The Design of Intelligent Temperature Control Fan System with Infrared Remote Control

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Abstract. The system can realize the basic functions of fan remote control, human body detection, indoor temperature display, fan automatic start and stop, etc. In addition, the temperature control system also increases the temperature range. Regulation and countdown function. The designed temperature-controlled fan system is easy to operate, sensitive to induction, intelligent in regulation, stable in performance, and inexpensive, and can meet the summer heat-reduction requirements of most families, and is economical and comfortable.

Introduction

Intelligent fan is a new type of fan that can automatically detect the ambient temperature and adjust the air volume according to the temperature[1-2]. It can remotely control the switch, wind speed, timing, appointment and other intelligent functions through remote control or mobile app. Its purpose is to bring users a more comfortable summer experience[3].

The intelligent temperature control fan designed in this paper uses single chip stc89c52rc as the main control device, and multiple sensors cooperate to control the operation of each circuit module, this fan system can not only realize the infrared controlling of the fan, displaying of the indoor temperature, adjusting the fan wind speed according to the temperature, which basically solves the defect of traditional fan and meets the needs of the vast majority of people[4-5] .

Overall design

The system hardware consists of the main control circuit module based on the single-chip STC89C52RC, the power module, the remote control module, the temperature sensor module, the human body signal acquisition and processing module, the crystal oscillator and the reset circuit module, the display module and the motor module. The system adopts single-chip STC89C52RC as the main control circuit, USB power supply for each module circuit, LCD1602 display module for the system to display temperature and range, countdown, infrared detection results, etc., using DS18B20 temperature sensor as temperature detection module, using stepper motor as fan main body.

After the system is powered on, first of all, the temperature sensor module of the system detects the temperature and displays it on the display screen. At the same time, the infrared sensor module senses whether the human body is in the fan out range. If someone is in front of the fan, the fan starts and compares the ambient temperature with the preset temperature range. If the temperature is in the set range, the fan motor rotates slowly, if it is higher than the upper temperature limit, the motor will rotate at full speed, if it is lower than the lower temperature limit, the motor will stop rotating, If the infrared sensor does not sense that someone is in the range of air output, the fan will

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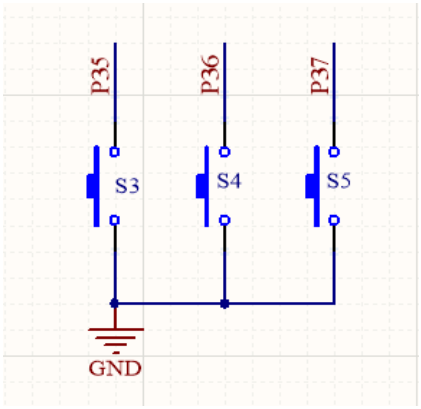
stop rotating after a delay of 30 seconds. This fan system can set the temperature range manually and control the fan speed remotely. It realizes the intelligent fan system which integrates remote control, temperature control and inductive control.

The design of main control circuit

The main control circuit is the core of the whole circuit, among, the P0.0- P0.7 pin of single chip microcomputer is connected with the db0-db7 pin of liquid crystal display, which can transmit temperature, human body signal and other data,P1.0- P1.2 pin is connected with RS, RW, EN pin of liquid crystal display,P1.3 pin is connected to the output terminal of the human body induction module to send the human body detection results to the single machine for further processing,P1.4 pin is connected to the base of the PNP triode ,P1.5 pin is connected to the data interface of the temperature sensor to transmit the real-time temperature data to the single-chip microcomputer, RST pin is connected to the reset circuit of the single-chip microcomputer,p3.2 pin is connected to the output terminal of infrared receiver to transmit infrared command signal,P3.5-P3.7 pin is connected to the key circuit to adjust the value of set temperature range.

