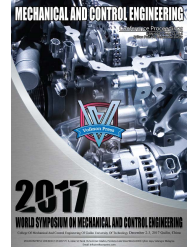




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THE DESIGN OF VEHICLE HAZARD WARNING DEVICE

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ABSTRACT

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with the accident of Asphyxiation and death in the children's car in recent years, the demand for this kind of dangerous alarm devices. The vehicle dangerous alarm device has both temperature and oxygen concentration monitoring and alarm function .As the core of the main measurement and control system of the vehicle dangerous alarm device, STC89C52 is used to collect, process and display the data of the data .The function of alarm and other functions, The temperature monitoring module uses DS18B20 digital temperature sensor, output signal is all digital; The Oxygen concentration monitoring module uses the potentiometer to replace, through the ADC0809 conversion, carry on the LCD digital display. In this paper, design based on single chip microcomputer on-board danger alarm device structure is simple, the design is unique the research has some significance.

1. Introduction

1.1 Background

With the rapid development of the economy today, the automobile industry is booming, and cars become daily transport, then the traffic safety problem is also emerging in an endless stream. In response to this demand, a variety of vehicle alarm device was designed out. The vehicle alarm device for various types of dangerous driving behavior, such as vehicle real-time monitoring alarm device, vehicle tracking and monitoring system of dangerous goods transportation, the realization in the intelligent vehicle GPS and GPRS based emergency alarm system and multi function hazard warning lamp warning device etc. In June 2012, Hunan's 3-year-old girl was forgotten by her teacher in the kindergarten bus for 7 hours. The bus doors locked, the car temperature of 50 degrees, Xiao Zi unfortunately died of heat stroke; in July 2013, Hubei 13-year-old boy Ding Ding was forgotten in the car, after more than 2 hours was found unconscious, temperature above 40 degrees, died in August 2014; Fujian JinJiang 2-year-old girl Xiao Huan with uncle and aunt on the way home to sleep in the back seat. Uncle thought Xiao Huan went home to bed already, the second day has found Xiao Huan was death. In recent years, children have been trapped in the car accident occurred frequently, so here the vehicle risk warning device designed to prevent children choking in the car and death. In modern society, people will see, personal safety is particularly important, since 1885, the German engineer Carle Benz made the world's first car in Mannheim, after the research and design on the reform of vehicle risk warning device is accompanied by the popularity of cars and increasingly rise, whether traffic accident alarm, car reversing anti-collision alarm device or overweight monitoring alarm device, even airbags, such a variety of research and design are the protection of personal safety, to prevent the occurrence of safety accidents. So, the research and design on vehicle risk prevention of child car asphyxia alarm device should be gradually put on the agenda.

1.2 Development status

Car alarm about the risk of a vehicle to prevent children death study with less research, research on this aspect still stays in theory and application, has not yet finished too mature application in the market. This design will be used to detect single-chip temperature and oxygen based on the detection of oxygen concentration and temperature inside the car, set the threshold in advance, when reaching a predetermined value alarm, prevent children dead in the car. At present, the vehicle safety warning device with higher practical value is still being studied. The foreign begin

to strengthen the monitoring efforts of the law, rather than on the risk warning device of vehicle.

With the frequent occurrence of accidents, there has been a preliminary study in china. In 2016 June 29th, Zhou Yupeng, Zhao Zhixuan, Wang Rizhou, Gong Xince published a "vehicle intelligent children life assurance devices" papers, and has received China patent [1]. There is also a real-time measurement and display of oxygen concentration and temperature, and compared with the set of indoor oxygen concentration measurement and control system [2]. These provide a more feasible solution to the problem of choking death in a child's trapped car.

1.3 The main contents of this thesis

Because of the small space in the car, good sealing performance, it is difficult to exchange with outside fresh air, locked in the car the child will die due to hypoxia and death of [3]. The design of the main content is to design a vehicle oxygen and temperature detection device, and when the vehicle temperature or oxygen to threaten the safety of the child's life, play an alarm role. Specific production is the choice of single-chip microcomputer STC89C52 as the core of the measurement and control system to complete data acquisition, processing, display, alarm and other functions. Using DS18B20 as the sensor temperature monitoring system, the output signal can be fully digitized; oxygen concentration monitoring module uses cheap potentiometer to replace the oxygen concentration sensor of high cost, earned the analog signal after conditioning amplification sent to the system 's core unit microcontroller STC89C52, and then through the ADC0809 conversion, the LCD display [4]. When the value reaches the presupposed value, the system will alarm. The general work can be divided into three steps: hardware design, software programming and debugging:

- 1) System hardware design. Combining the detection principle of temperature and oxygen concentration, select the temperature monitoring module, oxygen concentration monitoring module, design one for the system monitoring temperature and oxygen concentration circuit.
- 2) Write the driver for each module. Controlling the program according to the designed temperature and oxygen concentration, hardware structure and monitoring principle.
- 3) System debugging. First, each module of the system is tested, and the software function is tested, then the whole system is debugged, including the setting of the threshold and so on.

