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Application of Proteus in Simulation of Environmental Data Analysis System

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Abstract

Proteus in the simulation application of environmental data analysis system. The main content of this article takes at series as the main control chip, collects gas through gas sensor, displays data with display screen, processes the data, and transmits the results to PC for subsequent operation. Research conclusion through the simulation and development of the environmental data analysis system with at main control chip by using Protues software, the performance of processing and saving data of the chip is strengthened, and the serial port communication can realize other operations of environmental data by different users and platforms.

Keywords

Protues; Keil; Serial Communication; Data Acquisition.

1. Introduction

According to the definition of atmosphere and air in International Standardization (ISO): atmosphere refers to the sum of all air around the earth; Ambient air refers to the outdoor air exposed to humans, plants, animals and buildings. Many of the gaseous substances in the atmosphere are substances that cause air pollution, including carbon monoxide, carbon dioxide, sulfur oxides, methane, formaldehyde and so on. Their existence has an important impact on environmental pollution. In terms of data, there are corresponding papers on data acquisition and analysis as support. However, in terms of simulation software, there is no relevant paper on identifying different pollutants and making simple treatment, and the workload of communication with PC is large. Therefore, this topic is selected to further analyze and deal with the environmental pollution.

2. Simulation Hardware Architecture

2.1 AT89C52 Minimum System

In this simulation system, AT89C52 chip with low power consumption, stable operation and frequent use is used as the core controller of this system, and can reduce the size of hardware circuit when making real hardware system [1].

Because the working order of the single chip microcomputer needs to be controlled by the clock frequency, the operation frequency of the chip will be affected by the clock signal at a certain level. In order to adapt to different working modes, different clock signals must be set. If the system works normally, stably and efficiently under different clock signals, a stable oscillator must also be configured. To build the oscillator, a high gain inverting amplifier for building the oscillator needs to be configured between the pins of external crystal oscillator 1 and external crystal oscillator 2, and the fine tuning capacitor and quartz capacitor are connected. Through the above method, a clock circuit is established to provide a clock signal. Among them, the capacitance values of C1 and C2 in

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the clock circuit are 30 PF and the crystal oscillator frequency is 11.0592 MHz. Since reset is the basic operation of single chip microcomputer system, this paper adopts the method of power on reset to charge and discharge 10 UF capacitor through external power supply to realize the reset operation.

The core control components of the minimum system of AT89C52 single chip microcomputer mainly include single chip microcomputer chip, clock circuit and power on reset circuit, as shown in Figure 1.

