

## Design of intelligent dormitory remote system based on ESP8266

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### Abstract

People's living water quality is improved, and the comfort, convenience and safety of the living environment are valued. The system design mainly adopts HTTP protocol, and applies ESP8266 module, single chip microcomputer, relay and temperature sensor, humidity sensor, infrared sensor, illumination sensor, smoke sensor, ultrasonic sensor and other hardware, plus program writing, APP design, constitute a set. Complete smart dormitory system.

### Keywords

Design, system, ESP8266.

### 1. Introduction

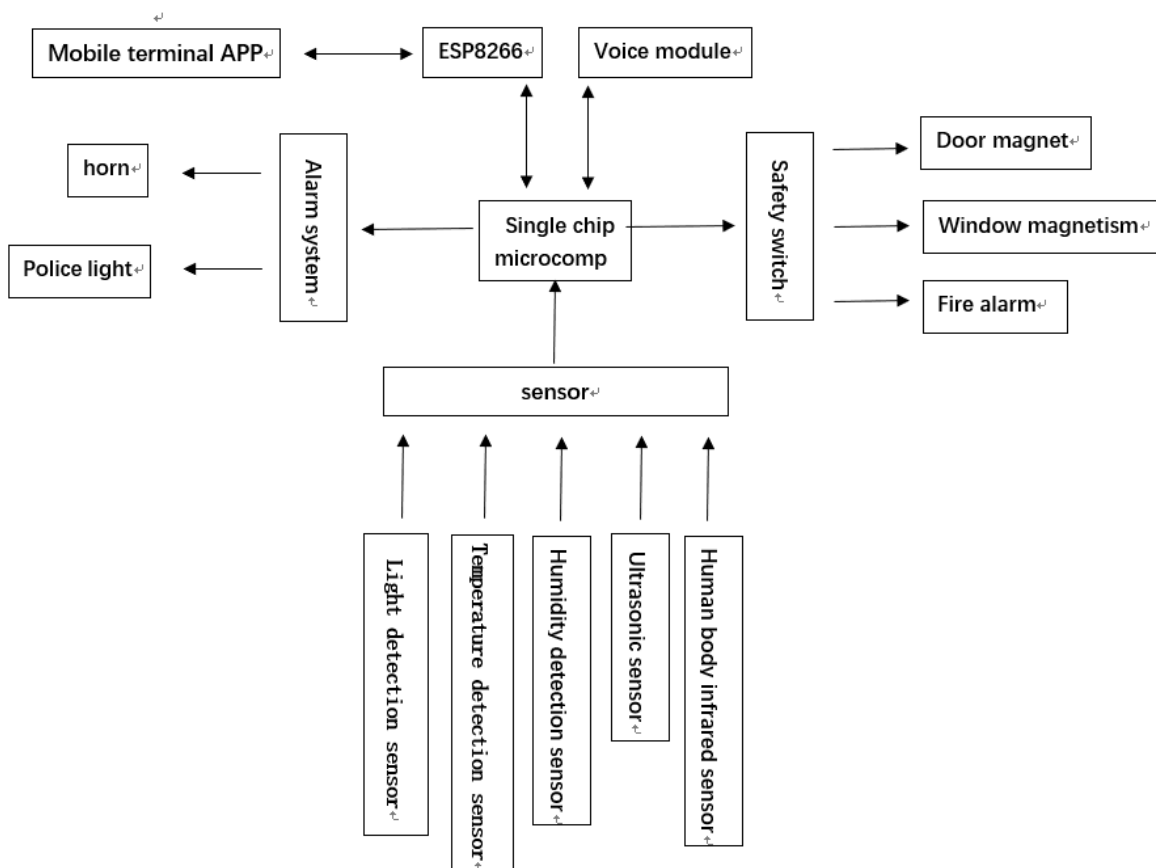


Fig1. Overall design

The ESP8266-based smart dormitory structure designed in this paper is shown in the figure. The system mainly adopts the HTTP protocol. The ESP8266 module is used as the transmission relay between the remote end and the controlled end, and the single-chip computer and the mobile terminal APP are connected to realize two-way communication. The single-chip microcomputer in the system is connected with various sensors, illumination detection sensor, temperature detection sensor, humidity sensor, ultrasonic sensor, human body infrared sensor and other detection devices. The signal information received by various sensors is transmitted to the single-chip microcomputer, and

