Design of Intelligent Energy Saving Control System for Desk Lamp Based on Single Chip Microcomputer

Na Yang[*]

Xijing University, Xi'an, China

515569778@qq.com

[*]corresponding author

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Abstract: Intelligence desk lamp for specifically induction human heat-releasing infrared signal based on infrared sensors, pyroelectricity signal processing circuit, using single chip computer processing, in order to achieve the purpose of easy control. When the room and someone when insufficient brightness around, desk lamp will be lighted, tell the darkness touch switch trouble; When learning on the desktop is too close, due to causes posture is not straight, the system will hint, in order to correct posture, preventing myopia; Learning too tired, sleep on his desk lamp when, it will automatically out; When no one in, the system also can make desk lamp extinguishes, in order to achieve automatic save energy purposes.

1. Introduction

Desk lamp is the life necessity of average family, but because often forget to turn off the lamp, cause tremendous energy waste. Global so much desk lamp, estimate, consume energy considerable. The other is as a necessity, of course, to make life more convenient, save the trouble of turning on the light in the dark, and can correct the sitting posture. The system has been tested in the laboratory. The distance of pyroelectric infrared detector 1 is about 4m (adjustable distance), mainly because the door is generally the distance from the desk; So that in the dark when a person to the door will start, saving the trouble of turning on the light, users can according to their actual situation for distance adjustment. The distance of infrared ranging detector is about 20cm (adjustable distance), the main consideration is that when learning, sometimes sitting posture is not correct, causing the body from the desktop is too close, easy to cause myopia, the lamp at this time issued a warning, remind attention, if not left within the set time, then forced out. Sometimes, when a person is tired of studying and sleeps on his desk, he forgets to turn off the light. The system will detect this and start a delay program. After a period of time, the lamp will automatically turn off.

2. Overall System Structure

The desk lamp intelligent energy-saving system will STC89C52 single-chip microcomputer as the main controller, special induction to the human body infrared signal, on the basis of the pyroelectric infrared sensor with pyroelectric signal processing circuit module, using the single chip microcomputer for processing, implementation according to the environment in some light to adjust the brightness of the light, no person to turn off the lights, energy saving, and make the correct posture, prevent myopia, and other functions, the overall structure diagram as shown in figure 3-1.
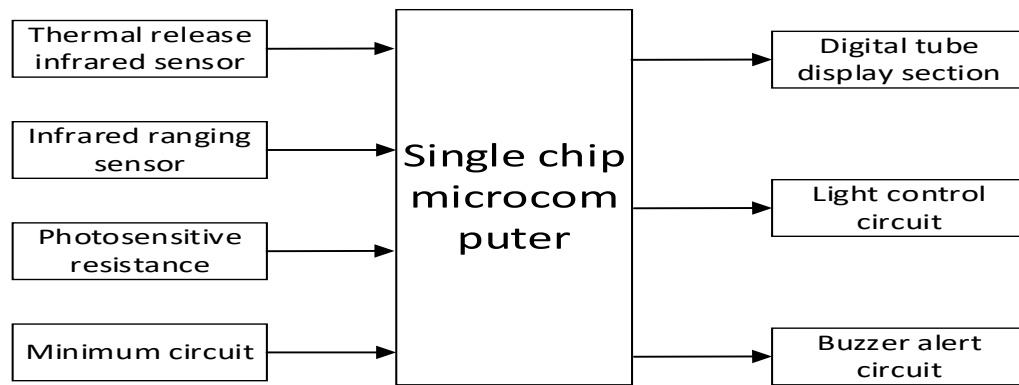
Fig.1System diagram

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3. The System Design

3.1. Core of the control system

The system is mainly composed of sensors, MCU units, buzzers, display parts, buttons and lights. The signal detection and processing part is composed of pyroelectric infrared sensor, photosensitive resistor and infrared ranging sensor. The role of the sensor is to sense whether someone is in, so the use of pyroelectric infrared sensor, the sensor is only sensitive to the wavelength of 10 mum (human body radiation infrared wavelength) about the infrared radiation, and other objects other than human body will not cause probe action; The function of the photosensitive resistor is to sense the light intensity of the surroundings of the lamp. MCU part of the 89C5l MCU, the MCU has the advantages of low price, simple development, convenient operation and encryption, so the market share is very large. The function of the microcontroller is to receive the return signal of the sensor, and control the display, alarm, lamp and other circuits after processing. The buzzer unit mainly gives warning signals according to the commands issued by the MCU unit. The control of the lamp is driven by a triode, through the microcontroller IO port output PWM pulse, control the brightness of the lamp. The sitting posture correction sensor is equipped with an infrared ranging sensor to measure the distance between the obstacle and the system. When the distance is smaller than the alarm distance, the buzzer will alarm. The display part is made up of 4-bit 1-body digital tube, which is driven by 8550 triode.