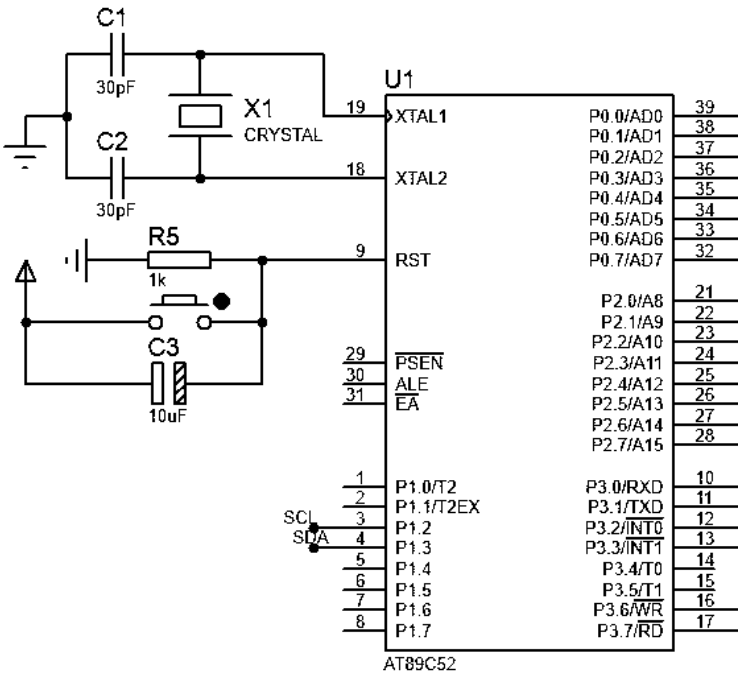

Figure 1. Minimum system circuit diagram

3. System Function Module

3.1 Gas Acquisition Module

When ADC0832 is not running, its CS input interface needs high level, and the chip is forbidden to use [2]. When it is necessary to start the digital to analog conversion, the CS enable interface must be set at the low level and remain low until the conversion is completed. At this time, the chip starts to convert, and the clock pulse is input to the clock signal end of the chip through the single chip microcomputer. Because the interface between do and di does not work together in communication, and the interface of MCU is bidirectional transmission, that is, when designing the circuit, do and di can be used in parallel on the same data line to achieve the effect of line multiplexing. The do / di interface can use the input channel work of the di interface to select the data signal. The potentiometer is used to simulate the polluted gas data and receive the analog signal [3] through the analog input channel (CH0). Its circuit diagram is shown in Figure 2.

After designing the gas acquisition circuit function, get_ AD_ The result function needs to set the chip selection signal to 1, the clock signal to 0 and the input port to 1 before calling_ nop_ () set the delay clock signal to 1, set the input signal to 0, and wait for get_ AD_ The collection of CO value is completed after the operation of result, and the collection process of other gases is similar.

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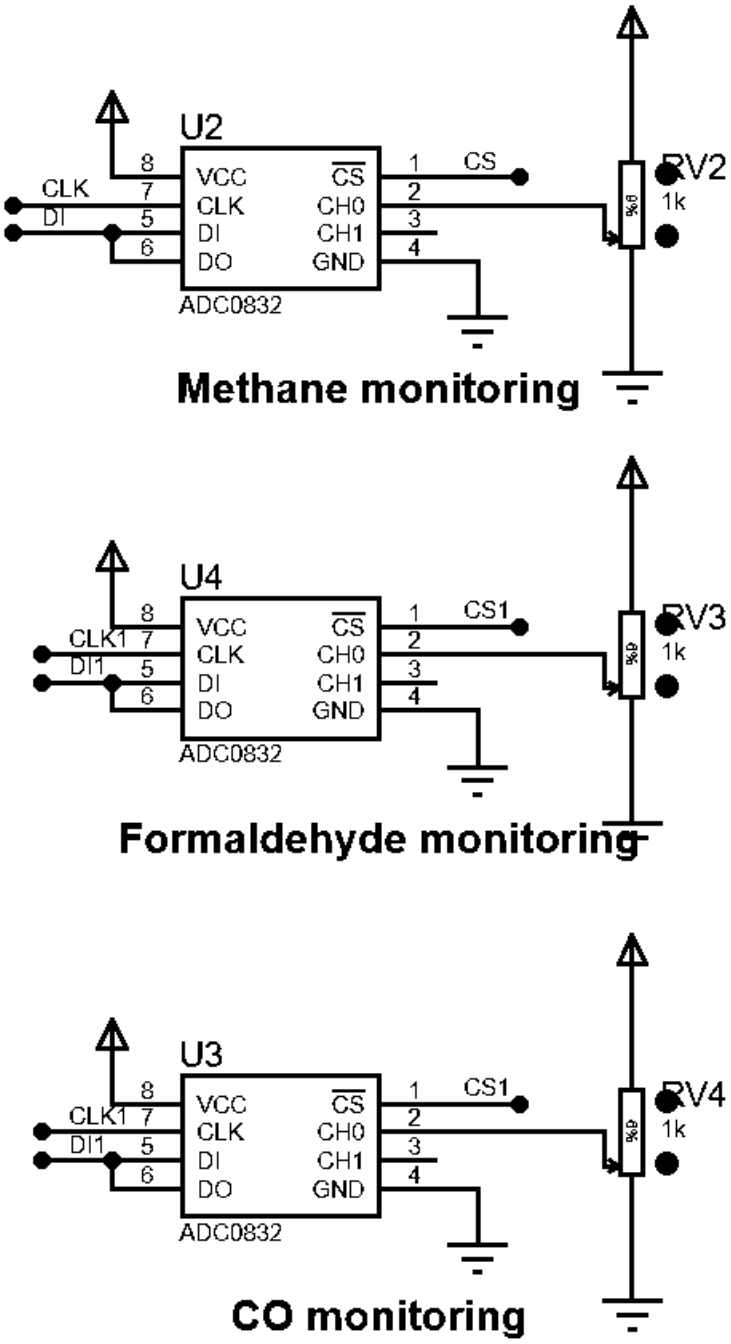

