

Design of intelligent electric curtain control system

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Abstract: Electric curtain is a kind of intelligent home product which combines electronic technology and mechanical technology. In the design of curtain intelligent control system, AT89C51 single chip computer is selected as the intelligent processor to cooperate with independent key module, LCD1602 data display module, DS1302 clock chip module, light intensity induction module, motor control module and system power supply to form the curtain intelligent control system design. In function, the light intensity acquisition is realized and used as the basis for controlling the curtain switch, with timing control function, timing control and light intensity acquisition cooperate to control the automatic switch of the curtain.

Keywords: AT89C51, light intensity sensing, timing control, electric curtain.

1. INTRODUCTION

In the process of building intelligent construction, intelligent home products are also indispensable. Among them, intelligent curtains are also more common intelligent home products. The more commonly used automatic control curtains are light sensitive automatic control curtains. According to the light intensity, the curtains are closed to achieve the effect of automatic blackout. The electric curtains generally use DC motor as the driving control device, and DC motor drive. The low dynamic noise is suitable for curtain which has requirements for noise. In general, the curtain controlled by DC motor will be controlled with limit switch. Because DC motor has no position feedback, it does not know the rotation position of the external curtain at this time, so the limit switch is generally installed at the appropriate position to control the position of curtain switch. The use of intelligent electric curtains to improve the comfort of the living environment is of great help to the improvement of social living quality.

2. SYSTEM SCHEME DESIGN

This paper designs a curtain intelligent control system which can automatically switch according to the external light intensity and timing control information. The curtain automatic switch is realized through the light intensity sensor cooperating with timing control. The purpose of this design is to provide an intellectualized transformation scheme for curtain components in smart home category, and to improve the richness of smart home products and the direction of development. It has a certain promoting effect.

The intelligent electric curtain control system is mainly composed of main control module, clock module, sensor module, key module, data display module and motor module. The opening time of the curtain can be set by the user, the external light intensity can be collected by the sensor, the curtain action can be controlled by the single chip microcomputer, and the data information can be displayed by the display at the same time, as shown in Figure 1.

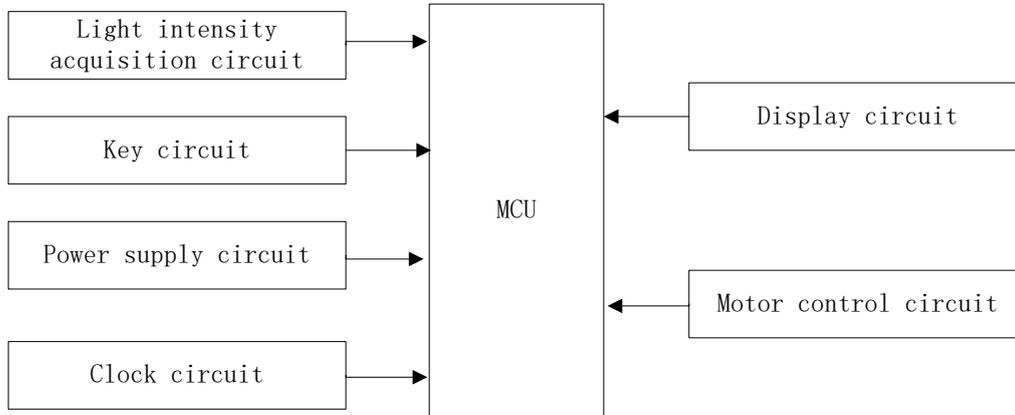


Figure 1 system structure diagram

3. SYSTEM HARDWARE DESIGN

3.1 Electric control circuit of curtain

The electric control circuit of curtain is transmitted to the single-chip microcomputer after the user determines the opening and closing time or the opening and closing degree and the light intensity sensor sensing parameters. The single-chip microcomputer will respond at a constant speed and then send out specific instructions, and then realize the specific operation through the motor.

