

Hardware Design of Remote Home Appliance Intelligent Control System Based on Android Mobile Phone

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Abstract: The intelligent control system of household appliances includes three modules: Android mobile client, central controller and control object. The Android mobile phone client wirelessly connects to the home central controller through the wireless communication device, and the central controller sends control commands to the smart home appliance, the environmental monitoring device, the network camera, the network alarm, and the intelligent ventilation fan through the Zigbee communication device, so that the problem of remote intelligent control is solved.

1. Introduction

The remote home appliance intelligent control system based on Android mobile phone relates to the field of electronic information technology, including an Android mobile phone client, and the Android mobile phone client wirelessly connects to the home central controller through a wireless communication device. The central controller sends control commands to smart home appliances, environmental monitoring devices, web cameras, network alarms, and smart ventilation fans through Zigbee communication devices [1-2]. This system can not only monitor the indoor environmental data in real time, but also alert the users and property personnel when the environmental data exceeds the preset threshold. At the same time, it can turn on the intelligent ventilation fan for indoor ventilation. It can also enable users to remotely control the intelligent household appliances. Even when they go out, they can turn on or off the electrical equipment in the home. It is a remote home appliance intelligent control system that is very suitable for Android mobile phones.

2. Technical background

Smart home appliances are home appliances that are formed by introducing microprocessors, sensor technologies, and network communication technologies into home appliances. They have automatic perception of residential space status and home appliance status, and home appliance service status. They can automatically control and receive residential users in residential or remote locations. At the same time, as a component of smart home, smart home appliances can be interconnected with other home appliances, homes and facilities in the house to form a smart home function [3]. At present, with the continuous development of science and technology, mobile phones have become an indispensable communication tool for people, but in general, they can only control household appliances at home, and cannot control household appliances remotely when they go out. Therefore, a kind of remote household appliances intelligent control system based on Android mobile phones is needed.

2.1 hardware structure

The intelligent control system of household appliances includes three modules: Android mobile client, central controller and control object. The hardware structure is shown in Figure 1. The Android mobile phone client wirelessly connects to the home central controller through the wireless communication device, and the central controller sends control commands to the smart home appliance, the environmental monitoring device, the network camera, the network alarm, and the intelligent ventilation fan through the Zigbee communication device.

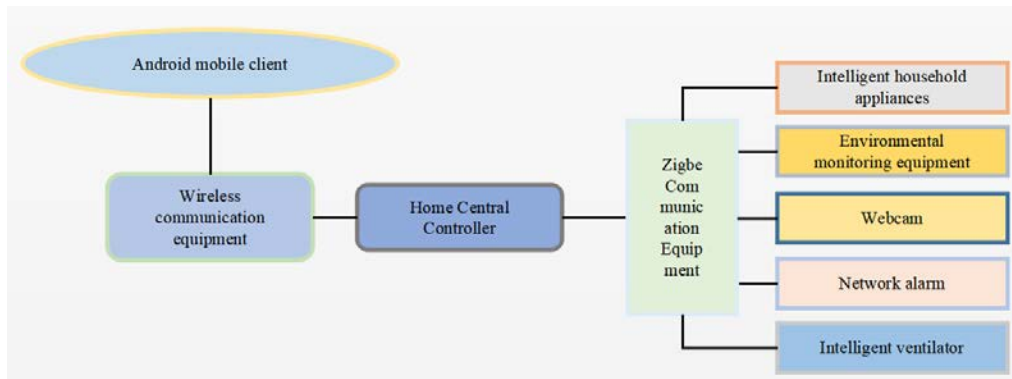


Fig.1. Schematic diagram of intelligent control system for household appliances

2.2 Home Central Control Module

The home central controller includes data storage module, data comparison module, intelligent alarm module and main control module. The structure diagram is shown in Figure 2. The data storage module is used to store the indoor real-time data collected by the environmental monitoring equipment, including temperature data, humidity data, natural gas data, brightness data, smoke data, noise data, PM2.5 data and formaldehyde data, and send the indoor real-time data to the data comparison module. The data storage module is also used to store the indoor view captured by the network camera. Frequency data; The data comparison module compares the indoor real-time data with the pre-stored indoor threshold. If the indoor threshold is exceeded, the alarm data is sent to the intelligent alarm module and the main control module; the intelligent alarm module turns on the network alarm, and notifies the user of the Android mobile phone client by wireless transmission. And starting a home network alarm; the main control module is configured to receive an instruction of the user's Android mobile phone client, and send the instruction to the corresponding smart home appliance separately, and the main control module is further configured to receive the alarm data sent by the data comparison module, if the natural gas data The smoke data, the PM2.5 data, and the formaldehyde data respectively exceed the corresponding indoor thresholds, and an open command is sent to the smart ventilation fan.