the information is transmitted by the single-chip microcomputer. The relay ESP8266 module communication enables the information to be presented to the user through the mobile terminal APP. The mobile terminal APP interface can provide the user with the data information of the humidity, temperature and personnel situation in the installation system dormitory for the user to check the environment and security situation in the dormitory. Real-time monitoring of the dormitory environment, once the safety value is exceeded, the MCU can use the program to debug and touch the horn, alarm light and other alarms to remind the user. At the same time, if an outsider enters, the alarm device can be triggered and the information can be sent remotely to the mobile phone control terminal. To ensure the safety of the dormitory environment. At the same time, through the operation of the mobile terminal APP, through the two-way communication of the ESP8266 module, the signal is transmitted to the single-chip microcomputer to control and control the door switch, the window magnet, the fire alarm and other safety switches, and the switch of the door and window can be remotely controlled to solve the problem of forgetting to bring the key and the lock. The problem of doors and windows, the same can also be applied to the lights in the dormitory, the switch of the electrical appliances of the air conditioner. At the same time, the voice module control system uses the TTS voice module to connect with the single-chip microcomputer to process voice commands and implement voice control.

## 2. Hardware design

### 2.1 MCU control chip

The MCU used in this system is MCS-51 single-chip microcomputer, including CPU, RAM, ROM, timer and 32 programmable I/O ports of core components. I/O port can be used to connect relay and temperature and humidity sensor, infrared. Sensor components such as sensors, alarms, control switches, etc., the PO end of the microcontroller is connected to the output section of each component, and the communication signals are connected to transmit data and commands.

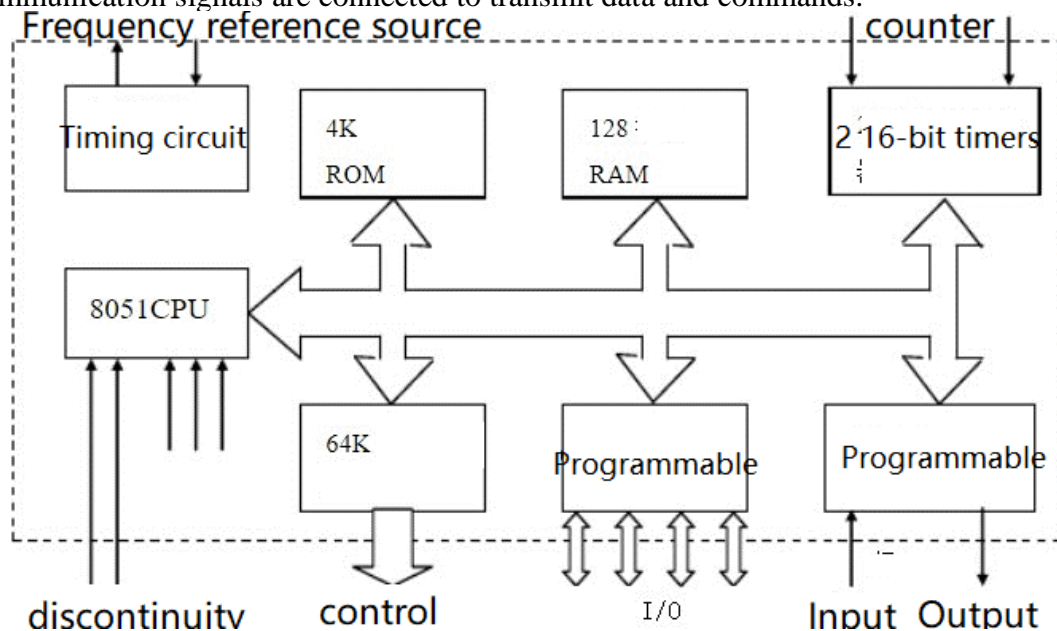


Fig2. MCU module architecture

### 2.2 Sensor system

The smoke sensor detects the concentration of smoke in the dormitory. The smoke ions can affect the current and voltage of the smoke sensor, thus turning on the alarm system. When a person is asleep or leaving the dormitory, if there is a fire, etc., it will not be discovered in time, which will cause loss of personnel and economy. The smoke sensor monitors the smoke concentration in the dormitory in real time. When the normal concentration range is exceeded, the alarm is turned on to reduce personal injury and economic loss.