The curtain electric control part in the design only needs to realize the positive and negative rotation of the motor and does not need to realize the control speed regulation. So the relay control is used to realize the positive and negative rotation of the DC motor. At the same time, the key analog limit switch is used to realize the construction of a reasonable curtain control circuit. The driver of the relay is triode. When the need for control, the single chip computer sends out low-level signals and the base of the triode. When it is close to low power, the triode is on, the relay is closed, and the relay is changed from 3, 4-pin to 3, 5-pin. The curtain control circuit diagram is shown in Figure 2.

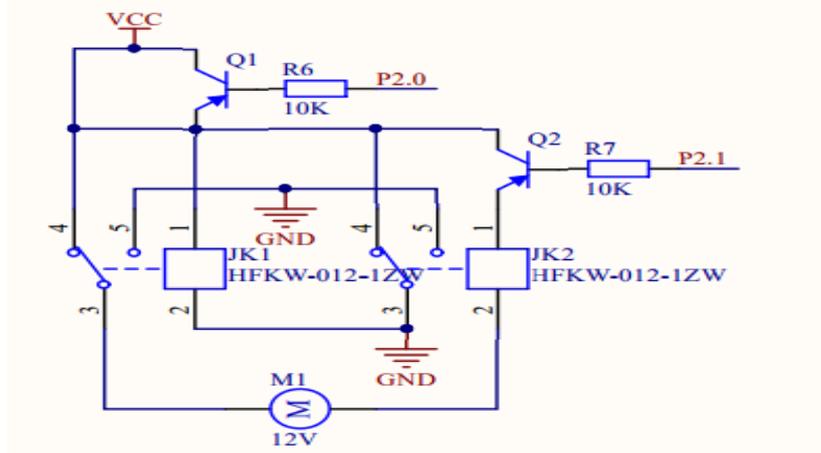


Figure 2 electric control circuit of curtain

3.2 Data display circuit

The data display circuit will display the date time, light intensity, timing time and other contents by LCD1602 LCD.

LCD1602 display can display 32 basic characters, and its ASCII character library can meet the data display requirements of the system. LCD1602 has 16 pins, including power supply pin, backlight power supply pin, display contrast control pin, data transmission pin and instruction transmission pin. The data transmission pin and instruction transmission pin are connected to the IO port of the single chip microcomputer for control. The display contrast control pin is provided by the adjustable resistance, and the data transmission pin is provided by the pull-up resistance. For the stability of data transmission, LCD1602 liquid crystal display circuit is shown in Figure 3.

