

## DESIGN OF AUTOMATIC DISTRESS BRACELET FOR ELDERLY BASED ON SINGLE-CHIP MICROCOMPUTER

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**Abstract.** This article introduces the basic component of Automatic Distress Bracelet, as well as its functions, application scenarios. This device implements that when the user parameters are abnormal, the user address will be automatically sent to the user's home through SMS.

*Keywords:* microcomputer, IoT, automatic system.

### Introduction

Every family has elderly people. Due to the decline of the body's physiological functions, elderly people prone to accidents and even life-threatening. It is conducive to better to build an elderly-friendly society that inform their families and ask passers-by for help in time, when the elderly is in danger.

This year, the concept of ensuring the safety of the elderly has become a social consensus. But products that can help to ensure the safety of the elderly have not gained popularity. Single-chip microcomputer can use to processing complex human body signals and has the advantages of low energy consumption and small size. Therefore, this is very suitable for achieving goals. What's more, different people have different physical indicators. It is the reason why it will always send the wrong distress signal if using the same value to define normal. Use the server and database to define the normal parameters of different users by process the parameters in the bracelet is one of the solutions.

This subject based in STC89C52 as processor and supplemented by several modules for example SKB360, GSM and Thermometer. When user's parameters are abnormal, it will get location information via satellite and send the location to the user's family.

### Positioning system section

In this section, it is necessary to obtain the location information and send the obtained data to the specified mobile phone number.

The main parts of this system are shown in Figure 1.

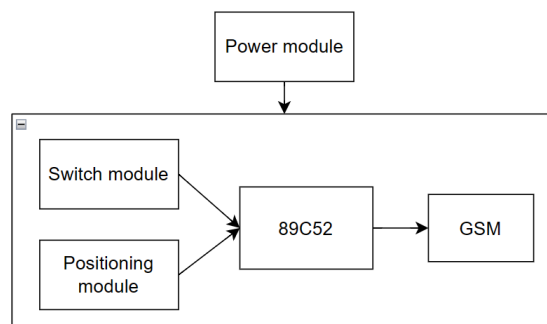


Figure 1. Block diagram of positioning system

The reason of why STC89C52 microcontroller is used, as the core is STC89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K in-system programmable Flash memory.

The microcontroller has low power consumption, rich interfaces, and low cost, which can fully meet the requirements of this design.

First of all, the normal operation of the STC89C52 is inseparable from the SCM minimum system, which consists of an STC89C52 and three parts: reset circuit, clocking circuit and power supply circuit. We can easily find the relevant circuit online. Figure 2 shows one of these.

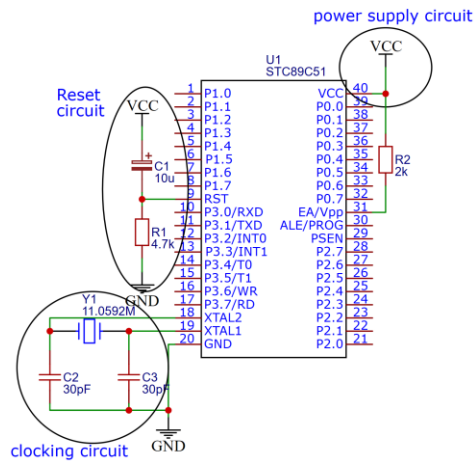


Figure 2. Example of a SCM minimum system

Then, a positioning device should be used to determine the location. NEO-6M GPS is a very popular, cost-effective and high-performance GPS module with a ceramic SMD antenna, an on-board memory chip, and a backup battery, which can be easily integrated with various microcontrollers [1].

When using this module, we do not need to have a clear understanding of the internals. The diagram of the equivalent interface of NEO-6M GPS is shown in Figure 3.

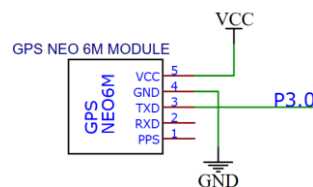


Figure 3. Diagram of the equivalent interface

After the navigation system is encapsulated as shown in the Figure 3, only consider five pins. By connecting TXD to the RXD of the microcontroller, positioning information can be obtained by using command like \$GPRMC.

