

## Research on Smart Home Control Based on Embedded Internet of Things

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**Abstract:** This article has carried out research on Internet of Things technology, smart home control system, embedded control system, and ZigBee gateway technology. Study realized the sensing module of the smart home hardware system, designed an embedded gateway control system and related hardware driver installation settings. By studying the smart home control technology, I have a deeper understanding of the overall structure, operating principle and key technologies of the smart home control system. I have a clear plan for the main design process of the software and hardware of the system, which lays a foundation for further detailed research. A solid foundation.

### 1. Introduction

With the rapid development of computer technology and Internet technology, the Internet of Things technology has gradually taken off its mysterious veil and continues to lead our lifestyle. In essence, the Internet of Things is a network formed by the integration of the Internet, communication network, and broadcasting network used in people's daily lives [4]. Therefore, the Internet of Things can provide basic technical support for the development of smart homes, and the development of the Internet of Things will also promote the development of intelligent homes. At the same time, smart homes use the Internet of Things technology to achieve control of household items and also promote the development of the Internet of Things. Therefore, understanding the concepts of the Internet of Things and smart home systems can further understand the development of smart homes based on the Internet of Things, and then better realize the intelligent development of homes.

As a comprehensive embodiment of electronic technology, automation technology, the IOT technology is constantly improving, and it has begun to enter our home life in the way of smart home. As an infrastructure network of a dynamic environment, the Internet of Things can use network application standards and communication protocols to classify items in the environment, so that the items can be integrated with the information network with a specific identity. Smart home is composed of various forms of home appliances and home appliances in people's daily life. The so-called home intelligence is actually to enable these independent home devices to communicate, and then to share home resources and information. Therefore, with the help of the Internet of Things, home information will not only be able to be connected to the Internet, but also to various networks such as wireless sensor networks, so as to form information communication with other homes, thereby achieving a highly intelligent home . Therefore, in principle, the smart home based on the Internet of Things is actually connecting the subsystems related to home life through the Internet of Things, and then realizes the exchange and communication of home information, so as to realize the intelligent home [1]. The purpose of smart home is to create a safe, convenient and comfortable ideal living environment for us. It is not only simple monitoring and management of televisions, refrigerators, lighting, access control and other equipment, but also lifestyle changes. As a reflection of lifestyle changes, the smart home system connects various controllable devices in the home through the network for centralized control and decentralized management, providing a more efficient management method.

### 2. Research on the Market Status of Smart Home Systems

## **2.1 Summary of the Status Quo of International Smart Home Development**

The earliest smart home appeared in the State of Connecticut in 1984—CT) Hartford's "smart building", although it only uses computers to simply switch on and off air-conditioning, elevators, lighting, etc., but since then, the United States, Canada, Britain, France, Germany, Australia, Economically developed countries such as Singapore have formulated their own standards for smart home solutions, and the smart home market has rapidly matured [2]. American smart homes take the digital home and digital technology transformation as an opportunity. They focus on luxury and pursue comfort and enjoyment, but their energy consumption is very large, which does not meet the current world-wide concepts of low-carbon, environmental protection, and open source savings. In 1998, Singapore launched a model intelligent system called "Future Home". This intelligent system has comprehensive functions and covers the functions of the smart home system. According to relevant surveys, there are more than 5,000 household applications in about 30 communities in Singapore. Intelligent system. South Korea uses 4A (Any Device, Any Service, Any Where, Any Time) to describe their smart home system, which is used to describe that users can control and interact with the smart home system at any time and any place in any way. In Spain, the intelligent home system is upgraded in a traditional European-style building. For example: when the indoor daylight is sufficient, the lighting will automatically turn off; a weather sensor is installed outside the house to monitor the weather in real time, and the windows and courtyard irrigation system are automatically closed . Japan's smart home is development, design, and construction of large-scale and group-oriented, people-oriented, focus on functions, take into account future development and environmental protection, a large number of new materials and new technologies, make full use of information, network, control and artificial intelligence technology to achieve residential Technology modernization. Based on the realization of ordinary home control, the smart home system created in Japan also makes full use of biometrics to control the access control system and collect health data. It takes less than 1 second to confirm the identity of the incoming person. By confirming the personnel, the access control system will Release automatically. Medical monitoring devices such as blood pressure and blood glucose are installed on the toilet pad. When a person sits on, they will automatically detect the family 's physical parameters, and a weight scale is installed in front of the sink. Record keeping for easy detection of health status. In addition, some well-known companies have also invested in research and development in the field of smart home. For example: Microsoft's "Dream House", Motorola's "Home Door", IBM's "Family Director" and so on. Smart home market.