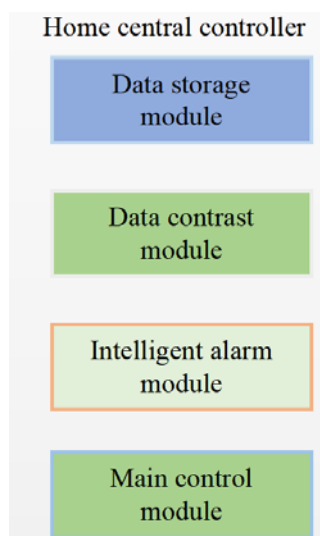


Fig.2. Family central controller structure diagram

2.3 Intelligent household appliances module

Android mobile client has Android mobile application. Wireless communication devices include wireless transmitters and receivers, GPRS data or wireless WIFI. Zigbee communication equipment uses 2.4 GHz frequency band. Indoor thresholds include temperature thresholds, humidity thresholds, natural gas thresholds, brightness thresholds, smoke thresholds, noise thresholds, PM2.5 thresholds and formaldehyde thresholds. The number of intelligent ventilation fans is plural. Smart

home appliances include: smart air conditioners, smart refrigerators, smart TVs, smart hoods, smart lights, smart curtains, smart door locks and smart windows. The structure is shown in Figure 3.

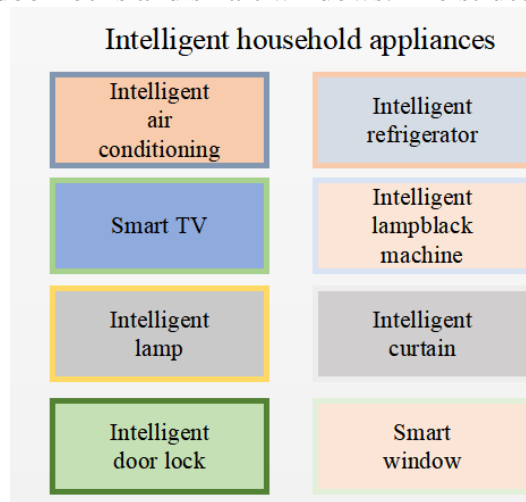


Fig.3. Schematic diagram of smart home appliance

2.4 Environmental Monitoring Module

Environmental monitoring equipment includes temperature sensor, humidity sensor, natural gas sensor, brightness sensor, smoke sensor, noise sensor, PM2.5 sensor and formaldehyde sensor. The structure diagram is shown in Figure 4. Temperature sensor is used to collect indoor temperature data, humidity sensor is used to collect indoor humidity data and natural gas sensor is used to collect indoor natural gas data. The brightness sensor is used to collect indoor brightness data, the smoke sensor is used to collect indoor smoke data, the noise sensor is used to collect indoor noise data, the PM2.5 sensor is used to collect indoor PM2.5 data, and the formaldehyde sensor is used to collect indoor formaldehyde data.

