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THE IMPLEMENT OF WIRELESS RESPONDER SYSTEM BASED ON RADIO FREQUENCY TECHNOLOGY

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ABSTRACT

It includes the Nrf24l01 wireless module, LCD1602 liquid crystal display module, reset circuit, clock circuit. In the specified time, items for agreement, disagreement and abstaining from voting can be selected by pressing the buttons of the transmitter part. The voting results is displayed in the LCD1602 liquid crystal display. This design has the advantages of simple operation, intuition and economic applicability.

KEYWORDS

Wireless responder system, 51 series single chip microcomputer, wireless module, liquid crystal display.

1. INTRODUCTION

The wireless forestalling-answer system is developed from the ordinary forestalling-answer system. The rush-answer machine is composed of single chip microcomputer and some circuit modules. In addition, the forestalling-answer system was first invented by foreign countries, and then introduced by our country and widely used. Nowadays, the rush-answer machine has been in widespread use as a tool in some special occasions, making our monotonous lives colorful [1-6].

This design elaborates on how to design the wireless forestalling-answer system based on radio frequency technology. It is an eight-routes wireless forestalling-answer system based on STC89C51 single chip microcomputer, which works as CPU to control overall operation, and the Nrf24l01 wireless module as a bridge [7]. The poll results are shown on the display by implementing the eight-routes polls in the circuit to respond within the prescribed time.

2. DESIGN THINKING

(1) The first step is to look for information related to the design in the library or on the network, and then screen out some useful knowledge about this topic and organize and summarize relevant information.

(2) The design of the wireless forestalling-answer system based on radio frequency technology is finished by using a relevant software, including drawing, typesetting, printing, completing the work and debugging.

(3) The answering time is able to be set manually, and the answering countdown can be adjusted within 0-99 seconds as required. The eight-routes rush-answer voting machine is able to be used to input data of eight groups and the voting results of corresponding options can be shown in the display module.

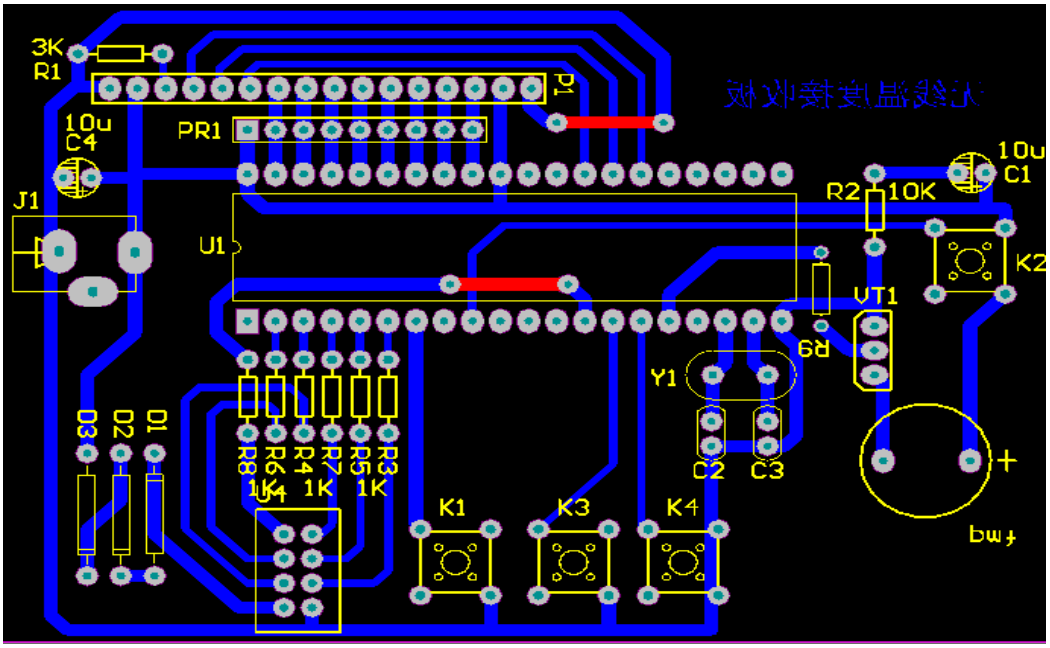

Figure 1: Control signals or multiplex pins with other power supplies

RST (9 pin): It represents the reset terminal. This pin can be used to constitute a reset circuit to allow the system to be initialized or reset, so that the system can operate normally and steadily.

PSEN (29 pin): Program storage is enabled, and external program storage is read. When the program is read externally, every machine cycle of PSEN is activated two times. When accessing the external data memory, PSEN is invalid, and when accessing the internal program memory, PSEN is also invalid [2, 8-10].