The temperature and humidity sensor can monitor the temperature and humidity in the dormitory. The northern school has a relatively dry and southern school with relatively humid and temperature differences. It can maintain the temperature and humidity in a more comfortable range and enhance the user's comfort. The light sensor can detect the light intensity, determine whether there is light in the dormitory, and judge whether the light has been turned off after the person walks.

The human body infrared sensor and ultrasonic sensor open the human body infrared sensor after the personnel leave the dormitory, install the transmitter on the outer side of the door, and the receiving end is installed on the other side of the door. The alarm is triggered according to the human body temperature, and the ultrasonic sensor is installed. In front of the door, when someone stays at the door, it will trigger to avoid the human infrared sensor being bypassed. It can monitor the people who stay at the door for too long, the intention is not in the way, or attempt to enter the dormitory, and trigger an alarm to remind the surrounding people to play a deterrent effect on the people who intend to enter the dormitory. Early prevention and early resolution of problems can avoid unnecessary economic losses.

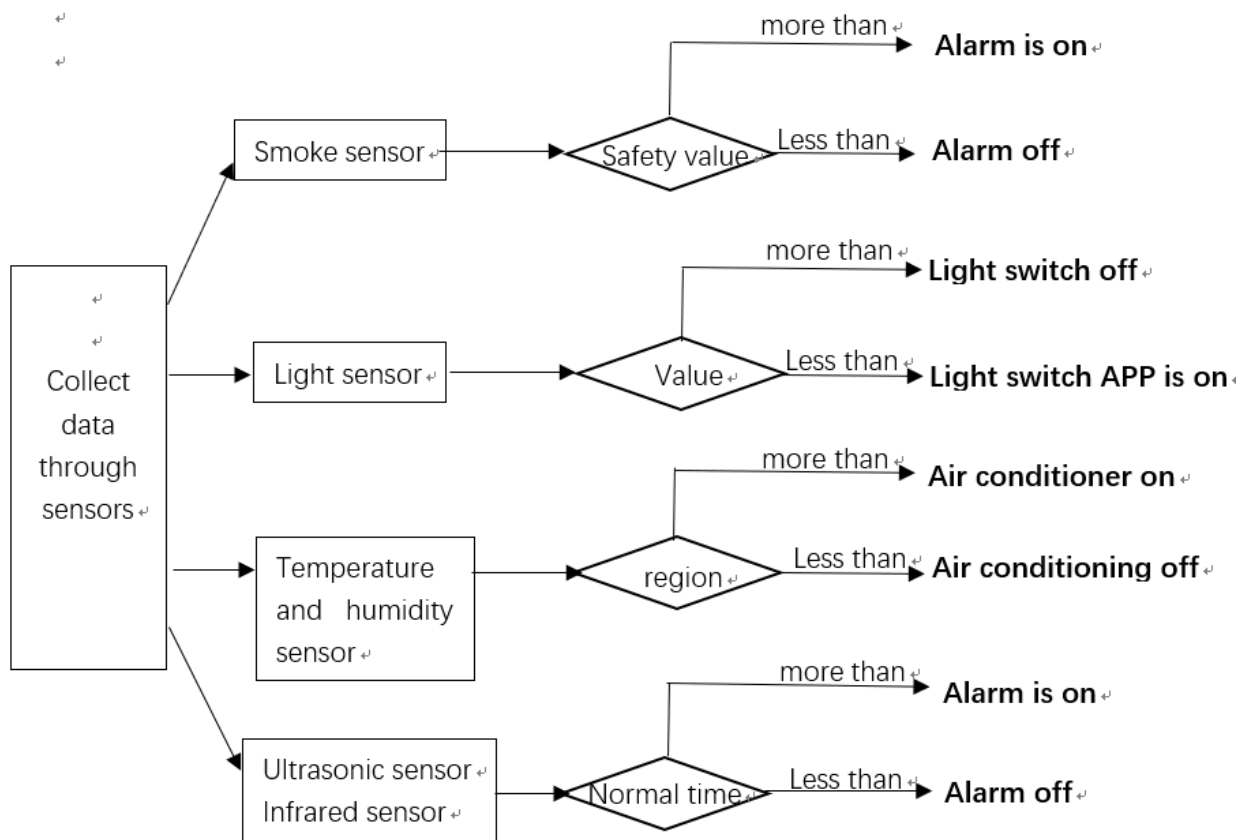


Fig3. Sensor control system

### 2.3 ESP8266 module

The ESP8266 module is a low-power WiFi transparent transmission module, which can connect the user's physical device to the WiFi wireless network and realize the communication on the Internet. The ESP8266 module of the system is connected to the single-chip microcomputer to realize the communication with the single-chip microcomputer. It can be connected to a series of sensors such as relays, alarms, control switches and temperature and humidity sensors. The data can be transmitted through the serial port, and the data detected by the sensor is transmitted to the mobile phone APP through the module, and the transmission is reliable. At the same time, ESP8266 module has PWM control function, which can adjust the light; connect relays, switches and so on to play GPIO control. It plays a key role in the entire IoT system as a transmission relay between the remote end and the controlled end.

### 3. Software design

The mobile phone APP of the system design adopts the E4A development platform, and the mobile phone APP suitable for the switch control system required by the smart dormitory is completed through code writing and format design. In this system, the Internet of Things management platform is designed according to the needs of the system. The Internet of Things management platform can be used to detect and display the current carbon dioxide concentration, light intensity, current temperature, relative humidity and other data in the dormitory, and whether there is currently a flammable gas and whether a flame is detected. Whether the infrared sensor and the ultrasonic sensor detect outsiders. The mobile phone APP of the system can be connected with the mobile phone number and WeChat. If the current carbon dioxide concentration and