



Smart home system based on raspberry pie

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Abstract: The intelligent home control system makes it convenient for people to control the household appliances, collect the information of the living environment, and ensure the safety of the home. The modern smart home control system faces two main problems: a large number of brands but not fully functional; the price is very expensive. This has given up many people to abandon the pursuit of this intelligent product. The focus of this study is to solve the two main problems. This paper has completed the basic functions of the intelligent home control system based on the raspberry hardware platform: information collection and home appliance control, and the new intelligent housekeeper function. Project results show that the system design is reasonable, the functions and indicators basically meet the functional requirements of the intelligent design Home Furnishing, Home Furnishing raspberry pie control system more perfect function based on reducing production costs, improving people's life and entertainment, in the intelligent control system Home Furnishing existing scheme put forward a new solution.

Keywords: Smart home system; Raspberry pie; Debian; Intelligent housekeeper.

1. Introduction

Along with the automation technology, network technology, communication technology rapid development, consumer electronics and digital products are gradually with the high-speed computer communication technology, closely together; at the same time as the gradual improvement of people's living standard, demand for intelligent household, security is also more and more high, to family environment and safety, intelligent equipment Home Furnishing and home network infrastructure integration. The design and implementation of the product is in the family, through the detailed analysis, research and design of the smart home control system, a low-cost and easy operation solution is achieved. The terminal control system is mainly used for the control of

household equipment, and ensure the safety of family, such as whether there are other unauthorized intrusion, whether there is a fire, the existence of Water Leakage happen and so on; in case of an emergency can also send text messages to the user information security tips home; at the same time to build intelligent housekeeper system through voice dialogue easy to control home appliances, or entertainment, information query; private cloud function provided by a control system to provide users with a simple, easy-to-use cloud backup platform, the user is either at home or outdoors can be wonderful to share media information for other family members. Although the intelligent home control system has achieved some success, it is not particularly successful from the perspective of future development. Especially the lack of industry standard seriously affects the popularization of smart home system. In particular, with the increasing demand for the quality of life and home environment, the core control terminal, as the smart home, is particularly important. In a word, the aim of this paper is to realize the intelligent home control terminal system with low cost and the compatibility of smart home multi device. The study of this paper has the following significance:

First, we use the raspberry platform and the low-cost and functional sensor module to reduce the hardware cost of smart home, and make the smart home more cost-effective.

Second, the open source embedded Debian system is used to reduce the development cost of the whole control system.

Third, using Python as a development language, combined with the use of multi platform, to improve the user's stickiness.

2. System design

2.1 software design

Combined with the characteristics and objectives of practical project, the first application of scene analysis, analysis of control terminal in real Home Furnishing environment is how to work, get the required function of the terminal, for the demand analysis of heroes foreshadowing; then stand in the user's point of view, analysis of the subdivision of the functional requirements of the users; finally, combining with the design features this paper presents functional requirements of intelligent control Home Furnishing terminal system as shown in figure 1.

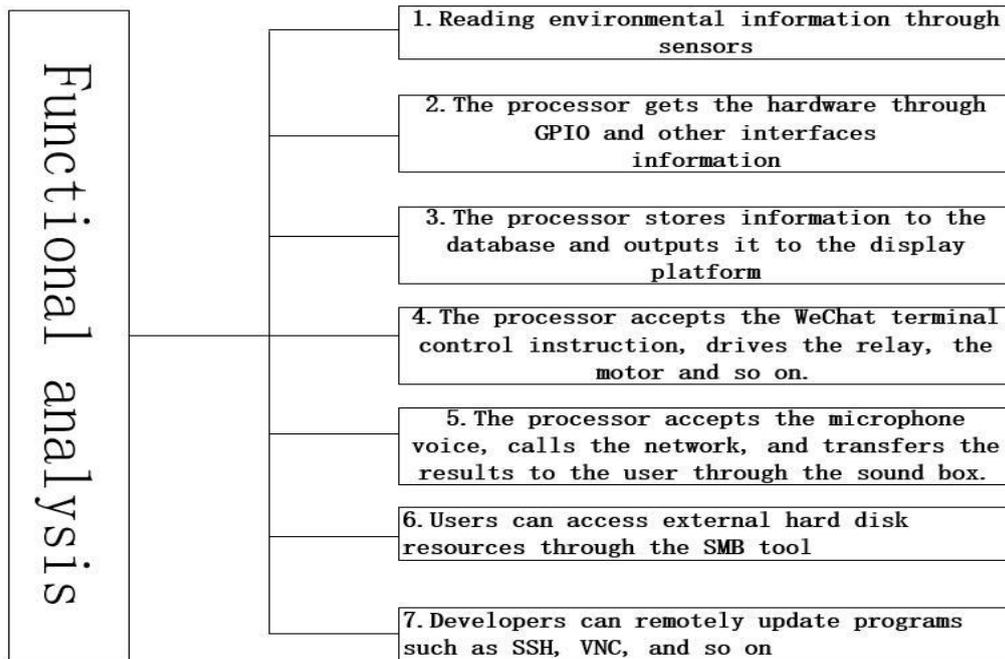


Fig.1 Functional analysis

According to the system analysis and the information transfer process, the information flow chart of the system is drawn as shown in Figure 2.

