Intelligent Home Control System Based on Single Chip Microcomputer

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Abstract. Intelligent home as a way to achieve the realization of the family information has become an important part of the development of social information, Internet of Things because of its huge application prospects, will be smart home industry in the development process of a more realistic breakthrough in the smart home industry development has great significance. This article is based on easy to implement, easy to operate, close to the use of the design concept, the use of STC89C52 microcontroller as the control core for the control terminal, and including infrared remote control, buttons, Web interface, including multiple control sources to control household appliances. The second chapter of this paper describes the design of the hardware and software part of the specific implementation, the fifth chapter is based on the design of a good function to build a specific example of the environment.

1. Introduction
Smart home is one of the most popular topics in modern society. Its goal is to realize intelligent control of household appliances through information and communication technology such as network, so that it can run according to people's setting work, regardless of distance. Intelligent and remote control is the smart home of the two major characteristics. At present, more and more institutions and individuals have begun to study the smart home. With the development of network technology, especially the development of wireless networks, networked intelligent home system can provide remote control, home appliances (air conditioning, water heaters, etc.) control, lighting control, indoor and outdoor remote control, curtain control, burglar alarm, telephone remote control Programming timing control and computer control and other functions and means to make life more comfortable, convenient and safe.

2. Research Background

2.1. The concept of smart home
Smart Home (Smart Home) is a home as a platform, both building, automation, intelligent in one of the efficient, comfortable, safe and convenient home environment. Home intelligent technology originated in the United States, the most representative of the X-10 technology, through the X-10 communication protocol, the network system can achieve the sharing of resources in various devices. Because of its simple wiring, flexible, easy to expand and widely accepted and applied. So far, X-10 technology products have sold more than 200 million, only in a country in the United States, there are more than 6 million families in use. Automated smart home is no longer a passive building, on the
contrary, has become the best use of time to help the owner of the tools to make the family more comfortable, safe, efficient and energy saving.

2.2. **Intelligent home control system functions**
The main functions of the intelligent home control system include two aspects: automatic control of home equipment and home security. The automatic monitoring of home equipment, including electrical equipment, centralized, remote control, remote off-site (by telephone or Internet) monitoring, control and data collection.

1. Monitoring and control of household appliances, in accordance with the requirements of the pre-set procedures for water heaters, microwave ovens, video and other household appliances to monitor and control.
2. Data collection, measurement and transmission of heat meters, gas meters, water meters and watt-hour meters. According to the requirements of residential property management, the data acquisition procedures are set up. The amount of heat meters, gas meters, water meters and watt-hour meters. Automatic data collection, measurement, and remote acquisition results will be sent to the residential property management system.
3. The air conditioner monitoring, regulation and control, in accordance with the pre-set procedures, according to time, temperature, humidity and other parameters of the air conditioner to monitor, adjust and control.
4. Lighting equipment monitoring, adjustment and control in accordance with the pre-set time program, respectively, the room lighting equipment on and off control, and can automatically adjust the illumination of each room.
5. Control of the curtain, in accordance with the pre-set time program, the curtain of the opening / closing control.

3. **Overall Design**

3.1. **Overall introduction**
This design uses STC89C52 chip as the control core, temperature, humidity and other sensors for environmental information collection source to Web control as a supplement to produce a network of air conditioning monitoring system. In the original mechanical key switch on the basis of the use of wireless remote control and Web pages remote control, to control the air conditioning units (such as fans, humidifiers, air valves, etc.), to achieve a long-range, multi-angle real-time control of air conditioning units. The In addition, in this design, the use of a variety of sensors want to combine intelligent according to the sensor to collect the value of automatic control, such as automatic switching fan, intelligent adjustment of chilled water, automatic adjustment valve opening degree. And can achieve fault diagnosis, provide alarm, data real-time data and historical data query and Excel table output.

3.2. **System design**
According to the design requirements, the system provides a core control module, Web server, Web HTML module, data acquisition module, relay module, key module, alarm module, and so on.

3.3. **Functional design**

3.3.1. **Multi-source control.** In order to meet people's high quality and convenient life needs, the system uses multi-source control, namely, key control, Web page remote control, automatic control system, these three kinds of control combination. Which Web page remote control, is to leave the server after the Internet through the Internet running on a specific server site, and then to view and manage the current air conditioning operation, just a few pages on the corresponding button, you can easily open, Close, control the home of the air conditioning unit, has reached the remote control
function. System automatic control is the core part of the system can be based on the external sensor to collect environmental information (such as temperature, humidity, etc.) and the user can make people can be more comfortable for comparison, and then according to the results of the corresponding equipment Adjust the control to maintain a comfortable value, to provide users with a good temperature and humidity environment.

3.3.2. Temperature control. Through the temperature sensor (Figure 1) to collect the current temperature information, sent to the acquisition module for conversion, analysis by the MCGS configuration software, by comparing with the default value of the chiller to determine the water valve opening, so that room temperature In a constant range. At the same time for the convenience of control, MCGS configuration software will be collected to send the temperature value to the LCD1602 LCD screen displayed.