2. HARDWARE DESIGN

2.1 System structure of vehicle mounted danger warning device

The vehicle danger warning device is mainly composed of two modules, one is temperature monitoring module and the other is oxygen concentration monitoring module. 5V voltage is used for power supply [5]. At present, the microcontroller based works are basically powered by 5V supply voltage, and the power supply capacity can meet the requirements of the system. The core of the whole vehicle hazard warning device is STC89C52, DS18B20 digital sensor is used as the main part of temperature monitoring module, the oxygen concentration monitoring module is composed of a potentiometer and a ADC0809 analog-to-digital converter, the data measured by the two modules are all digitally displayed by LCD, and the system will call the police whenever either or both of them reach the presupposed value [6].

2.2 System hardware diagram and flow chart

2.2.1 Hardware design of temperature monitoring module

Temperature monitoring module hardware diagram as shown in figure 1, figure 2 is the DS18B20 initialization flow chart, the temperature monitoring module of the hardware is relatively small but each part is an essential part of the normal work of the vehicle hazard warning device. The temperature control module is externally connected with 5V supply voltage to supply power. This is a partial circuit diagram

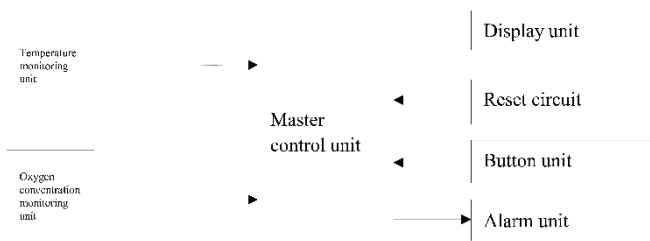


Figure 1: System diagram of on-board danger warning device

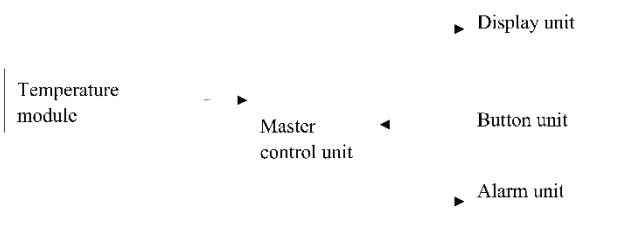


Figure 2: Temperature monitoring hardware block diagram

Choosing DS18B20 as the temperature sensor of this system, data acquisition, processing, display, alarm and other functions are completed by the SCM STC89C52, which is the core of the measurement and control system. DS18B20 is easy for MCU to handle and control, many peripheral circuits in traditional method of temperature measurement are omitted, omit the sample / hold circuit, operational amplifier, analog-to-digital conversion circuit and to transmit serial / parallel conversion circuit long distance, simplify the circuit, shorten the working time, reducing the hardware cost of the system [7].

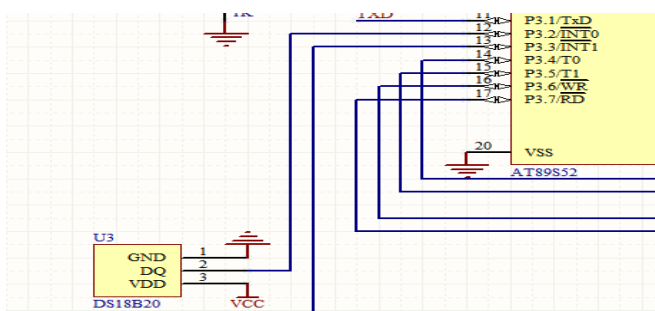


Figure 3: Connection diagram of temperature monitoring module and master IO

There are two ways to connect SCM and DS18B20 in hardware. VCC connected to the external power supply, GND ground, I/O connected with the I/O line of SCM and powered by parasitic power. At this point, UDD, GND grounding, I/O MCU connected with the I/O line.

