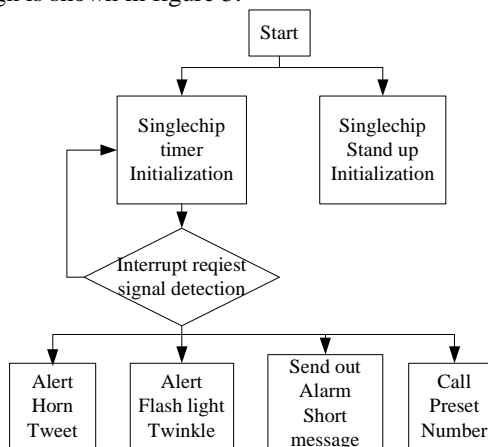


Figure 3. Flow chart of system software design

4. Simulation Results and Physical Demonstration

4.1. Simulation result

In the design process of the circuit diagram, Proteus simulation software is used, which is the best SCM and simulation tools. From the schematic design, program debugging, microcontroller, peripheral circuit collaborative simulation to PCP design, this truly realized the complete design from concept to product. In addition, Keil C51 simulation software is used, which provides rich library functions and powerful integrated development debugging tools. Windows interface, its generated target code is efficient and easy to understand. Because of the limitations of the simulation tools, it is impossible to simulate the wireless alarm, so this design only simulates the sound and light alarm part [11].

4.2. Physical demonstration platform

In order to verify the rationality of the system design more intuitively, the object demonstration platform is built in this research. According to the system design, the microcontroller and the GPRS module should communicate with each other through the serial port. In view of the limitations of the actual hardware, only the RXD (P3.0) interface of the microcontroller is connected with the TXD (42) interface of the GPRS module. Single chip TXD (P3. 1) interface and GPRS module RXD (40) interface to connect the real analog microcontroller and GPRS module serial communication. In addition, the artificial analog infrared sensor to the microcontroller P3.2 interface input a low level signal, the local sound and light alarm function and remote wireless alarm function are normal operation, this achieves the desired results. The object demonstration model is shown in Figure 4, the short message alarm receiving picture is shown in Figure 5, and the telephone alarm receiving picture is shown in Figure 6.

5. Conclusion

This article comprehensively considered the family guard against theft the realistic question and the actual demand, and aimed at the family burglar proof main characteristic, designed a new family to guard against theft the warning system.

This study uses modular design ideas, and use sensors, microcontroller, GPRS module and GPRS mobile network to build a home anti-theft alarm system. This realizes the local sound and light alarm, and also realizes the function of remote SMS alarm and telephone alarm. Because of the limited level, there are some defects and shortcomings in the design, which need to be improved continuously, for example, the anti-interference of the system is not taken into account. In addition, since the system uses the GPRS module, in addition to the functions that have been achieved, you can also develop ad-

vanced anti-theft functions such as MMS, alarm and real-time monitoring.



Figure 4. Hardware in the loop demonstration model



Figure 5. Mobile phone short message receiving picture



Figure 6. Telephone alarm receiving picture

References

- [1] Liu Haibin, Song Lin Han, yonghua. Multi function home security system based on GPRS MMS module [J]. Modern electronic technology, 2011,6 (7): 138-141.
- [2] LAN Jun Lin, Huang Jihai, Chen Shengjun. Design of remote home anti-theft monitoring system based on [J] GPRS. Computer security, 2008,7 (3): 65-68.
- [3] Zhang gang. Design of home anti-theft control system based on UPRS network [J]. Journal of Zhejiang University of Technology, 2011, 9 (1): 181-186.
- [4] Yu kan. Design and research of UPRS smart home control platform based on embedded technology [D]. Nanjing: Nanjing University of Posts and Telecommunications, 2009.
- [5] Ma Xuewen, Liu Qiang. Design of home burglar alarm system based on GSM [D]. Shenyang: Northeastern University, 2009.
- [6] Wish Yan, Han Yanjie. Home burglar alarm system based on GSM SMS module [D]. Baoding: Hebei University, 2004.

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- [7] Liu Changzhen. Design of remote home monitoring and alarming system based on [J] USM. Security science and technology, 2008, 11 (8): 35-38.
- [8] Zhou Zhuoran, Xu Daolian. Design of home anti-theft system based on STC89C58 and USM network [J]. Microcomputer and application, 2011, 7 (18): 17-19.
- [9] Xie Weihua. Design of intelligent home fire prevention and theft protection system based on MCU [J]. Mechanical and electrical product development and innovation, 2009,8 (6): 148-149.
- [10] Liu Tongqiang. Embedded control system based on image processing [D]. Ji'nan: University of Jinan, 2009.
- [11] Liu Xinneng. Research and implementation of fault tolerance scheme for Henan mobile data network [D]. Beijing: Beijing University of Posts and Telecommunications, 2008.