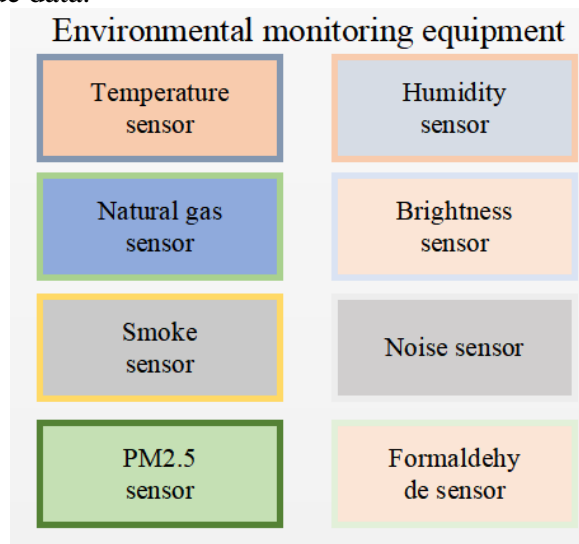


Fig.4. Structural sketch of environmental testing equipment

3. Implementation method

Android-based remote home appliances intelligent control system includes Android mobile phone client, Android mobile phone client has Android mobile phone application program, which facilitates users to control home appliances remotely directly through Android mobile phone. Android mobile phone client connects the home central controller wireless through wireless communication device, and the central controller transmits through Zigbee communication device. Control commands to intelligent household appliances, environmental monitoring equipment, network cameras, network alarms and intelligent ventilation fans; The wireless communication

device includes a wireless transmitter and a wireless receiver, GPRS data or wireless WIFI to facilitate wireless transmission of data information. The Zigbee communication device uses a 2.4 GHz frequency band to facilitate transmission of data information at close range.

3.1 The central controller

The household central controller includes data storage module, data comparison module, intelligent alarm module and main control module. The data storage module is used to store indoor real-time data collected by environmental monitoring equipment, including temperature data, humidity data, natural gas data, brightness data, smoke data, noise data, PM2.5 data and formaldehyde data, and to send indoor real-time data. The data storage module is also used to store indoor video data collected by network camera. Environmental monitoring equipment includes temperature sensor, humidity sensor, natural gas sensor, brightness sensor, smoke sensor, noise sensor, PM2.5 sensor and formaldehyde sensor, temperature sensor is used to collect indoor temperature data, humidity sensor is used to collect indoor humidity data, natural gas sensor Used to collect indoor natural gas data, brightness sensor is used to collect indoor brightness data, smoke sensor is used to collect indoor smoke data, noise sensor is used to collect indoor noise data, PM2.5 sensor is used to collect indoor PM2.5 data, formaldehyde sensor is used Collect indoor formaldehyde data. The working process of the central controller is shown in Figure 5.

