

## Design of intelligent obstacle alarm based on ultrasonic sensor

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*Abstract: Because the ultrasonic ranging technology can achieve the purpose of detecting distance without contact without contact, it makes it widely used in distance measurement, intelligent mobile obstacle avoidance robot, automatic drone navigation, and automatic navigation of unmanned cars. This text controls the ultrasonic sensor, LCD real-time display distance and alarm through AT89C51. The whole system is mainly divided into five modules, namely the power circuit module, the ultrasonic distance measuring module, the alarm module, the LCD display module and the button module. Each module performs various functions, and each module is connected and independent to form a complete Ranging alarm system. Through physical production and debugging, the expected requirements have been met.*

*Keywords: AT89C51 single chip microcomputer; Hc-sr04 ultrasonic sensor; Buzzer.*

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### 1. INTRODUCTION

This paper mainly adopts hc-rs04 ultrasonic sensor, takes AT89C51 single chip microcomputer as the core, and designs the hardware structure circuit and software program of ultrasonic rangefinder according to the principle of ultrasonic rangefinder. This paper sets the measurement distance, and the measured results are displayed in the form of nixie tube. If the measurement distance is less than the set value, the buzzer will give an alarm<sup>[1]</sup>. Ultrasonic is universal and applicable. It can realize the function of on-site real-time monitoring the distance from the target, such as intelligent mobile positioning of mechanical robots, on-site pipeline length measurement, etc., and it is also used in diffuse reflection and relatively harsh environment. It is also used in car reversing radar, intelligent automatic obstacle avoidance movement of robots, and on-site survey of some construction sites, For example, measurement of liquid level and well depth<sup>[2]</sup>.

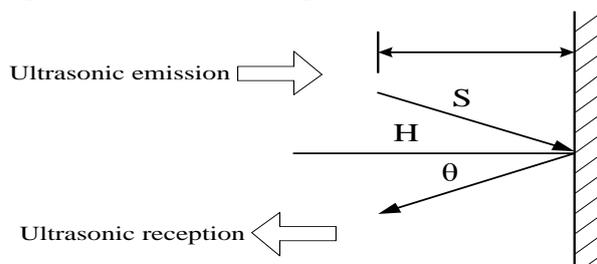


Fig. 1 Schematic diagram of robot effectively avoiding obstacles

As shown in Figure 1, this is the schematic diagram of the mobile robot effectively avoiding obstacles. The function of ultrasonic sensor of intelligent obstacle avoidance robot is to detect the distance of objects in front<sup>[3]</sup>. The distance of the object in front is calculated according to the time difference

between sending the ultrasonic wave and receiving the ultrasonic wave. Ultrasonic ranging can accurately obtain the position and distance of the obstacles in front, and can effectively judge and avoid obstacles, so that the robot can simply control the robot through intelligent methods. The effective distance of ultrasonic sensor is generally short, usually between five meters and ten meters<sup>[4]</sup>. Due to the low price, good accuracy and stable technology, ultrasonic sensor is widely used in intelligent robot obstacle avoidance system. The system is mainly composed of four ultrasonic distance detection modules, key module, LCD display module, alarm module and power circuit module. With AT89C51 single chip microcomputer as the core, the single chip microcomputer has the characteristics of low cost, high stability and can be easily assembled into various intelligent equipment.

## 2. HARDWARE CIRCUIT DESIGN

This paper mainly designs the control circuit, detection circuit, motion circuit and alarm circuit. Its principle circuit is shown as in Fig. 2.

