

## Design of intelligent remote control clothes hanger

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*Abstract: With the development of electronic technology and the improvement of people's living standards, more and more household intelligent clothes hanger products have entered thousands of households. Using single chip microcomputer and sensor as the core of the design of the clothes hanger, the intelligent control of the clothes hanger is realized. The automatic detection of the surrounding environment and the extension and automatic withdrawal of the intelligent clothes hanger are controlled. The automatic lifting and lowering of the intelligent clothes hanger can be controlled by manual keys. The weather and raindrop sensor module can automatically judge the weather and raindrops. Through the temperature and humidity sensor to control the outside temperature and indoor humidity. The circuit designed by the single chip microcomputer also uses photosensitive resistance. When the outdoor sunlight is strong, the photosensitive resistance sensor will automatically receive the information from the outdoor sunlight, and the transmission of these information will be fed back to the intelligent microcontroller, so that the clothes hanger will automatically stretch out of the outdoor to irradiate the strong sunlight. The design circuit of this product has the characteristics of flexibility and convenience, wide application range, low cost and high operation stability, and high cost performance ratio.*

*Keywords: STC89C51, Clothes hanger, Wireless remote control.*

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### 1. INTRODUCTION

Now the clothes hanger used in the family is still the most original one, which can not be changed with the external environment. When people are not at home, if it suddenly rains or it gets dark, the clothes outside are wet or dewy because they are not collected in time. In summer, the temperature at noon is very high. Even at home, people will not collect clothes at this time. If the clothes are not collected in time after being exposed to the sun, the clothes will fade and deform, causing great damage to the clothes. In Japan and China, there are also smart electric clothes racks. According to different environments and conditions, it can control the extension and retraction of the clothes drying rack, and realize the function of intelligent remote control clothes drying rack. It has high use value in family life and will be widely used in future life.

## 2. SCHEME DESIGN OF THE SYSTEM

In this paper, a clothes hanger is designed, which can be recycled or extended according to the weather change. If it rains suddenly or there is no sun outside, the MCU will control the motor to reverse and the clothes hanger will be recovered. If the weather outside is very good, the temperature and humidity are also within the preset value, the single chip microcomputer will control the motor to rotate forward, and the clothes hanger will stretch out.

This design is mainly composed of MCU, temperature and humidity detection module, light detection module, raindrop sensing module, wireless receiving module, etc. STC89C51 is used as the circuit controller to simulate the extension and retraction of the clothes hanger by using the forward and reverse rotation of the motor. Wireless remote control circuit is a wireless sending and receiving module which is composed of sc2262 / sc2272 encoding and decoding chip. The automatic and manual modes are changed by wireless remote controller. DHT11 temperature and humidity sensor is used to form the temperature and humidity detection module. DHT11 temperature and humidity sensor can detect the temperature and humidity of the surrounding environment. When the humidity is too high or the temperature is too low, the sensor will transmit the detected data to the single chip microcomputer. After receiving the instruction, the MCU controls the motor to reverse rotation and the clothes dryer takes back. If it rains suddenly outside, the raindrop sensing module will send the instruction to the MCU. After receiving the instruction, the MCU will control the motor to reverse and the clothes hanger will be taken back. The system block diagram is shown in Figure 1.