The sending function of information is implemented by the GSM module. The GSM module has all the basic functions for communication based on GSM network. In other words, simply put the GSM module plus the keyboard, display and battery is a mobile phone.

SIM800A is a GSM/GPRS module from SIMCOM, which size is 24×24×3mm and can be applied to various compact product design needs. The module's high sensitivity, low power consumption and lightweight size make it suitable for automotive, handheld devices such as PDAs, vehicle surveillance, mobile phones, cameras and other mobile positioning system applications. Therefore, it is fully meet the requirements of this design [2–4].

Similarly, the SIM800A module has is encapsulated by using SMT. It can simply be thought of as a module with only four pins. The diagram of the equivalent interface of SIM800A is shown in Figure 4.

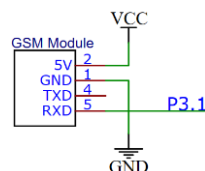


Figure 4. Diagram of the GSM Module

Of course, after successfully connecting the SIM800A module and the microcontroller, a SIM card is also required to use the network provided by the operator to operate.

### Switching system section

This section is used to decide whether to send user's address via SMS. In other words, it is the Switching module of Positioning system. Here will use a thermometer as an example to illustrate the composition of this system.

First of all, it is necessary to discuss the usefulness of uploading data to the cloud. The data is saved to better monitor the state of the body, which is very helpful in predicting and preventing certain diseases. Moreover, the system should have a certain learning ability that adjust the standards according to the user's situation.

The size of the bracelet determines that it cannot store a lot of data. And, the bracelet is not a good user-friendly interface. Therefore, it is necessary to use the cloud. The main parts of Switching system are shown in Figure 5.

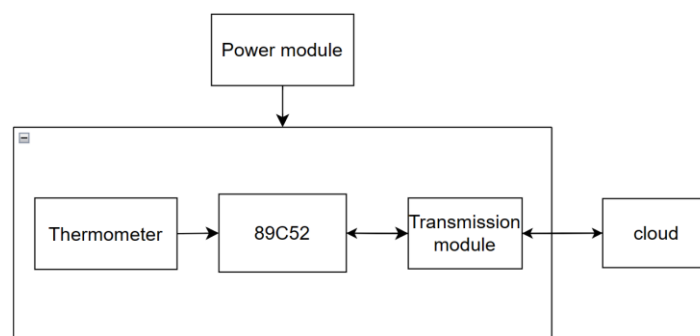


Figure 5. Block diagram of switching system

There are two main ways to transmit and save the data collected by smart bracelets.

The first is to connect the bracelet to the network by WIFI. The ESP8266 module can be used to achieve this effect. This method requires additional steps to identify the user of these bracelets. However, it no additional action is required after successful identification.

The second is to connect with bracelet and phone by Bluetooth. This method requires Occasional manual manipulation. However, this design is simpler and the supporting mobile phone software can provide users with a more beautiful interface. It is a convenient method to logotype user that user only need to log in to the client and connect the bracelet via Bluetooth on his phone.

Finally, learning is the process of grasping patterns in data and improving oneself or making predictions. By identifying a large number of parameters and summarizing the characteristics through algorithms, the system can achieve the purpose of parameter adjustment. [5] Of course, there may be an alarm when the parameters are normal in the early stage. Therefore, there must be a design to cancel the alarm.

### Conclusion

The complete bracelet system consists of a hardware system and a software system. This report focuses on the design of hardware systems. Because the whole program is more complex, and the amount of calculation is large, and more floating-point number calculations are used, it is recommended to use C language for the writing of the program for easy reading.

### References

1. Guide to NEO-6M GPS Module with Arduino [Electronic resource]. URL: <https://randomnerdtutorials.com/guide-to-neo-6m-gps-module-with-arduino/>
2. GPS Module [Electronic resource]. URL: <https://www.datasheetq.com/CSR8635-doc-CSR/>
3. GPS Module [Electronic resource]. URL: [https://blog.csdn.net/R\\_Z\\_Q/article/details/104464836/](https://blog.csdn.net/R_Z_Q/article/details/104464836/)
4. SIM800A [Electronic resource]. URL: <https://cn.simcom.com/product/SIM800A.html>
5. Haykin // Neural Networks: A comprehensive Foundation, 2nd Edition. Vol. 2. P. 43–44.