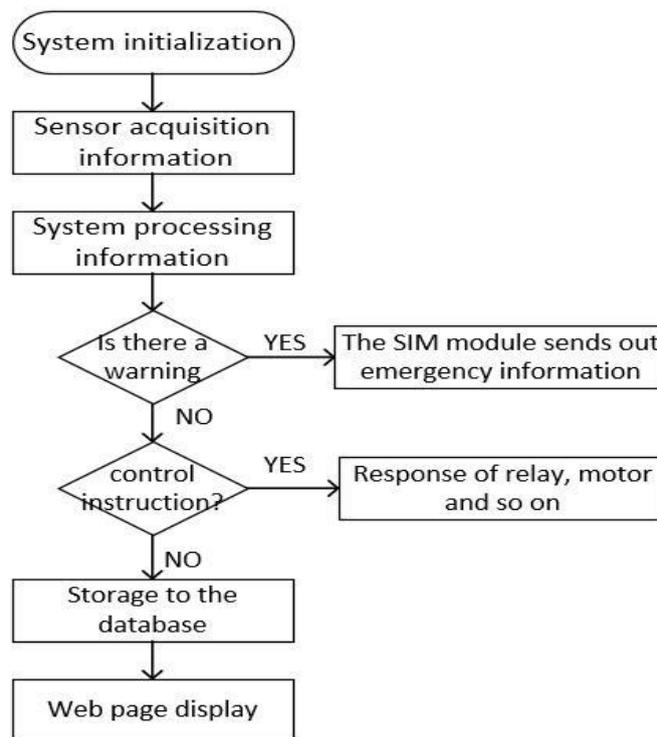


Fig.2 Information flow graph

The software design is divided into four parts: data acquisition, data processing, data storage and data display. The acquisition part is mainly through the GPIO protocol to collect data of temperature and humidity sensors, and to obtain the information of the human induction sensors and other switches. The camera module uses the

mjpg-streamer plug-in and can access the Linux UVC compatible camera by HTTP. Intelligent audio is to get initial data through voice input by users; data processing by running in raspberry pie platform Python program, through the business logic processing code compile corresponding module, the realization of its functions; data storage using the popular Mysql database storage, switching information, such as temperature and humidity data; data display by web in the form of display, control instructions issued by WeChat end. The five parts together construct a complete smart home system, which transfers data collection to the user floor, and controls the underlying devices according to the needs of users, completing a complete cycle. The process is shown in Figure 3

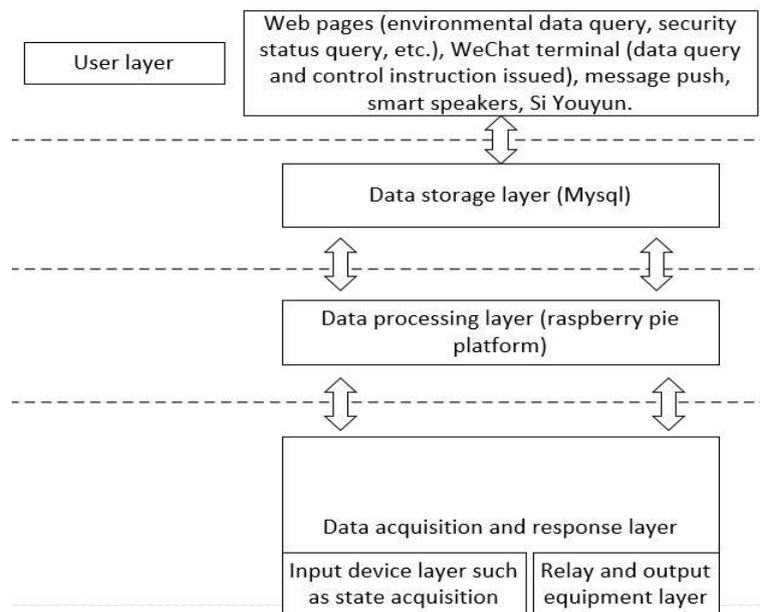


Fig.3 software design framework

2.2 Hardware Design

The hardware part includes raspberry pie and a peripheral circuit, the peripheral circuit consists of a camera module, infrared, body sensors, temperature and humidity, fire, gas, ultrasonic sensor module, relay, motor module, speaker components, external hard drives, GPIO, USB, CSI, through the AV interface to access the hardware design of the raspberry pie the platform is shown in figure 4.