Figure 2. Gas acquisition circuit diagram

3.2 Display Module

In led1602 LCD, a 10kq potentiometer is needed to adjust its contrast, so as to prevent "ghost" from appearing [4]. In addition, it is not necessary to configure the LED on the LCD screen to operate normally because the resistance of the LCD screen is pulled on the high level, so it is not necessary to configure the LED on the LCD screen to operate normally. Finally, according to the signal detected by the above gas acquisition module, the data is calculated and operated by the single chip microcomputer, and the ready display data is transmitted to the display module for display [5], as shown in Figure 3.

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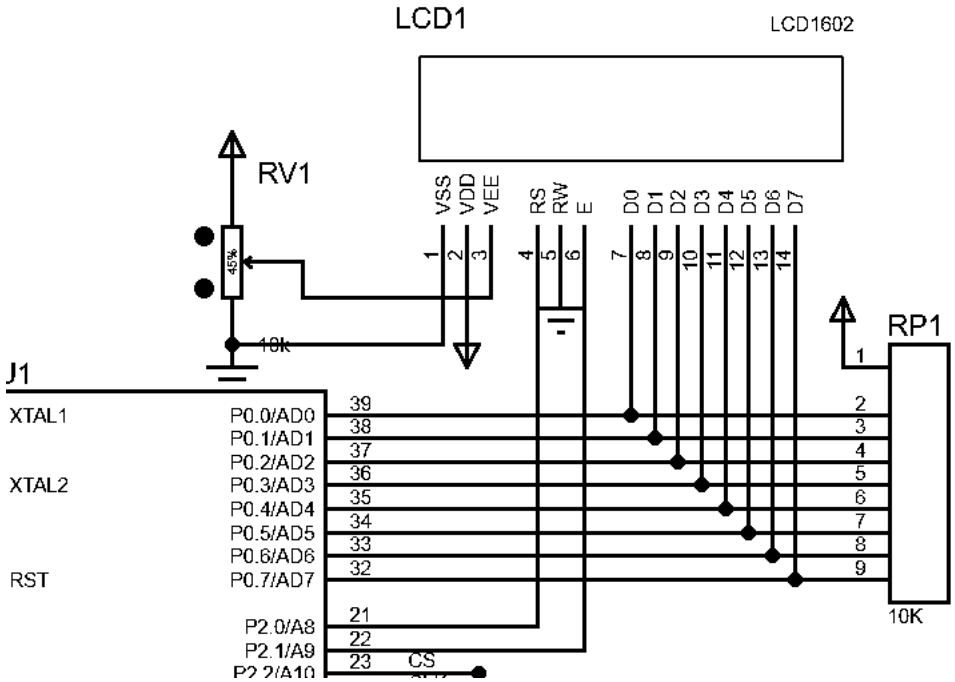

Figure 3. Display circuit diagram

3.3 Exception Handling Module

The abnormality handling circuit is mainly composed of triode (bd136), LED lamp, two external power supplies and relay. Through the switch in the relay, if the input data is abnormal, the LED connected with the relay lights up.

3.4 Alarm Module

Hardware resources of alarm circuit, mainly PNP type triode amplifier, buzzer and 1K Ω resistance. In addition, the main function of configuring resistance in the circuit is to limit the current and prevent the buzzer from working due to excessive current.

4. Serial Communication

When designing a multi-functional control system, the general upper computer and lower computer cooperate together, and the system tends to be more efficient. In this study, the upper computer is represented by PC with virtual serial port, and the lower computer is generally composed of single chip microcomputer and other circuit modules. In general application, single chip microcomputer is the bottom layer of the main controlled object, and the next result analysis of the transmitted data is realized through PC.

4.1 Serial Communication Hardware Circuit

In practical applications, the transmission length and speed of RS-232 will generally exceed the standard value, which fully meets the needs of building a simulation system. The simulation hardware of serial communication module mainly includes the virtual COM port generated by configure virtual serial port driver software and the communication between PC and RS-232 simulated by STC ISP software. RS-232 serial port mainly adopts ASCII code for data exchange. Its device characteristics and logic level standard are + 3V ~ + 15V. The signal is effective and the serial port works. Among them, COM1 port is used as the serial communication port of the system chip, com2 is the PC port, the baud rate is 9600 BPs, and the data bit is the default value [10]. At the same time, a virtual terminal is set in Proteus to observe the real-time data and compare it with the data transmitted to the upper computer to prevent the phenomenon of data scrambling. The serial communication circuit diagram is shown in Figure 4.

