

An Intelligent Window Design with Communication Function

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Abstract—This paper designs an intelligent window, STC89C52 single chip microcomputer as the central processor, using a variety of sensors to collect environmental factors, the data to the central processor, through the central processor for data processing, and the control unit issued instructions, control the window open and close. A communication module is introduced into smart Windows, which can be controlled by a homeowner through a mobile phone, making the Windows more intelligent. And the overall price is low, can improve people's life comfort.

Keywords—Intelligent window; The sensor; Central processing unit; Communication module

With the rapid development of science and technology, people's living standard has been improved day by day, and people's demand for safety, health and comfort of life has become more urgent. In recent years, communication technology has developed rapidly. Many researchers combine communication technology with household products, making furniture products more perfect in function and with more humanistic characteristics.[1] Intelligent window as a kind of intelligent home, in recent years also has a rapid development at home and abroad. In Singapore and the United States, millions of households have installed intelligent doors and Windows, which has improved the quality of life. Home also has a lot of research in this field, for example, based on the STM32 development board, code for each module to write and run the test, then will the module integration into Windows, complete intelligent window for each control module, through the inspection unit of indoor and outdoor environment, and the test results is passed to the CPU, The central processor processes the received information, and then issues execution instructions to each control unit

to control the window switch, and transmits the information to the owner's mobile phone through the communication module, and the owner can also control the window according to his own preferences.[2] However, domestic products are usually functional separation, while foreign products are more expensive. This paper designs an intelligent window with communication function. The price is low, which can meet people's living needs and improve people's living standard.

1. Hardware control

This design uses STC89C52 MCU, which is an 8-bit high-performance MCU. It takes MCS-51 as the core to receive the data collected by the intelligent window illumination detection module, temperature and humidity detection module, smoke detection module and rainfall detection module, and processes the data.[3]

1.1 Lighting detection module

Light detection module uses GY-30 light intensity sensor, mainly based on BH1750 digital light intensity induction as the core, spectral characteristics close to visual sensitivity, can be used to detect a wide range of brightness.

1.2 Temperature and humidity detection module

The temperature and humidity detection module used in this design is DS18B20, which has strong anti-interference ability, fast response speed, excellent quality, high cost performance, long signal transmission distance, up to 20M, small size, low energy consumption, single line serial port makes the system integration simple.

1.3 Smoke detection module

MQ-2 smoke sensor for smoke detection, the sensor is often used in homes and factories for smoke detection, fast response, high sensitivity, long service

life, simple drive circuit, the smoke concentration is greater, the greater the efficiency of electrical conductivity, the greater the strength of the analog signal.

1.4 Rainfall detection module

YL-83 raindrop sensor is used to detect the rainfall conditions. It is installed outdoors and divided into two parts. Signal comparison circuit and induction board are used for signal comparison with LM393. The induction plate is made of double-sided material with nickel plating on the surface and good oxidation resistance.

2. Communication technology module design

Communication technology is an effective way to improve the intellectualization of products. It can realize the manipulation of intelligent products through mobile APP. The communication technology is controlled by Bluetooth and GSM according to the distance between the house owner and the window. Bluetooth is used for short distance and GSM is used for long distance. This communication technology enables timely communication, ensuring that information can be quickly received and sent, and realizing the owner's timely understanding and control of the state of the window. SCM client with HC - 05 bluetooth module, are installed in the host cell phone APP, mobile phone bluetooth is turned on, can receive single-chip microcomputer data from the bluetooth module, according to the communication protocol parsing data display on the phone, the same information by mobile phones bluetooth communication module via bluetooth to microcontroller end, bluetooth communication module based on the data analysis, Issue control commands to the control unit. Since Bluetooth wireless transmission cannot realize long-distance communication, GSM is adopted for long-distance to realize the dual communication between Bluetooth and GSM.

3. Overall system design

The system uses STC89C52 MCU as the central processor, the GY-30 light intensity sensor, DS18B20 temperature sensor, MQ-2 smoke sensor and YL-83 raindrop sensor collected information to the central

processor, the central processor through information processing, processing results are displayed on the display screen, And converted into instructions to the driver circuit, through the driver circuit to control the window. At the same time, the CPU will also send information to the owner of the house, the owner of the house through Bluetooth wireless phone and the CPU data transfer, the owner of the house can also according to their own will, to control the window. The overall design of the system is shown in Figure 1.[2]

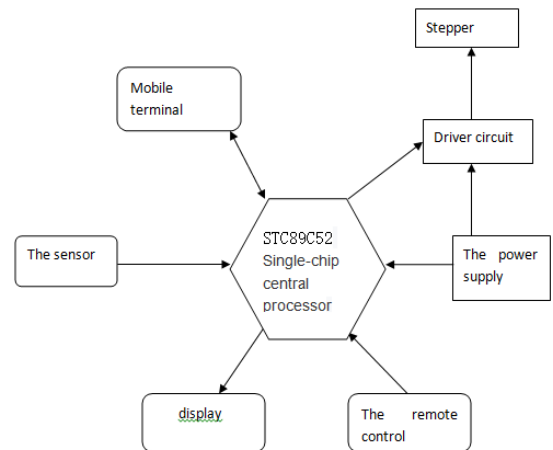


Figure 1 Overall design of the system

4. The software design

C language is a kind of easy to learn assembly language, this intelligent Windows programming using C language to compile, programming for Windows using automatic control and manual control, automatic control mode, the system USES the information from the sensor to the central processing unit (CPU), by the central processor to judge the window open, and then drive circuit to control window. In manual mode, the window can be controlled by remote control, and the two modes can be switched freely. The control flow chart is shown in Figure 2.

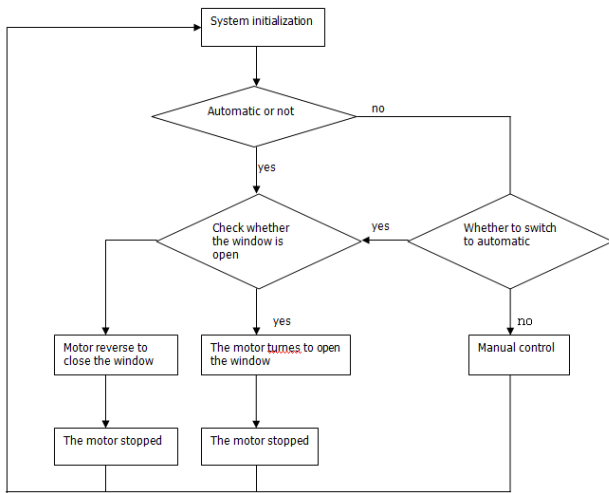


Fig 2 Control flow chart

5. To summarize

In this design, the information collected by the sensor is transmitted to the central processor. The central processor processes the information and converts it into the control signal of the window. The communication technology is applied to the intelligent window system so that the owner of the house can know the working state of the window in time. [5] The automatic mode and manual mode can be converted freely to realize the free control of the window, making the window more intelligent and more humanized. And the overall price is low, can improve people's life happiness.

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