

Design of Water Quality Detection System

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Abstract

In this paper, AT89C51 single chip microcomputer is used as the core, turbidity sensor is used to test the turbidity of water source, and then the analog signal is converted into digital signal through pcf8591. The temperature of water quality is detected by DS18B20 temperature sensor. Finally, the processed temperature and turbidity are transmitted to the display module for display through RS485. The water quality detection system can effectively detect the turbidity and temperature in the effluent, so as to judge the water pollution and ensure the safety of water quality.

Keywords

Water quality monitoring, temperature collection, LCD1602.

1. Introduction

Water is the most basic material in people's life, and the health and safety of water is the basis of everything. Therefore, it is particularly important to have a good water quality detection device. In this design, the water quality detection system is selected to integrate turbidity detection and temperature detection. Better detection of water quality can achieve better health.

2. Overall Design of the System

The overall design of the system is shown in Figure 1, which is the overall design block diagram of water quality detection, including power supply module, temperature detection module, turbidity detection module, communication and display module. Mainly through the turbidity detection module and temperature detection module to detect the turbidity and temperature of water quality, and then the detected turbidity is converted to analog-to-digital conversion. The measured data is transmitted to the display module to display turbidity and temperature. The power supply module provides a guarantee for the overall voltage, so as to realize the overall function.

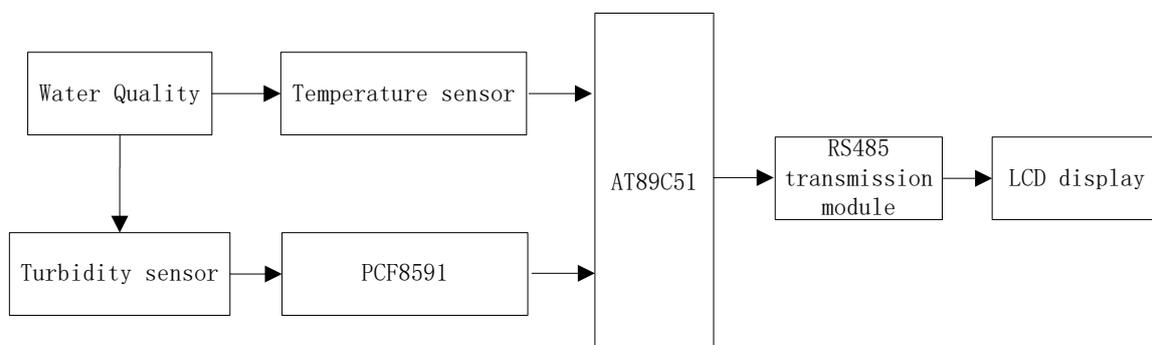


Figure 1. Overall design block diagram

3. The Hardware Design of the System

3.1. Turbidity Detection Circuit

In this design of water quality detection system, the turbidity sensor of tsw-30 is selected mainly because it is easy to use and low-cost. At the same time, it can also measure the analog value of water quality and digitize the analog value through pcf8591a / D analog-to-digital conversion, so as to know the current water turbidity. The digital quantity can adjust the trigger threshold through the potentiometer on the module. When the turbidity reaches the set threshold, it will be measured to warn or link other equipment. When the system is started, the turbidity will be measured. The turbidity detection circuit is shown in Figure 2 below.

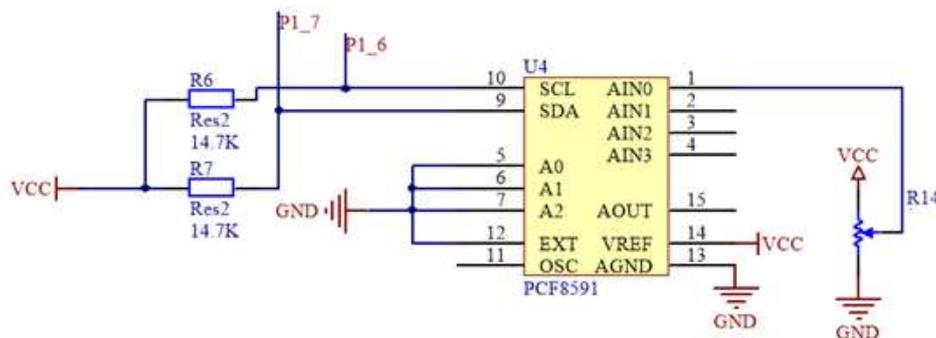


Figure 2. Turbidity detection circuit

Through the analog-to-digital conversion of the input data from PCA pin (scp-1) to the analog-to-digital conversion (ADC) of the pca91 (PCA) pin, the input data is converted to the analog-to-digital (ADC) pin of the PCA (sc91) through the analog-to-digital conversion of the input data from the PCA pin (sc91) to the analog-to-digital conversion (ADC) of the pca91 (PCA) pin_ 6 and P1_ 7 ports for a data storage.