When the DS18B20 is connected with the microprocessor, it needs only one line to realize two-way communication between the microprocessor and the DS18B20 [8]. This is its unique single line interface mode. The DS18B20 conversion circuit and all sensing elements are integrated into an integrated circuit like a triode without any peripheral elements in use.

2.2.2 Hardware design of oxygen concentration monitoring module

Refer to the web and information, Master chip STC89C52 in the design of vehicle safety warning device is a low power and high-performance CMOS 8-bit microcontroller, with 8K system, programmable Flash memory. Its superior performance is suitable for this system, so it is sure to be used [8]. Figure 4 is a block diagram of oxygen concentration monitoring. The oxygen sensor is electrically connected with the SCM, and the SCM control alarm device carries out an alarm [5].

The oxygen monitoring module is connected with the main control IO, as shown in figure 5.

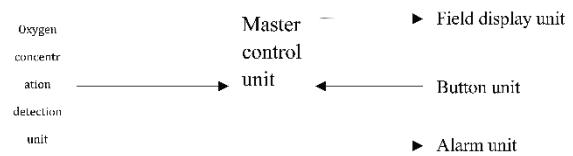


Figure 4: Hardware block diagram of oxygen concentration monitoring

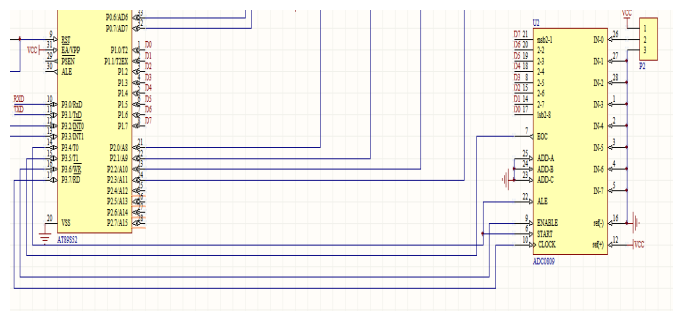


Figure 5: Connection diagram between oxygen monitoring module and master IO

2.2.3 Display unit circuit module

The display unit module uses the LCD digital display device, when the LCD receives the temperature information transmitted from the STC89C52 microcontroller, the data is displayed. The connection circuit between the display module and the master IO is shown in figure 6.

2.2.4 Alarm circuit module

The circuit diagram of the alarm module and the main control IO is shown in figure 7. This system uses buzzer as an alarm device, the alarm circuit designed is simple, connected with the PNP after the main control. Preset a temperature and oxygen concentration threshold, when the system simulated temperature or oxygen concentration reached or exceeded the threshold, the alarm sounds to alarm

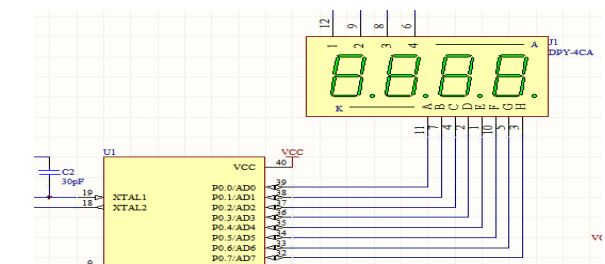


Figure 6: Shows the connection diagram between the unit circuit and the master IO