3.2. The sensor consists of the signal detection and processing section

In the circuit design part, the microcontroller in the intelligent energy saving lamp design of the main control unit, the main control circuit lighting, control circuit is under the control of the microcontroller. The sensor plays an important role in the design. The circuit principle of signal detection and processing composed by the sensor is shown in figure 2.
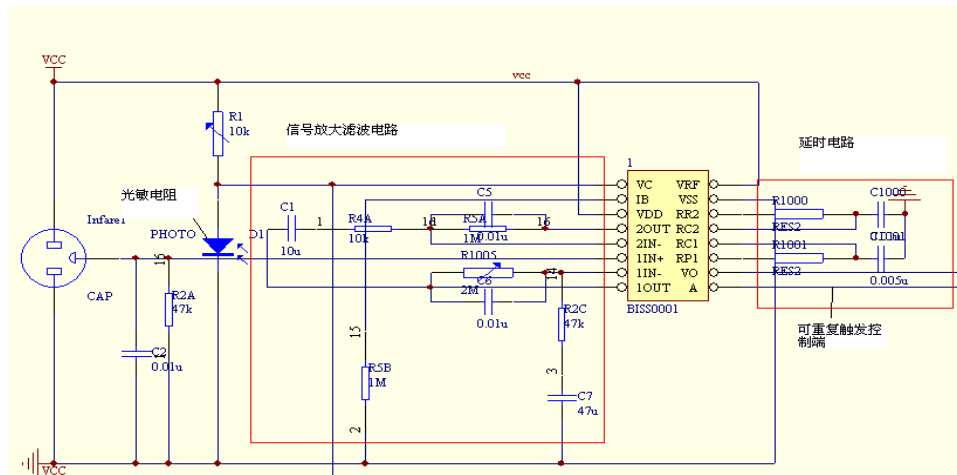
Fig2.The sensor consists of the signal detection and processing section

3.3. MCU light control circuit

Figure 3 is a light control circuit composed of single chip microcomputer. LED the negative ground, all the lights in parallel, the anode in the collector of a transistor Q1, when the microcontroller IO port LED output high electricity at ordinary times, Q2 conduction, by conduction of the base of Q1 Q2 lower, Q1 conduction, parallel LED the positive took on the power of the light, the light is on, when the microcontroller IO port LED low electricity at ordinary times, Q2 closing, the base of Q1 was higher 10 k resistor of R12, Q1 closing, parallel is highly connect power leds, leds put out. When the IO port of the microcontroller changes quickly, it can control the brightness of the lamp through the duty cycle of PWM.
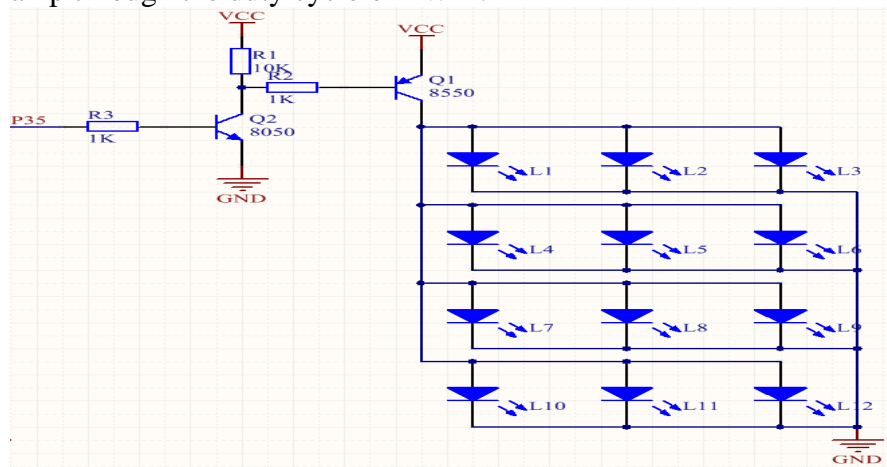

Fig.3 Light control circuit

3.4. Display circuit

In daily life, we are no stranger to liquid crystal displays. LCD module has been used as a common device of many electronic products, such as calculators, multimeters, electronic watches and many household electronic products can be seen, the main display is Numbers, special symbols and graphics. In the single-chip microcomputer and human human-machine communication interface, the general output mode has the following: light emitting tube, LED digital tube, liquid crystal display. This design USES the liquid crystal display as the output device.

4. System Software Design

This system USES C language, in the KEIL environment to compile and debug the program, combined with some functions to achieve the corresponding functions of each module. The main program of the system is shown in figure 4.
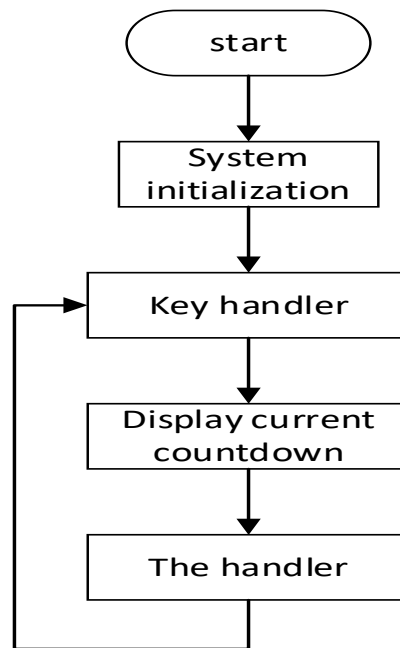
Fig.4 System main program

5. Conclusion

This paper introduces and designs an intelligent energy saving control system of desk lamp with STC89C52 single chip microcomputer as the control core. Based on the improvement and innovation of traditional desk lamp, it can save energy, correct sitting position and prevent myopia. It not only facilitates People's Daily life, but also promotes the development of intelligent desk lamp. At the same time, the cost is lower, which basically conforms to the actual demand and has certain practical application value and market prospect.

Acknowledgments

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