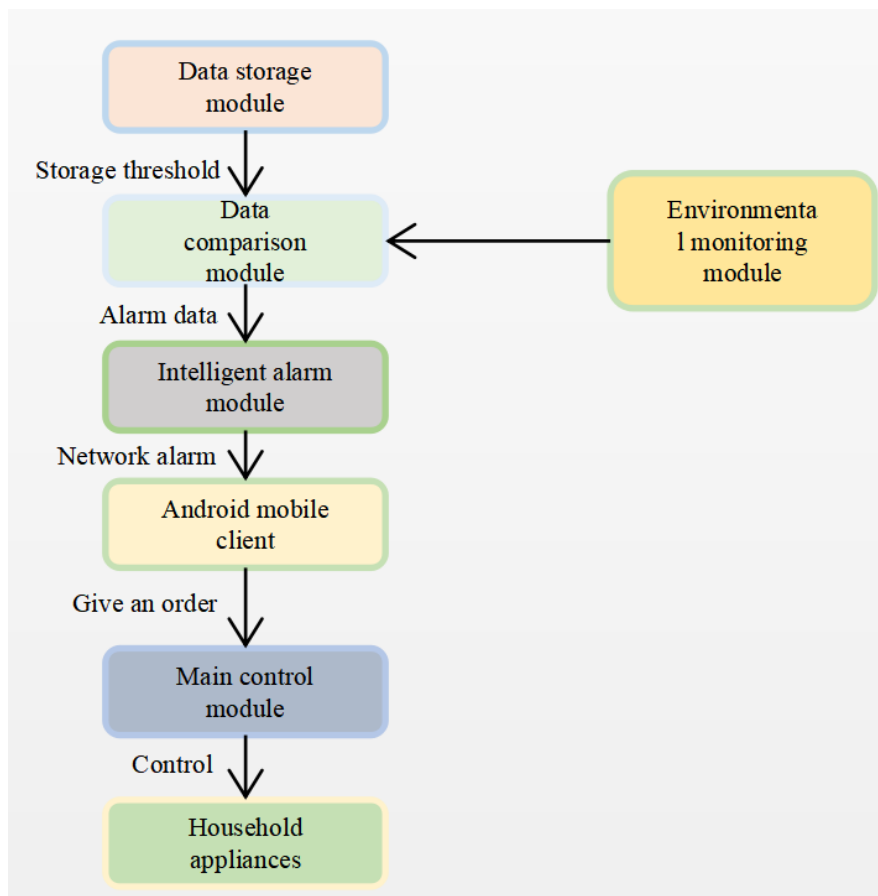


Fig.5. Central controller work flow chart

3.2 Data Contrast Module

The data comparison module compares the indoor real-time data with the pre-stored indoor threshold, and sends the alarm data to the intelligent alarm module and the main control module if the indoor threshold exceeds. Indoor thresholds include temperature thresholds, humidity thresholds, natural gas thresholds, brightness thresholds, smoke thresholds, noise thresholds, PM2.5 thresholds, and formaldehyde thresholds. The working process of the data comparison module is shown in Figure 6.

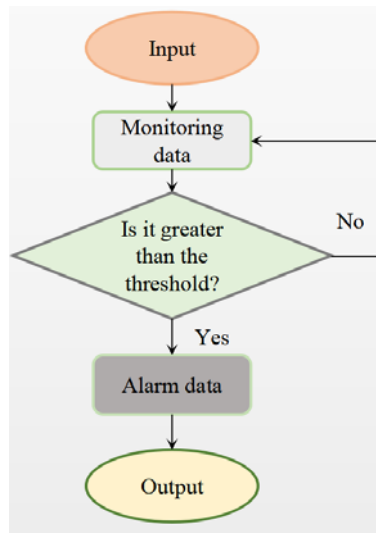


Fig.6. Data comparison module work flow chart

3.3 Intelligent alarm module

The intelligent alarm module opens the network alarm, notifies the Android mobile phone client and starts the home network alarm through wireless transmission mode; the main control module receives the instructions from the Android mobile phone client described by the user, and sends them to the corresponding intelligent household appliances respectively. The intelligent household appliances include: intelligent air conditioner, intelligent refrigerator, intelligent TV, intelligent lampblack machine, and so on. Smart lights, smart curtains, smart door locks and smart windows. The main control module is further configured to receive the alarm data sent by the data comparison module. if the natural gas data, the smoke data, the PM2.5 data, and the formaldehyde data respectively exceed the corresponding indoor thresholds, the open command is sent to the intelligent ventilation fan, and the number of the intelligent ventilation fans is Multiple. The working process of the intelligent alarm module is shown in Figure 7.

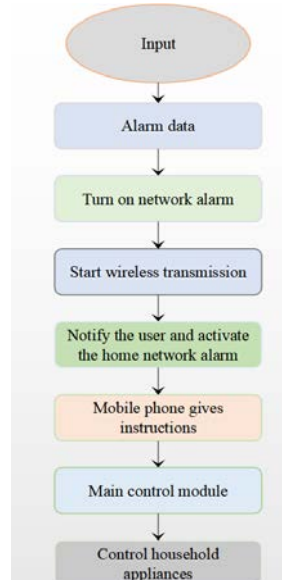


Fig.7. Intelligent alarm module work flow chart

3.4 Application

Intelligent household appliances control system, users send control instructions to the central control of the home through the Android mobile phone client, open or close the smart household appliances, and receive indoor environmental data and video collected by the environmental monitoring device through the Android mobile phone client. When the indoor environment data

exceeds the set threshold, the alarm is carried out through the indoor network alarm, and the alarm information is sent to the user's Android mobile phone client. At the same time, when the indoor natural gas data, the smoke data, the PM2.5 data and the formaldehyde data respectively exceed the corresponding indoor thresholds, an open command is sent to the plurality of sets of intelligent ventilation fans to perform indoor ventilation. At the same time, you can also set the smart ventilation fan to open, and open the smart window for indoor ventilation.

4. Conclusion

The home appliance intelligent control system not only can monitor the environmental data in the home indoors in real time, but also can alert the user and the property personnel when the environmental data exceeds the preset threshold. At the same time, it can open the intelligent ventilation fan for indoor ventilation, and also enable users to remotely control the intelligent household appliances equipment, even when they go out, they can turn on or off the electrical appliances in the home. It is a very suitable remote household appliances intelligent control system for Android mobile phones.

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