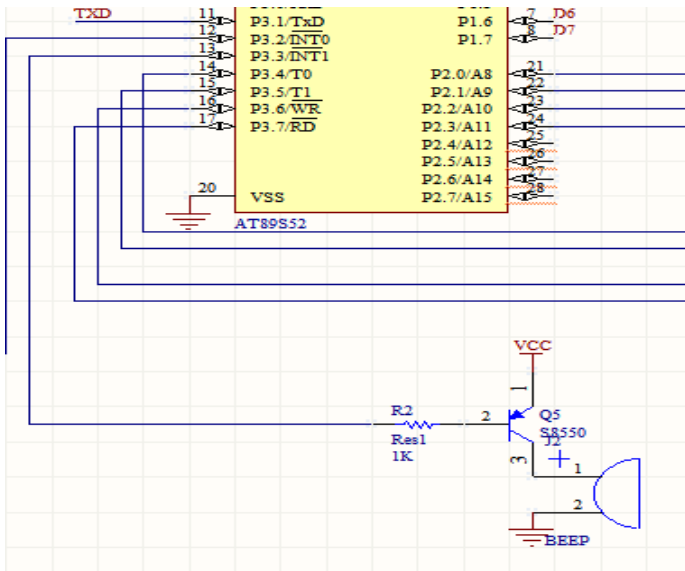


Figure 7: Connection diagram of alarm circuit and main control IO

3. SYSTEM SOFTWARE DESIGN

When the power is on, some components of the system need to be initialized before they can start running properly [9]. The temperature module starts temperature measurement, only when the data reaches a dangerous value (threshold value, the system set up the dangerous temperature is 32 degrees Celsius), the buzzer will alarm; similarly, the oxygen concentration reached the dangerous value (23%), the system will alarm. Because the button control is used, when the left shows 0, the temperature is measured. When the left side shows 1, the oxygen concentration is measured [10]. The measured temperature and oxygen concentration will be displayed on the display screen, no matter whether the system alarms. As shown in Figure 8, the main program flow chart.

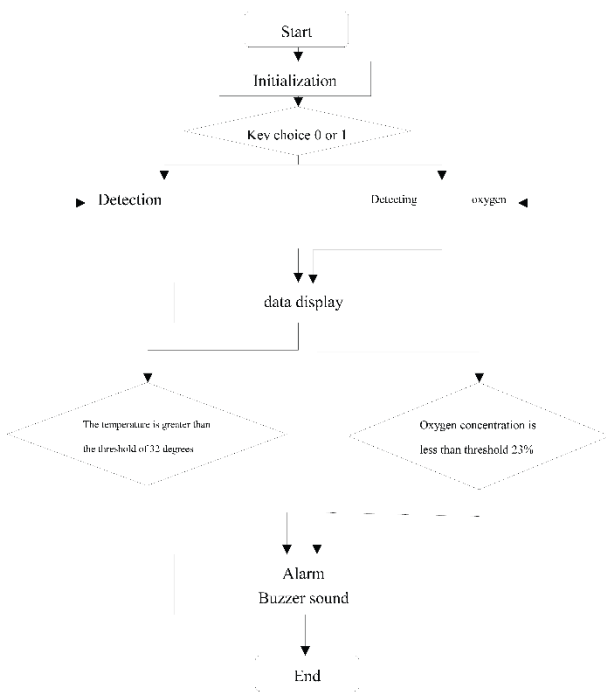


Figure 8: Flow chart of main program

4. SIMULATION DEBUGGING

The design will use Proteus for simulation of the design. It is a EDA tool software, powerful, can be simulated on the market a variety of commonly used mainstream microcontroller. It can also be programmed directly on

a schematic based virtual prototype, followed by display and output, to see the effect of input and output after operation. And then with the system configuration of the virtual logic analyzer, oscilloscope and so on, Proteus established a complete electronic design and development environment. After running on the Proteus, you can carry out the simulation test of the vehicle risk warning device system, as shown in figure 9. After power on, press start / stop button S5 to start work. From left to right, the first button, S6, select "1" to measure the oxygen concentration, if less than 23%, the system alarm, concentration is simulated by a potentiometer, the 0-5V outputs are simulated 0%-100% respectively; The second buttons S4 select "0", that means temperature measurement. If more than 32 degrees, centigrade system alarms.

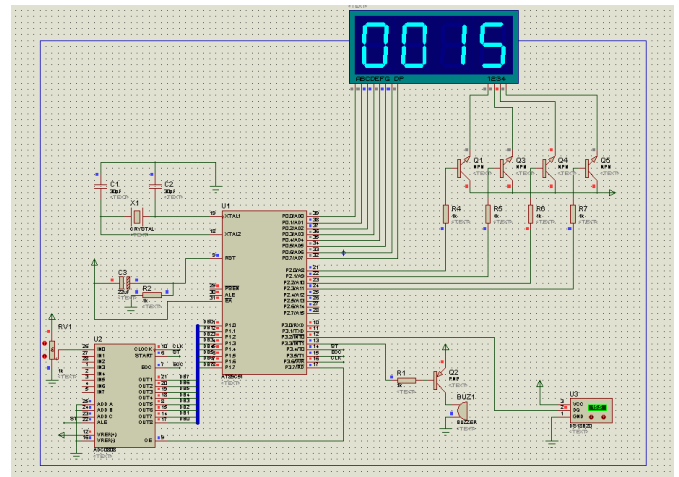


Figure 9: Simulation of vehicle danger warning device

5. CONCLUSION

This design mainly by the temperature monitoring module and oxygen concentration monitoring module two parts and the alarm and display of two parts, etc., after simulation, basically can complete the alarm task, in real life has very important value.

Acknowledgement

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