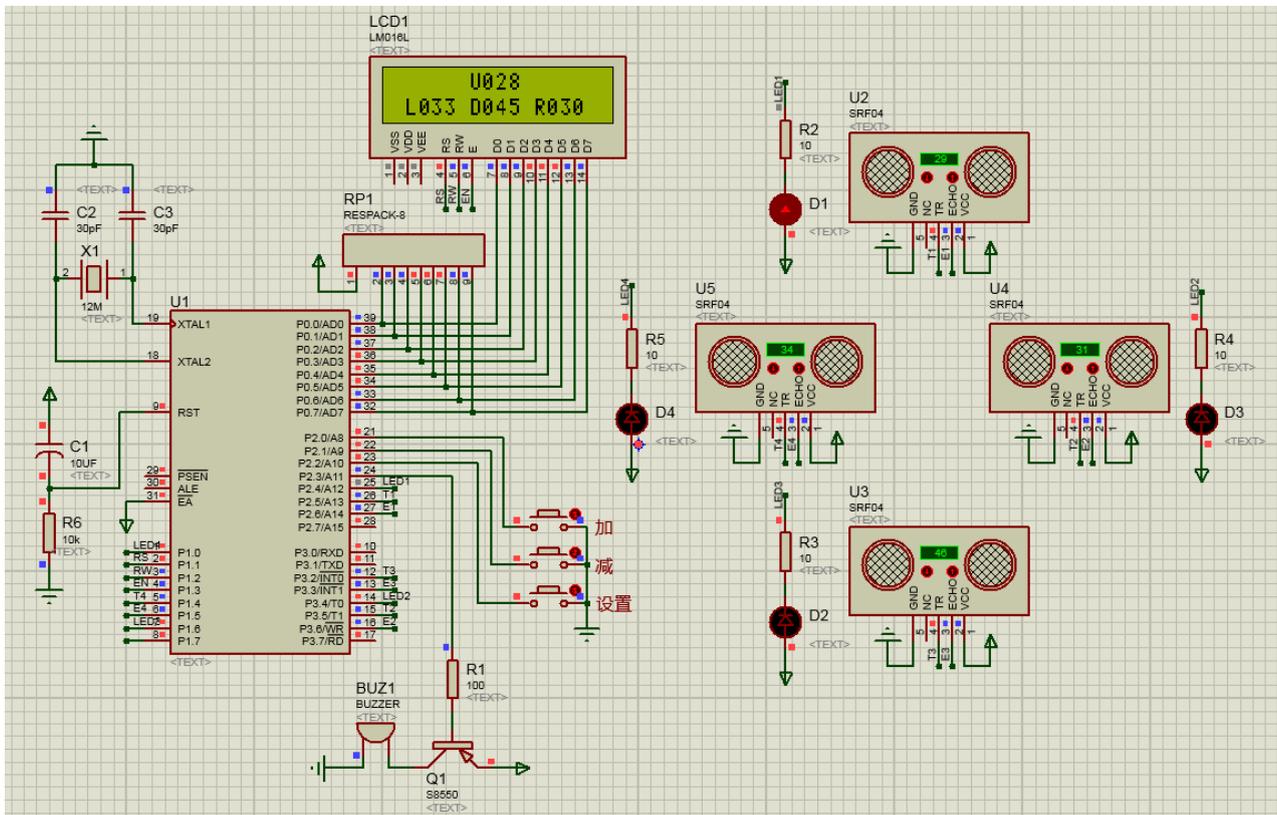


Fig. 2 Design principle of intelligent obstacle alarm based on ultrasonic sensor display circuit design:

Liquid crystal display is a kind of display equipment, which is characterized by small volume, light weight, portability and low energy consumption. It has been widely used in portable electronic products. This design uses 1602 LCD display module, which can display English, numbers, symbols, etc.

Ultrasonic ranging circuit:

a. Principle of Ultrasonic Ranging: the general workflow of ultrasonic transmitter is to initialize the system, transmit ultrasonic, ranging, wait for reflected ultrasonic, and finally receive reflected ultrasonic. Ultrasonic has the characteristics of good directivity, strong penetration and easy to obtain

concentrated sound energy; b. Ultrasonic module circuit: because this design has four ultrasonic sensors to detect the surrounding information. The ultrasonic sensor sends out ranging information, performs ranging, and finally feeds back the ranging information to the single chip microcomputer.

#### Buzzer alarm circuit

In this paper, in addition to the buzzer, there is an NPN triode. The three ends of the triode are respectively connected with the single chip microcomputer, 5V power supply and the buzzer. The function of the triode is to drive the buzzer to work by amplifying the current. The working principle of the buzzer is that when the triode is on, the buzzer will alarm. When the triode is not on, the buzzer will not alarm. When ranging, set a specific value first. When the distance is less than the alarm number, the circuit will trigger the alarm system and cause audible and visual alarm.

### 3. SOFTWARE DESIGN

Main program flow chart: the software design of ultrasonic rangefinder is mainly composed of main program, ultrasonic generation subroutine, ultrasonic receiving interrupt program and display subroutine. The main program flow chart of software design is shown in Fig.3.

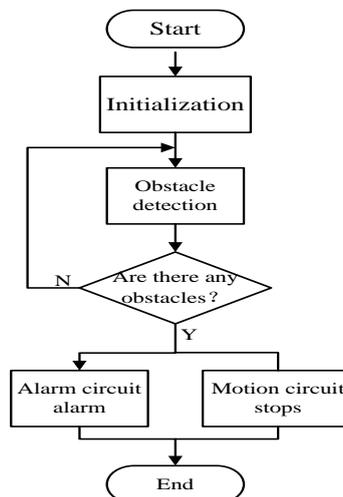


Fig. 3 main program flow chart

### 4. CONCLUSION

In this paper, the information of the surrounding environment is collected by the ultrasonic sensor and fed back to the single chip microcomputer for judgment and processing. If the distance is less than the set value, the system will send out an alarm, on the contrary, it will not give an alarm. Although the design principle is simple, it is highly practical. It is widely used in high-tech fields such as UAV, mobile intelligent obstacle avoidance robot and driverless car.

### REFERENCES

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