The design of keyboard module

The circuit diagram of keyboard is shown in Figure 1.The keyboard circuit consists of three independent keys, which are the temperature range setting key S3,the temperature "+" key S4, and the temperature "-" key S5.S3 key is connected with P3.5 pin of single chip microcomputer,S4 key is connected with P3.6 pin,S5 key is connected with P3.7 pin. When S3 key is pressed, the cursor will be obtained at the digital position corresponding to the temperature range, and the cursor will be moved to the digital position corresponding to the lower limit of the temperature range after pressing this key again, When the S4 key is pressed, the decimal digit of the number at the cursor position is increased by 1, and the digit is decimal one, when the S5 key is pressed, the decimal digit of the number at the cursor position is decreased by 1, and the digit is reduced to 0. After the temperature range is set,S3 key is pressed to indicate that the temperature is set.



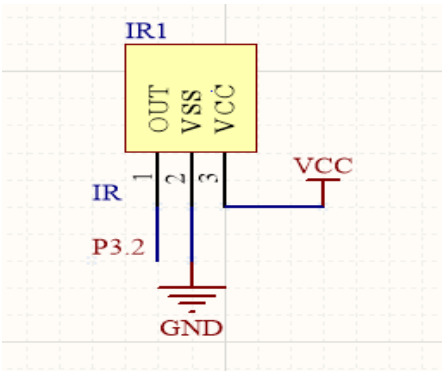


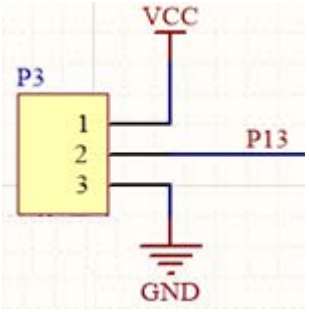
Fig.1. The Keyboard circuit Fig.2. Infrared remote control receiving circuit

The design of remote control module

The infrared remote control receiving circuit module is shown in Figure 2,VCC and VSS pins are connected to power and ground respectively, and data output terminal (OUT) is connected to p3.2 pin of single chip microcomputer. The function of remote control keyboard is the same as that of key keyboard, which can set the temperature range of fan.

The design of human body signal acquisition and processing module

The circuit of human body signal acquisition and processing module is shown in Figure 3.The function of the module circuit is to convert the infrared radiation emitted by human body into electrical signal and send it to the single chip microcomputer for further processing, then control the start and stop of the motor, adjust the sliding rheostat on the module to realize the demand of receiving the infrared radiation distance of human body about 0-7 meters,1 pin and 3 pin are respectively connected to the power supply and ground,2 pins are the electrical signal output terminals, which send the infrared signal to the microcontroller through port p1.3. If there is a human signal, the output terminal always outputs high level, if there is no detection of human body within its detection range, the output terminal changes from high level to low level.



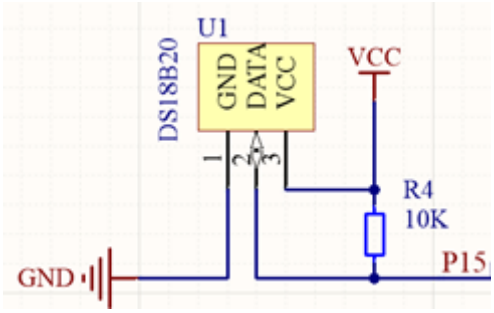


Fig.3. The circuit of body signal acquisition module Fig.4. The wiring of DS18B20

The design of temperature sensor module

The wiring diagram of DS18B20 circuit is shown in Figure 4.DS18B20 digital temperature sensor collects the field temperature, and sends the measured data to P1.5 port of STC89C52 microcomputer, and it displays the ambient temperature value on LCD1602 display, compares the temperature value with the upper and lower limit of the preset temperature value. The motor rotates at full speed when it is higher than the upper limit of the preset value, and the motor stop rotating when it is below the lower limit.

Conclusion

This design is an intelligent temperature control fan system of infrared remote control. It is composed of LCD1602 display module, digital temperature sensor DS18B20 module, independent key module, infrared remote control module and human body signal acquisition module. This fan system can display the ambient temperature, set the temperature range, detect the human body signal, and realize the intelligent fan system which integrates remote control, temperature control and inductive control.

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