This design uses pcf8591 A / D conversion as the core component of turbidity conversion. This paper mainly uses 8-bit digital to analog conversion in pcf8591 to convert the measured turbidity, so as to convert the analog turbidity into the data that can be displayed. And then better complete the turbidity measurement. A0 ~ A2 and ext are grounded, and the pin address end is grounded. Then Sal and SDA are respectively connected to the clock line of the data line of the MCU, and the measured turbidity is converted to an analog-to-digital conversion. A resistance of 4.7K Ω is connected to one side of the interface to stabilize the voltage.

3.2. Temperature Detection Circuit

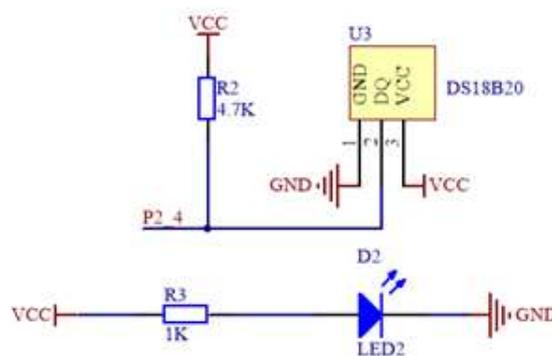


Figure 3. Temperature detection circuit

DS18B20 temperature detection module is used in this water quality detection design. This temperature detection module has the characteristics of small size, strong anti-interference ability and high precision. Therefore, this sensor is used in this design. When the system is turned on, it will be converted to the temperature measurement interface through the button prompt. At this time, DS18B20 will conduct a temperature measurement through the DQ pin, and transmit the measured temperature to the P2.4 port of the MCU for a temperature storage. Figure 3 shows the temperature detection circuit.

The design of the temperature detection circuit, through DS18B20 as the main components, through the ds48b20 DQ pin of the water temperature for a measurement, the measured temperature for data transmission and processing, so that the integrity of the whole program.

3.3. Display Circuit

1602 is a widely used character LCD module. It is mainly composed of character LCD, hd44100 and resistor capacitor. In this design, it is mainly used to display turbidity and temperature sensor measured by turbidity sensor Measured temperature. Figure 4 shows the display circuit of this design. Among them, 8-14 pins are respectively connected with the P 0 of single chip microcomputer_ 1 to P0_ 7 connected to display the data stored in MCU.

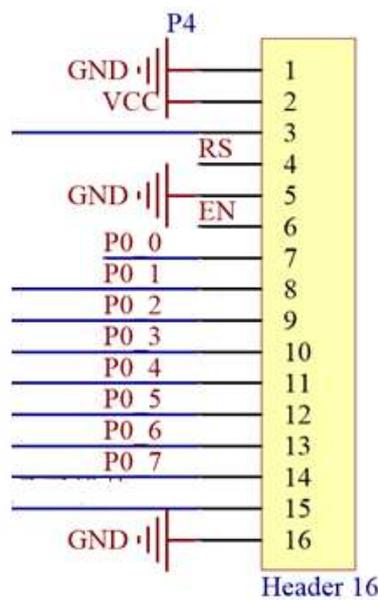


Figure 4. Display circuit

Using 1602 liquid crystal display screen can better display the measured turbidity and temperature, and carry out a real-time display, will not produce some ghost and fuzzy situation. At the beginning of this design system, it will enter an initialization interface, and the words "welcome" will appear to measure the temperature and turbidity of water quality in turn. When the turbidity and temperature of water quality are measured, the words "finish" will be displayed, and then the words "ZD WD" will be displayed, that is, the collected data. When the power is off, the display will end.

3.4. RS485 Circuit

Figure 5 shows the RS485 circuit diagram with a receiver and driver. The design of water quality detection needs to transmit the measured turbidity and temperature, and RS485 can stably transmit these data, which greatly simplifies the operation process. Four pins are connected to the TXD (the 11th pin) of MCU, which makes great contribution to the data transmission.