![Temperature sensor DS18B20](image)

**Figure 1.** Temperature sensor DS18B20

3.3.3. Humidity control. Through the temperature sensor to collect the current temperature information, sent to the acquisition module for conversion, by the MCGS configuration software analysis, by comparing with the default value, determine the humidifier water valve opening, so that indoor humidity maintained at a constant range. At the same time for the convenience of control, MCGS configuration software will be collected to send the temperature value to the LCD1602 LCD screen displayed.

3.3.4. Air valve opening control. Whether the valve is a valve or switch valve, depends on the project needs, the vast majority of projects are using adjustable air valve, but the wind pump is very power consumption, most of the frequency should be more energy conversion. The design of only one fan, both fresh and return air, then through the air valve to adjust the new - return air ratio is desirable. According to the temperature in the fresh air channel, the humidity sensor and the temperature in the return airway, the humidity and humidity of the humidity sensor, and the return air temperature and humidity, adjust the opening of the new wind electric damper and return air electric damper, The wind ratio is controlled at a predetermined value. Under different weather conditions, should choose a different proportion of fresh air return to achieve energy efficiency, reduce system energy consumption.

3.3.5. Mode control. Mode control, that is, the concentration of electrical appliances together to control, such as setting the temperature, chilled water or hot water, which is if you manually switch to one by one is more complicated, if the summer mode, chillers and chilled water set to A model that, when there is such a need to start this model, so that the cumbersome control will become a step in place, and this control mode with the city to achieve it is also easier. But the mode is not so much, so
as not to make the operation of the system becomes more complex in the specific design only need to use several cases (scenes) can be set to a fixed mode to control, in this design hand Mode, summer mode, winter mode, where the hand auto is the MCGS configuration software according to the preset and the sensor automatically controls the air conditioning unit. Summer, winter mode is based on different weather conditions set indoor temperature and humidity, chillers are through chilled water or hot water.

4. Hardware Design

4.1. Minimum system modules
STR89C52 chip a total of 40 pins, 1 to 8 feet is a general-purpose I / O interface (p1.0 ~ p1.7), 9 feet rst reset button, 10,11 pin RXD serial input, TXD serial output, 12 ~ P3 interface (12,13 pin INTO interrupt 0, INT1 interrupt 1,14,15: count pulse T0 T1 16,17: WR write control RD read control output), 18,19 feet: crystal resonator, 20 pin ground, 21 ~ 28 p2 interface high 8-bit address bus 29: psen off-chip rom strobe, single-chip on-chip rom operation 29 feet (psen) output low level 30: ALE / PROG address latch 31: EA rom Take instruction controller, power supply + 5V.

![Figure 2. Minimum system design](image-url)

4.2. Serial module
Serial MAX3232 chip, MAX232 chip is the company dedicated to the computer's RS-232 standard serial design of a single power supply level conversion chip, the use of +5 V single power supply. The main features are:

1. meet all RS-232C technical standards
2. only a single +5 V power supply
3. the chip charge pump with boost, voltage polarity reversal capability, can produce +10 V and -10V voltage V+, V-
4. low power consumption, the typical power supply current 5mA
5. internal integration of two RS-232C drive
6. the internal integration of two RS-232C receiver

4.3. Humidity sensor module
Humidity collection selected th100hum humidity sensor, which features are as follows:

1. In connection with the microprocessor only need a mouth line to achieve the microprocessor and th100hum two-way communication.
2. Measuring wet range of 0% to 100%, the inherent humidity measurement of 0.5%.
3. Support multi-point network function, multiple th100hum can be connected in parallel on the only three lines, up to only 8 in parallel, if the number is too much, will make the power supply voltage is too low, resulting in signal transmission instability, Multi-point temperature measurement.
(4) Power supply: 3 ~ 5V / DC.
(5) Does not require any external components in use.
(6) The measurement result is serially transmitted in 9 to 12 digits.

4.4. Serial to Ethernet module
Because the RS-232 serial communication distance is only 15M, far can not meet the smart home wiring, networking requirements, taking into account the cost and technical issues, the design used in a RS232 serial to Ethernet module, the microcontroller The data is sent over the network to the web daemon. The module's specific functions are as follows:
(1) 10M Ethernet interface;
(2) 1.5KV electromagnetic isolation;
(3) Serial port baud rate of 300 ~ 115200bps;
(4) Support TCP / IP protocols include: ARP, IP, ICMP, IGMP, UDP, TCP, HTTP, DHCP;
(5) Work: TCP Server, TCP Client, UDP, virtual serial port, socket control;
(6) Working port, target IP and port can be set;
(7) To provide virtual serial port management software;
(8) To provide a common configuration function library, user-friendly development of applications;
(9) Can be configured using the configuration tool XVCOM;
(10) Can be configured using a web browser;
(11) Input voltage: 5V;
(12) Low power consumption Maximum operating current: 80mA;
(13) Operating temperature: 0 ~ 65 °C.

5. Conclusion
Intelligent home as a way to achieve the realization of the family information has become an important part of the development of social information, Internet of Things because of its huge application prospects, will be smart home industry in the development process of a more realistic breakthrough in the smart home industry development has great significance. The 21st century is the information of the century, a variety of new electronic information technology to promote the great progress of human civilization. Comfortable, stylish home life is a sign of social progress, intelligent home control system can not change any home appliance structure at home, the home of electrical appliances for easy control, so that people enjoy the high technology to bring the simple and stylish Modern life.

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