temperature data exceed the specified data range, or the sensor detects the flame and detects the stay and intrusion of the outside person, the mobile APP alarm can be Send SMS to the APP to set the mobile number and send a notification to WeChat, in case the mobile APP does not receive the alarm message. On the mobile APP, the lights in the dormitory, air conditioners, doors and windows, etc. will also be displayed. After the person walks, if there is light or air conditioning, the lights and air conditioners can be turned off by the mobile APP, saving electricity, and the air conditioner can be turned on in advance. When you return to the dormitory, you will have a cool environment. If the doors and windows are not closed, you can find it in time, and close it through the mobile app to avoid returning to the dormitory to close. You can also use the mobile APP without the key. You can open the doors and windows.

By designing the mobile APP and connecting with the ESP8266 module, the sensor data is transmitted to the mobile APP to view the data, and can also be controlled by the mobile APP, so that the ESP8266 module can transmit information and perform operations.

### 4. Conclusion

The system is designed with a smart dormitory remote system based on ESP8266 module. The MCS-51 single-chip microcomputer is used as the MCU ESP8266 module as the transmission relay between the remote end and the controlled end. The single-chip microcomputer is used to connect various sensing devices to the mobile terminal APP. The sensing device includes a series of sensors such as a temperature and humidity sensor, a light sensor, a smoke sensor, an infrared sensor, and an ultrasonic sensor. The sensor is used as a detecting device to obtain information and transmitted to the mobile phone APP through the ESP8266 module and the single chip communication, and the control module and the single chip simultaneously light the dormitory. , air conditioners, doors and windows and other home appliances to control, it can be realized: remote switch lights, control air conditioning, 220V relays connected to the air conditioning and lighting circuit, through the APP remote control relay to open and close to control its opening and closing; measurement and display Indoor temperature and humidity, when the temperature and humidity exceed the normal value, there is an alarm prompt; intelligent alarm, when the outsider is detected in the dormitory, the alarm device is triggered, and the information is sent remotely to the mobile phone control terminal to protect the property of the dormitory; remote access control, Realize the remote control terminal to open the door function, solve the problem of forgetting to bring the key; voice control, you can use the voice module to control the system. The E4A design mobile phone APP is convenient for users to realize remote control of smart dormitory. It provides users with a convenient and safe dormitory environment, which makes the user's life more comfortable, cheaper and safer. Its technical equipment also has great market prospects in the market.

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