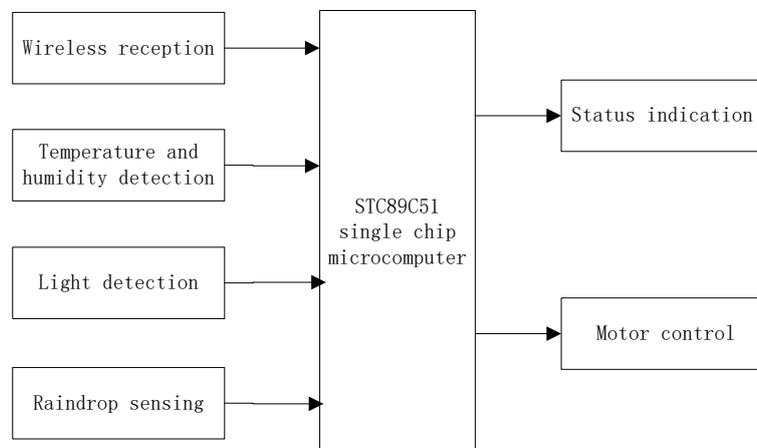


Figure 1 System block diagram

## 3. THE HARDWARE DESIGN OF THE SYSTEM

### 3.1 Design of temperature and humidity acquisition circuit

The p2.0 interface of MCU is used to send and receive a serial data to MCU, which is the data transmission interface of MCU. Add a 10k resistor between pin 2 and the power supply because the sensor circuit range to be measured is usually less than 20 meters. The sensor pins 1 and 4 are connected to the Vdd and GND terminals of the MCU. The third foot of the sensor is suspended. DHT11 temperature and humidity sensor determines the extension and withdrawal of the clothes hanger by detecting the external temperature and humidity. If the detected temperature is very high

and the humidity is lower than the preset value, the sensor will send the detection results to the single-chip microcomputer, and the single-chip microcomputer can extend the clothes hanger by controlling the motor. If the detection temperature is very low and the humidity is greater than the preset value, the sensor will send the detection results to the single chip microcomputer, and the single chip microcomputer can recover the clothes hanger by controlling the motor. Temperature and humidity acquisition circuit is shown in Figure 2.

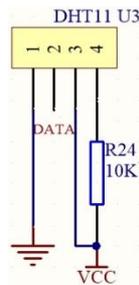


Figure 2 Temperature and humidity acquisition circuit

### 3.2 Design of photosensitive detection circuit

The photosensitive resistance in the circuit is pgm5467. This circuit detects the intensity of outdoor light through photosensitive resistance, which can directly determine the intensity of outdoor sunlight and night light and outdoor sunlight. Due to the different intensity of light, the value of photosensitive detection resistance is different. It can directly detect cloudy and sunny outdoor weather by assisting MCU and temperature and humidity collector.

In this circuit, the resistance value of potentiometer R23 is adjusted to control the photosensitive resistance. When the resistance of R23 is adjusted to the maximum value, the potential at the reverse input end of the comparator LM393 is lower than that at the same direction end. In this case, if the comparison output is high, the photoresistor resistance will increase with the attenuation of the comparator beam. At this time, the single-chip microcomputer controls the motor to take back all clothes. When R23 resistance is adjusted to the minimum value, the potential at the reverse input end of the comparator LM393 is higher than that at the same direction end. In this case, if the comparison output is high, the photoresistor resistance will decrease with the enhancement of the comparator beam. At this time, the single-chip microcomputer controls the motor to extend all the clothes. The photosensitive detection circuit is shown in Fig. 3.

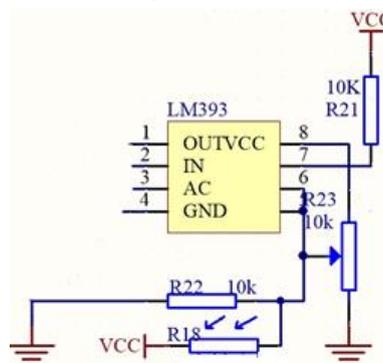


Figure 3 Photosensitive detection circuit

### 3.3 Design of raindrop induction circuit

Raindrop sensor is used to detect the weather outside and see if it rains. When raindrops drop on the raindrop sensor detection board, the resistance value of the measuring board will change. Increasing the resistance value of the measuring board can prevent the change of the detection electrode voltage. By increasing the resistance value of R20, the change of raindrop induced voltage is calculated. Finally, the raindrop sensing signal is received and regulated by operational amplifier circuit. When there is no water drop on the reaction board, the indicator light is not on, and when a drop of water is dropped, the indicator light is on. After wiping off the water droplets above, it returns to the high output level state. Through the output level, the positive and negative rotation of the motor is controlled. The raindrop induction circuit is shown in Figure 4.