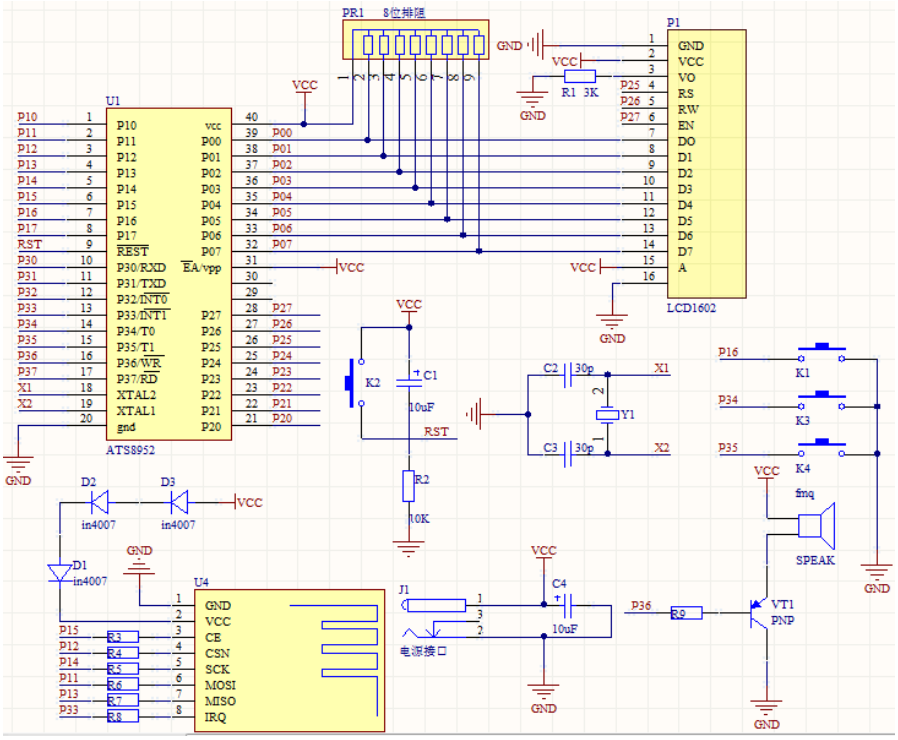

Figure 2: The Reset Circuit

The main features of the module are:

High transmission rate; the transmission rate is 2Mbps: A lot of frequencies; 125 frequencies meet the needs of multipoint communication and frequency hopping communication.

Subminiature; a 2.4GHz antenna of a small size is placed inside the module: Low power consumption; it is mainly embodied in low consumption of current and low energy consumption.

We can roughly know the construction principle of pins in nRF24L01 module and the connection between pins of the module and pins of single chip microcomputer. We can also know the general model of this module.

The working principle of this module is: when transmitting the radio signal, the module is first configured to the transmitting mode through single chip microcomputer, and then the values of pins are changed to transmit the radio signal [11]. When receiving the radio signal, the module is configured to the receiving mode through single chip microcomputer, and when it induces the radio signal with the same frequency, it receives the signal.

Table 1: The Description of nRF24L01 Pins

Pin	Symbol	Function	Description
1	GND	Power Ground	Ground（0V）
2	VCC	Power Supply	Supplied to Module
3	CE	Data Input	Work Mode Selection
4	CSN	Data Input	SPI Chip Selection Signal
5	SCK	Data Input	SPI Clock
6	MOSI	Data Input	Input from SPI
7	MISO	Data Output	Output from SPI
8	IRQ	Data Output	Output Interruption

All the functions of the module can be realized through the eight pins of Table. 1, and the unity and real-time performances of transmitting and receiving can be realized. From the Table 1. it can be seen that this module has diverse functions.

(4) **THE DESIGN OF SYSTEM SOFTWARE**

Software design is dividing the overall structure of the system based on different types or functions of the circuit, forming different circuit modules. The relationship of modules and that of compiled programs compose the specific design flow of the system software [12]. Simplifying the circuit through simplifying the connections in the circuit into connections among modules makes the operation of modules seem to be easier.

(5) HARDWARE PRODUCTION AND SYSTEM TEST

4.1 Hardware Production

The functions required in the design (countdown, reset, etc.) are achieved with a lot of programs driving single chip microcomputer. Writing a program is also an important part of the design [13]. Write a reasonable program requires a solid foundation of the C language. Therefore, I reviewed the C language and studied the software Keil uVsion4 at an earlier time. Then I compiled the C language program in Keil uVsion4 according to the requirements of the design and succeeded after running the program without grammatical errors.

4.2 Software Simulation Debugging

The schematic diagram of the design which is designed in Protel99SE is simulated in Proteus to correct errors. After that, the compiled program is downloaded to the simulation single chip microcomputer in Proteus [14].

In order to improve the schematic diagram and the program, the operation key is clicked on to run the circuit emulation system and check the working condition of the circuit and the functions. Consequently, satisfactory simulation results are obtained through constant debugging the program and improving the schematic diagram.

During the debugging, it was found that the timer was abnormal, and the answer time was unable to be set up correctly [15]. At that time, the problem cannot be found out immediately. However, my classmates and I found that the program compilation was not reasonable after careful examinations. After modifying the program, the timer is normal. At the same time, the abnormal display module was also found. The problem, the wrong connection between the display module and single chip microcomputer, was found in the circuit connection after examinations and was corrected after debugging [16]. The software simulation debugging is finished with no problems in the program and simulation hardware.

I improve my maturity of using the software and avoid similar problems in the software simulation debugging through summarizing these problems and my defects.

(6) RESULTS AND ANALYSIS

After debugging, the design has been basically meeting the requirements of the subject and a wireless rush-answer machine based on radio frequency technology with 51 single chip microcomputers as the CPU for overall control, Nrf24l01 wireless module as a bridge, the voting results of pros, cons and abstention from the machine sent to the host and the pressing times of the corresponding options shown on the LCD screen.

(7) CONCLUSION

The design of remote control of Wireless Responder System Based on Radio Frequency Technology has deepened my understanding of the AT89C52 single-chip microcontroller, including its development and prospects. It makes me more desired for the knowledge on this module.

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