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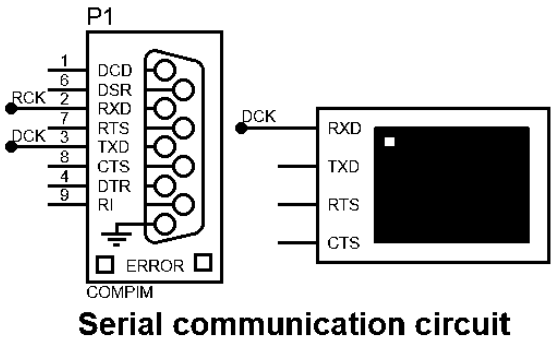

Figure 4. Serial port circuit diagram

5. Serial Communication

This system mainly uses at series chips as the control core to establish the hardware schematic diagram of environmental pollution analysis and Simulation of AT89C52 single chip microcomputer. The gas sensor can be used to collect analog signals and transmit the data to the single chip microcomputer through digital to analog conversion. The MCU loads the software program. Firstly, the data is transmitted to the display screen module through the P0 interface. First, the initialization operation is carried out, and then the polluted gas data display function is entered; Secondly, the software program is used to judge the range of collected gas data, and the buzzer and abnormal processing circuit are used to preprocess the input data; Thirdly, use the virtual serial port simulation software to configure the virtual serial port, and control the MCU reading and writing interface through the key to facilitate the user to transfer the operation data to the PC end and save the data results and original data into a text file with the application of at software. The overall structure of the system is shown in Figure 5.