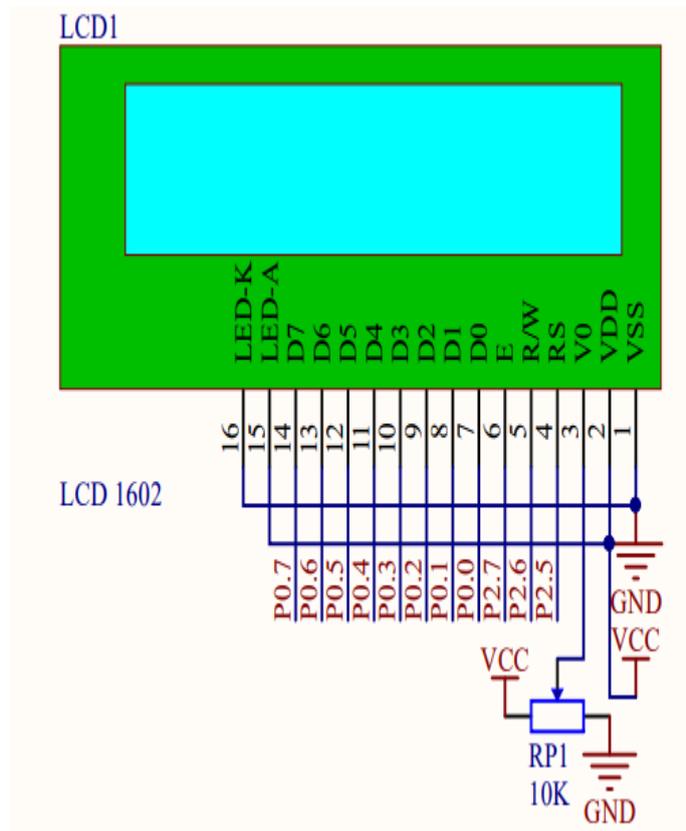


Figure 3 data display circuit

3.3 Key circuit design

In the electric curtain control system, six independent keys are designed for the time adjustment and timing switching power supply equipment of the system. When the key is pressed, the pin of the single-chip microcomputer inputs the low-level signal, while when the key is not pressed, the pin of the single-chip microcomputer inputs the high-level signal. The single-chip microcomputer can judge whether the key is pressed by the high-level input signal of the pin. In the design of the key circuit, one end of the key is connected to the ground signal and the other end is connected to the pin of the MCU. The functions of each key are as follows: SW1: modify clock / cursor movement; SW2: set time parameter; SW3: numeric add health; SW4: numerical decrease fitness; SW5: Curtain limit opening; SW6: curtains limit shut down. The key circuit is shown in Figure 4.

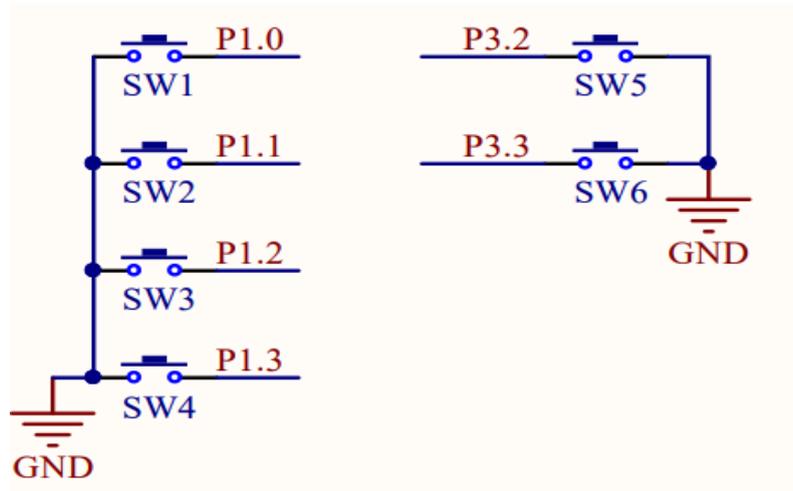


Figure 4 key circuit

3.4 Design of light intensity acquisition circuit

The main function of the light intensity collection circuit is to collect the indoor light intensity parameters and feed them back to the single chip microcomputer, which will send out instructions to control the curtain action.

In the system, 10K adjustable resistor and standard photosensitive resistor are selected to form the analog quantity data output of the analog light intensity collection circuit of the voltage dividing circuit, and the triode is controlled by the base to conduct. It can be realized to judge whether to open and close the window curtain after the signal of high and low level is collected by the single chip microcomputer according to the light intensity output, and its control sensitivity can be adjusted by adjusting the adjustable resistor. The light intensity collection circuit is shown in Figure 5. .

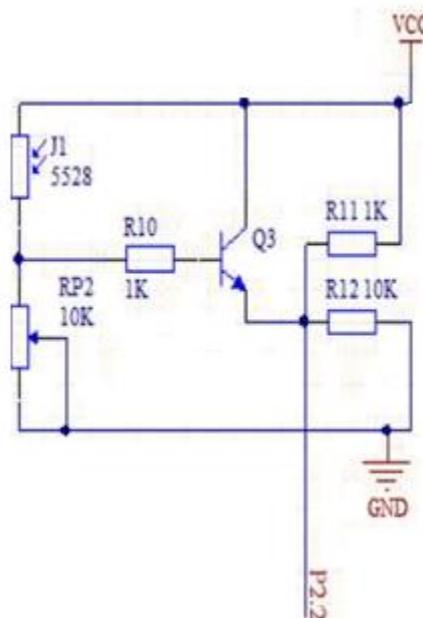


Figure 5 light intensity acquisition circuit

4. SYSTEM SOFTWARE DESIGN

The software of this paper mainly completes the initialization of each system, judges whether it is in the timing working state, if not, closes the curtain; if it is in the timing working state, controls whether the curtain needs to be opened or closed by collecting the light intensity. The design mainly includes

time reading, timing switch and curtain control logic. In addition to start initialization, the program executed in the while cycle function is to continuously scan the key information and read the DS1302 time chip information, and use the LCD to display the time and relevant control parameters in real time. When the key information is triggered, start the key information analysis program, and then enter Corresponding key information processing subroutine, the program flow chart is shown in Figure 6.