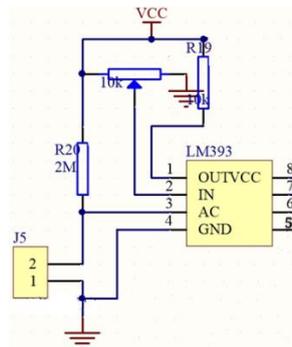


Figure 4 Raindrop sensing circuit

### 3.4 Design of DC motor drive circuit

The DC voltage stabilizing relay is used to control the forward and reverse rotation of the DC motor to drive the extension and retraction of the clothes hanger. Two 5V DC voltage stabilizing relays are used to drive the relay to work normally through 9012 triode, and three LEDs are used to display the running state of the motor. When the red light is on, it means that the clothes hanger is working in the automatic mode; when the yellow light is on, it means that the clothes hanger is extending, and the motor is rotating forward; when the green light is on, it means that the clothes hanger is retracting and the motor is in reverse. When the travel switch of the motor connected to the clothes hanger is pressed, the corresponding travel indicator light flashes for 3 times, and the motor will stop the rotation of the clothes hanger, indicating that the designated position has been reached at this time. The motor drive circuit is shown in Figure 5.

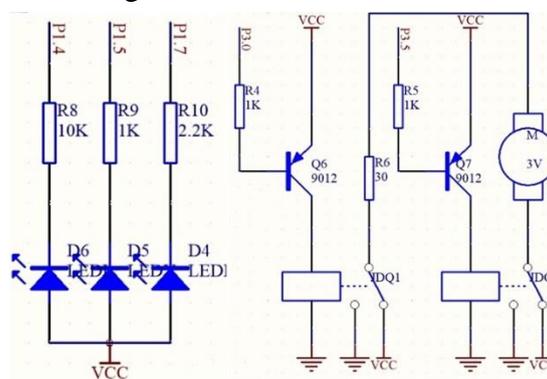


Figure 5 DC motor drive circuit

### 3.5 Design of remote control circuit

The remote control circuit uses sc2272 and sc2262 for transmitting signal and receiving signal in real time. The remote control circuit uses 12V battery to supply DC power to the transmitter controller terminal, After pressing the key of the remote control circuit, the positive pole of the battery is connected with the remote control power chip, the transmitting end of the transmitting signal source and the two negative poles of the control module and the remote control power supply. The remote control circuit of the receiver is shown in Fig. 7 and its receiving circuit is shown in Fig. 6.

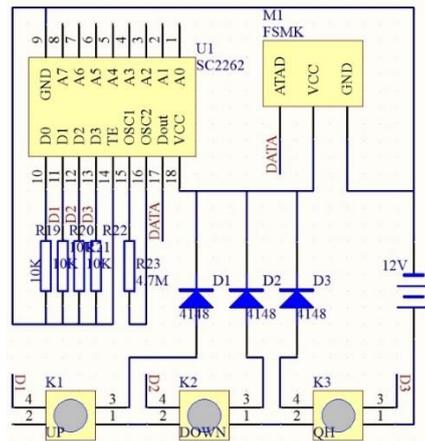


Figure 6 Remote control circuit

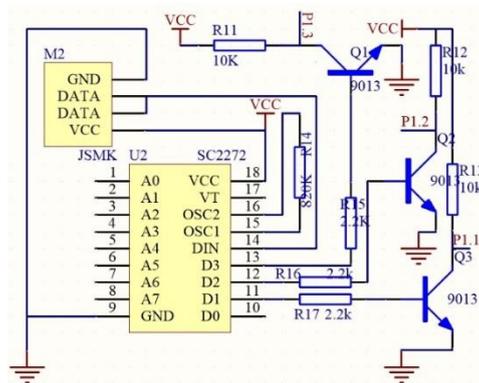


Figure 7 Wireless receiving circuit

### 3.6 Design of wireless module

Sc2262 / 2272 is a control technology chip which uses a pair of wireless remote controls with digital address and data coding for wireless data transmission and signal receiver. Sc2262 can support up to 6-bit data terminal pins. The complete address and data pin codes are connected in series from 17 pins, which can be used in radio frequency remote control transmission circuit. It is pin 17 output of data input terminal of RF remote control signal transmitting and decoding module for transmission. RF receiving module receives and sends it to PT2272 decoding chip. Once the address and code terminal are compared and verified three times, the encoding chip VT of sc2272 will start to output from the normal high level. If sc2262 continuously sends coded signals, the 17th pin of sc2272 and the corresponding data will continue to transmit and run at a higher address pin level. After sc2262 stops sending address and coding signals continuously, sc2272 terminal pin will return to high level and return to normal low level. Because the control circuit of the high frequency digital signal control transmitter can receive and completely execute the long-circuit input of the 17th pin of the control

sc2262 and the short-circuit output of the high-frequency digital signal, the amplitude modulation of the digital signal transmission of the high-frequency digital control transmission circuit is 100%. The wireless receiving circuit is shown in Fig. 7.