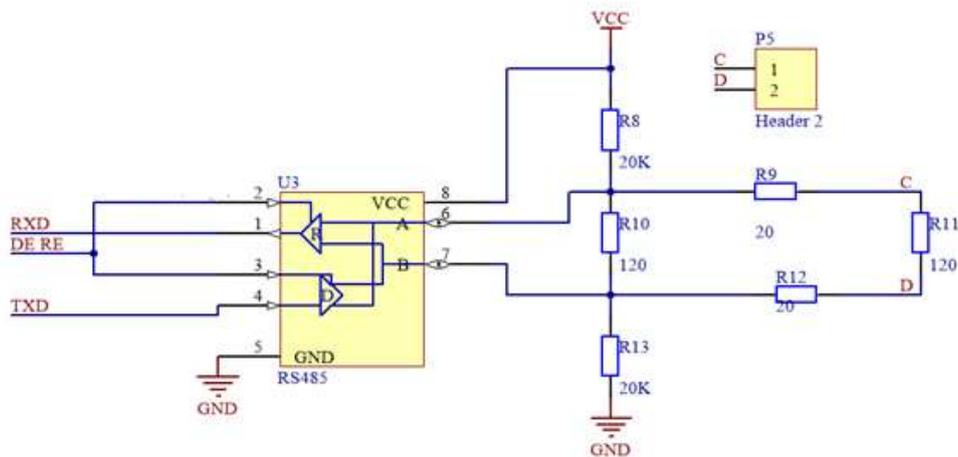


Figure 5. RS485 circuit

The design of this circuit is mainly to provide a channel for the transmission of the measured data, and to help the display of temperature and turbidity. Similarly, for the convenience of data transmission, this circuit is directly connected with the display module, and finally directly displays the turbidity and temperature, which greatly improves the efficiency.

4. Software Design of the System

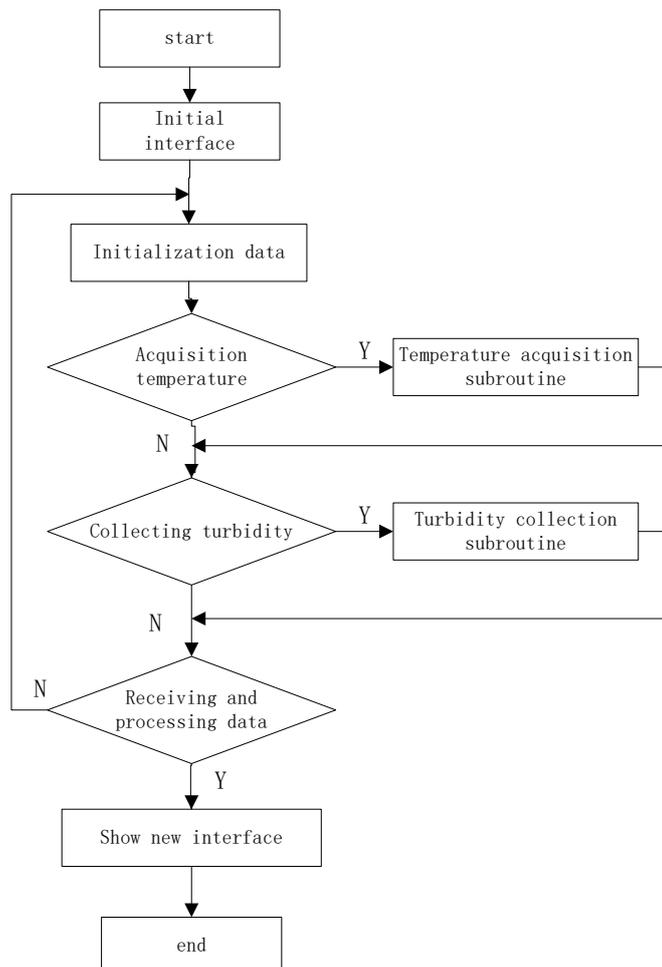


Figure 6. Main program flow chart

As shown in Figure 6 above, the main program design flow chart of the water quality detection system is shown. Let the program initialize first, and then the display screen will display the word "welcome". Measure turbidity and temperature according to the display screen. Then, the temperature and turbidity are detected respectively according to whether the temperature detection or turbidity detection is entered. If no detection subprogram is entered in the detection process, it will automatically enter the display of the last detected data. When a new data is generated, the last data will be replaced. At this time, the detected data of turbidity and temperature are processed into data that can be displayed in 1602, and then the new data will be displayed. And then better detection of the water quality, to understand the water quality.

5. Conclusion

With the development of modern society, people's quality of life gradually to the direction of healthy development, in the next few years, I believe that water quality health will be more and more important. Water quality is the foundation of human life, and water quality safety is more important. In China, groundwater resources in rural areas are the main water supply resources. Therefore, based on this requirement, this water quality detection system is designed to detect water quality conveniently and quickly without professional training. At the same time, it has the characteristics of small volume, light weight and easy to carry, which fills the blank of civil water quality detector and has great practical value.

References

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