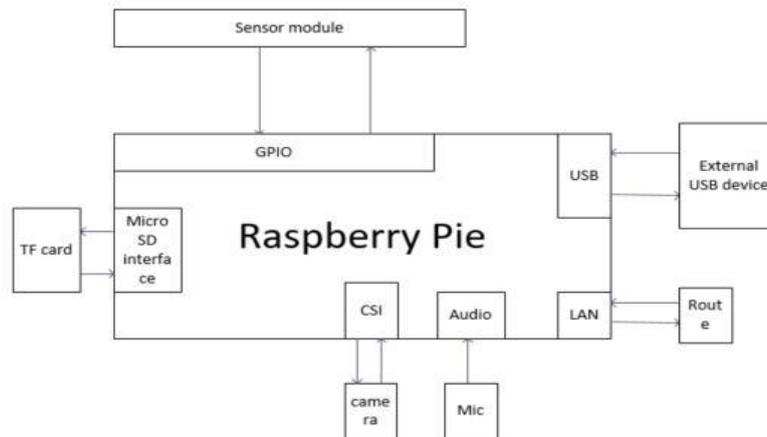


Fig.4 Physical layout of hardware platform

The underlying hardware is divided into four categories: one is the GPIO interface switch sensor module environment data acquisition module and environmental monitoring through the physical connection of raspberry pie; two is the external mechanical hard disk access in USB by the hard disk box platform and camera and speaker is connected to the platform in this way; the three is the platform itself through the camera CSI camera interface access; four is the microphone via the AV3.5 interface access system. These four types of peripherals jointly form the output and output units of the system, provide the data for the system, and receive the user control instructions to make the corresponding action.

2.3 Service management

Service management mainly includes application services, Web services, and data Library service. The application service is responsible for the various sensor modules Communication, get the data of the underlying device and save it to the database server in time, and the Web service is responsible for publishing these data to Web, which allows users to view the information needed by browser in real time. On the contrary, when users want to remotely control a device, they use Web service to write control commands to database service, then send it from database to send the command to the controlled device by application service.

2.4 User application layer

It mainly includes desktop computers, portable computers, tablet computers, and smart phones. Its main function is to provide the user with a human-computer interface that can interact with the system remotely through Web browser or WeChat platform. If we monitor the operation of the equipment in the house by browser, because the Web server adopts the technology of dynamic webpage generation, there

is no need to install additional application software except browser software on all kinds of computing devices. The real backstage program is on the Web server. If it runs through WeChat's home appliances, it only needs to log on to WeChat software. On the smartphone, we can send the control instructions to the application server through the WeChat public number test platform, and then send it to the underlying hardware.

3. System application and testing

After the successful development of the system, it has been installed in many houses. Users can send remote instructions to WeChat's home appliances conveniently, and also can open the camera in real time to see the situation at home. When you are at home, you can interact with intelligent housekeepers, get information about mail or weather, etc. in your spare time, you can play music and telecontrol with the system automatically. Through the accumulation of long time data, users can clearly understand the number of home appliances opening, the monthly changes in the indoor environment, and the rainfall information in the area. The temperature change is shown in Figure 5.

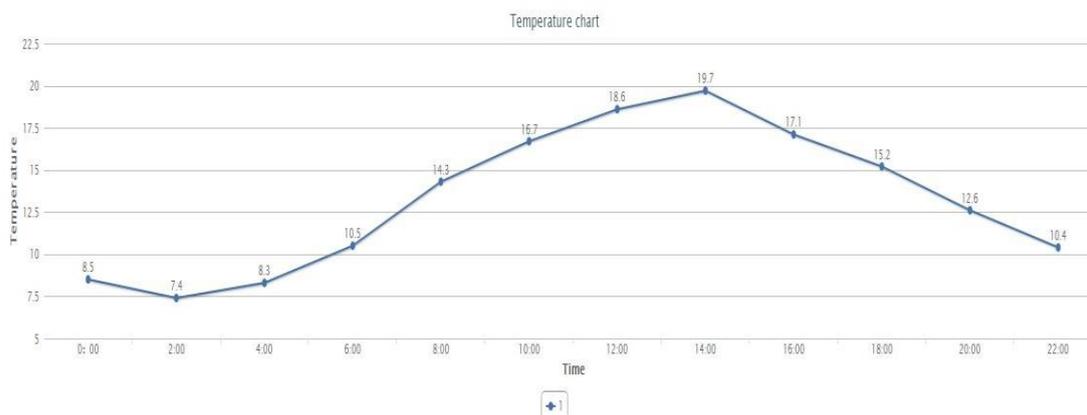


Fig.5 Temperature change table

4. Conclusion

This paper analyzes the basic requirements of the smart home system, and puts forward a more economical and practical intelligent home control system design. According to the design scheme, combined with my actual theoretical knowledge and practical level, the complete set of equipment for intelligent home system is finally realized. Through experimental test, it can achieve environmental monitoring, control the function of household appliances, and can realize human-computer interaction through intelligent sound. This design provides a more reliable scheme for the smart home into the ordinary people's family, and has a certain social reference value.

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