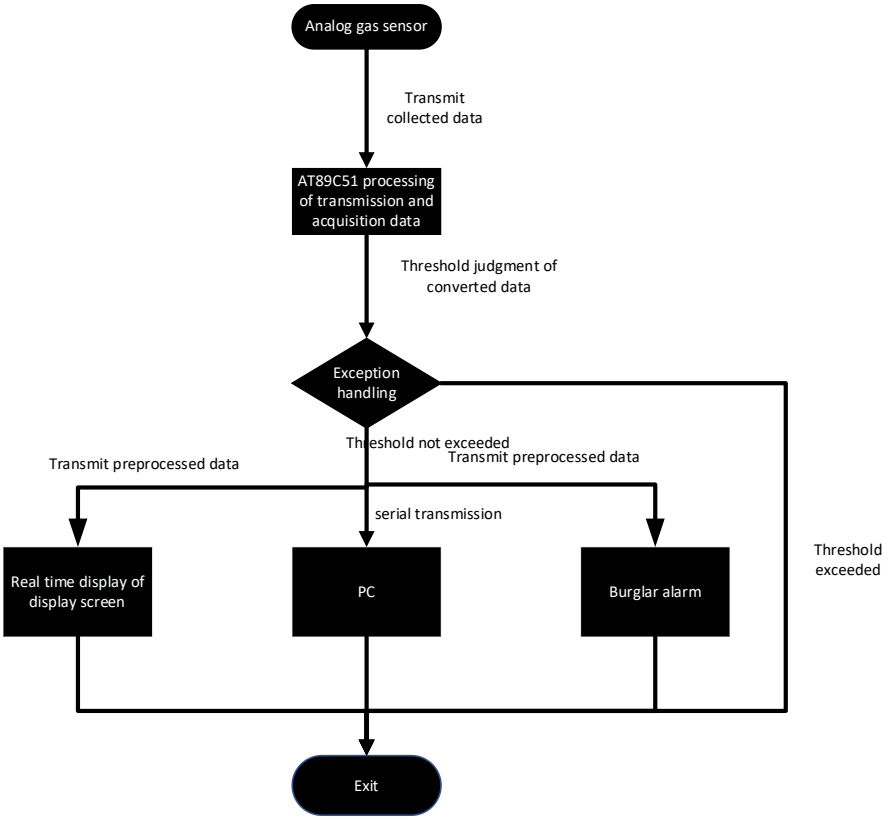

Figure 5. Overall structure diagram

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6. System Test

Firstly, the gas signal is simulated using CO, formaldehyde and methane gas simulators, and the analog signal value is changed by controlling the pull-up or pull-down of pot-hg. Secondly, the analog signal is converted into digital signal through ADC0832 and transmitted to MCU through P2 interface. Thirdly, the MCU uses the P0 interface data function and the pull-up resistance to transmit the data to the led1602 display screen. In addition, press the key and set the falling edge to trigger the interrupt, and then turn on the P3 interface read-write control function to realize the preparation of data transmission between PC and MCU. Finally, configure the virtual COM interface parameters for data transmission and configure the buzzer circuit and the initial low level of LED light to further complete the initial work of the system. Therefore, the user can not only collect the polluted gas value through the display screen, but also download and save its value on the PC.

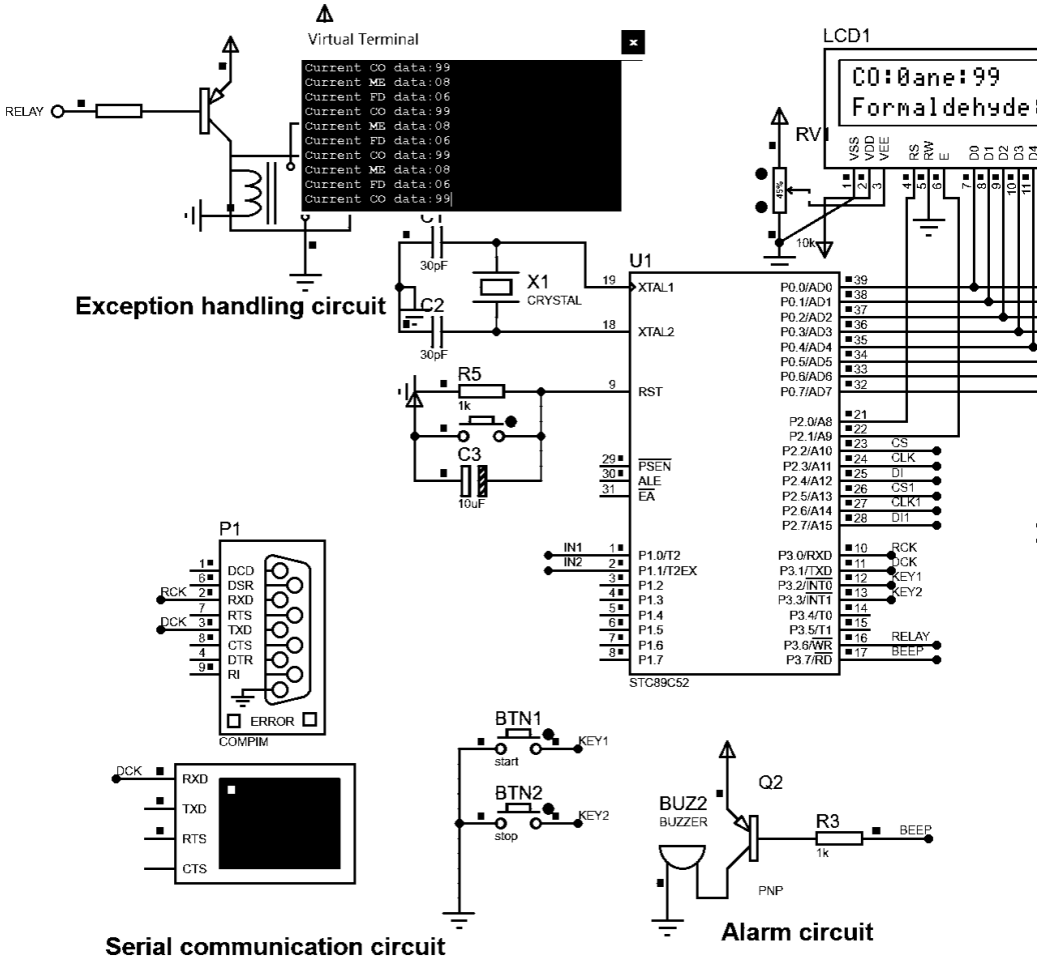

Figure 6. System implementation renderings

Acknowledgments

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