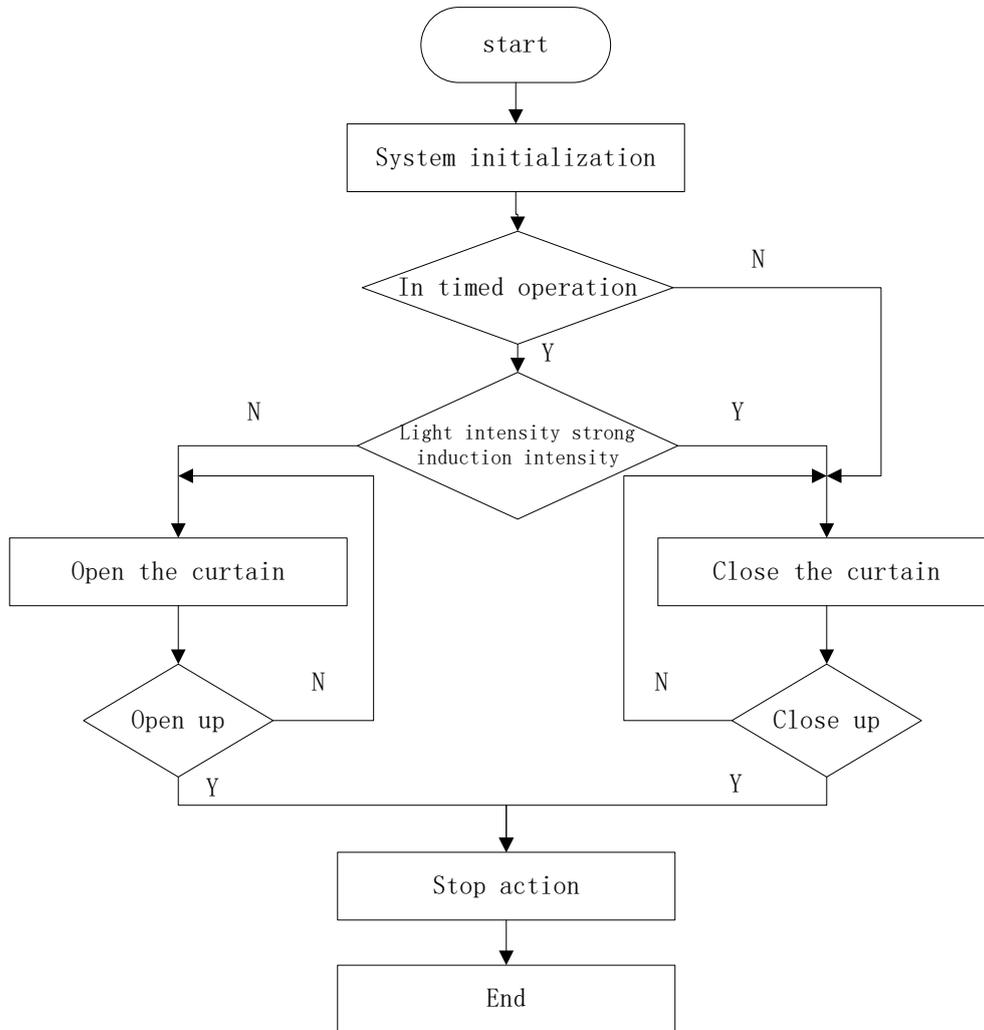


Figure 6 flow chart of system software design

5. CONCLUSION

The intelligent electric curtain control system designed in this paper realizes the real-time collection of light intensity information, can automatically open and close the curtain according to the intensity of light, and can also realize the timing switch of the curtain, which provides a practical scheme for the design of modern intelligent home system, with the advantages of low cost, simple structure and wide application range.

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