#### 4. SOFTWARE DESIGN OF THE SYSTEM

After the initialization of the system, when the system is in the intelligent mode, the MCU will automatically control the extension and withdrawal of the clothes hanger according to the data obtained from each detection module. If the clothes hanger reaches the designated position during the stretching process, the limit switch will be closed, and the clothes hanger will stop extending and be fixed in the current position. When the system is in manual mode, the clothes hanger can be extended and retracted manually by remote control. The main program flow chart is shown in Figure 8.

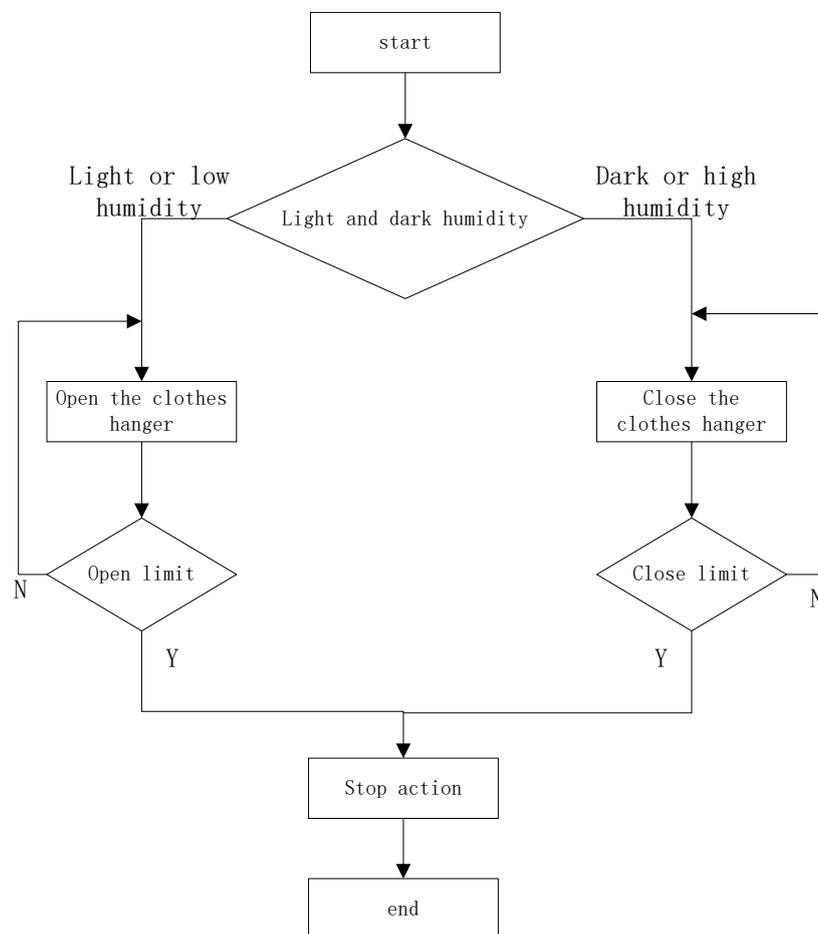


Figure 8 flow chart

#### 5. CONCLUSION

The intelligent clothes hanger control system designed in this paper can realize the intelligent control of the extension and recovery of the clothes hanger according to different external environment conditions, and provides a good implementation scheme for the design of modern intelligent home equipment, with the advantages of simple structure, low cost and wide application range.

**REFERENCES**

- [1] Wang Qi, Xu Yingfeng. Design of intelligent clothes hanger based on MCU [J]. Modern computer (Special Edition), 2017 (28).
- [2] Li Suyun, Qin ruobao. Design of intelligent clothes hanger based on multi-sensor [J]. Shandong industrial technology, 2016 (03).
- [3] Lu Meng, Chen Guorong, Zhu binkui, Xu Gao, Liu Qiandi. Design and implementation of intelligent environment aware clothes hanger [J]. Internet of things technology, 2017 (08).