## **2.2 Summary of the Development Status of Domestic Smart Home**

The domestic smart home market development momentum is extremely rapid. The earliest smart home in China began in 1994. At that time, smart home technology had not been mentioned. At that time, most intelligent control systems depended on imports. With the emergence and gradual development of the Internet of Things technology, smart home as a main application direction has also developed rapidly. On August 7, 2009, then Premier Wen Jiabao proposed "perceive China" during a survey in Wuxi. Since then, various domestic IoT application directions have entered the blowout period. Appliance manufacturers and IoT technology research institutions have joined the development of IoT systems, and the development of smart home systems has naturally gradually matured. Since 2009, the country's continuous support for high-tech industries such as the Internet of Things, the joint intervention of mobile communications and home appliance companies, and the rapid development of domestic smart home system R & D capabilities have grown rapidly, mainly in the Middle East and coastal economies. Developed area. Currently, Haier's U-home, ZiguangWulian, Wuxi's Home Cube, Beijing's Dongyu Smart, etc. have high market influence in the smart home field in China. Control, the rest of the company is focusing on the development of lighting, curtains and home security monitoring. In the development of China's intelligent housing, after more than ten years of exploration, the construction area has now reached 40 billion square meters, and it is estimated that by 2020, another 30 billion square meters will be added. In 2010, there were 9,000 smart buildings in China. The number of intelligent residential communities in the

country will reach tens of thousands in the next ten years. The smart home industry in China has relatively advanced development in Beijing, Shanghai, and Shenzhen. Shenzhen's smart home has done a good job in wiring, and has a strong foresight. Considering the power supply, air conditioning, telephone, television, network, etc., it is more comprehensive and embedded smart wiring. The concept is more advanced; Beijing's smart home is better at considering functions and local style. The urban planning and layout of the Pudong New District in Shanghai is more in line with the needs of a commercial metropolis like Shanghai. According to the classification basis of the "Instruction Manual for Classification of Smart Home System Products" of the Intelligentization Committee of the China Interior Decoration Association on April 5, 2012, smart home system products are divided into 20 categories: control host (centralized controller); intelligent lighting system; Electrical control system; home background music; home theater system; intercom system; video surveillance; anti-theft alarm; electric lock access control; Software; home wiring system; home network; kitchen and television system; sports and health monitoring; automatic watering of flowers and plants;

### **3. Functional Composition of Smart Home**

As an important application of the Internet of Things, the smart home's control system architecture inherits three important characteristics of the Internet of Things. First, it is the widespread application of various sensing technologies [5]. Massive types of sensors are deployed on the Internet of Things. Each sensor is an information source, and the content and format of information captured by different types of sensors are different. The data obtained by the sensor is real-time, periodically collecting environmental information at a certain frequency, and constantly updating the data. Second, it is a generalized network built on the Internet. The important foundation and core of the Internet of Things technology is still the Internet, which is integrated with the Internet through various wired and wireless networks to accurately and accurately transmit information about objects in real time. The information collected regularly by sensors on the Internet of Things needs to be transmitted through the network. Due to its huge amount, a large amount of information is formed. Analyze, process and process meaningful data from the massive information obtained by the sensors to meet the different needs of different users and discover new application areas and application models.

#### **3.1 Function Overview of Perception Control Module in Home**

The internal sensing control module of the home is the IoT sensing part of the smart home. This module is the application end of the smart home system. It is responsible for direct communication with various control points in the home. It is responsible for collecting parameter information of various devices. Parameter changes are transmitted by coding through the communication module.

Perceptual control inside the home is the basis of the smart home, that is, wired or short-range wireless communication is used to connect various controlled objects in the home to achieve family information collection. It mainly includes sub-control systems such as lighting system, curtain system, smart socket, intelligent electrical control, security alarm device, and access control camera. Among them, the advantages of using wired transmission are stable communication and low cost; the advantages of using short-range wireless are no wiring, easy expansion, and easy maintenance. The sensing networking trend in the home is the development of short-range wireless communication technology, and the sensing collection of home appliance information is completed through transit nodes.

The short-range wireless communication technologies currently widely used are: Bluetooth, IrDA, Wi-Fi, and ZigBee.

#### **3.2 Functional Overview of Home Internal Gateway Module**

The home internal gateway construction module is the data collection and distribution center of the Internet of Things. This module is responsible for data processing of the smart home, and completes communication conversion and information sharing transmission between different

network communication protocols. The home internal gateway module is responsible for completing the communication protocol conversion between the sensor control node and the Internet and the control terminal, and realizes the configuration and control functions of the home internal sensor node. The smart home gateway should have the following main functions:

### **3.2.1. Stable Access Control Capability**

At present, various types of sensors are complex, mainly designed for a certain functional application, and lack the compatibility and overall planning of comprehensive sensors [6]. At present, both at home and abroad are establishing a standardized system of IoT gateways to achieve the interconnection and interconnection of various communication technology standards, and have achieved leadership in the field of smart homes.

### **3.2.2. Stable Access Control Capability**

The purpose of configuring the gateway is to realize the management of the sensing nodes inside the home. The content includes obtaining the node identification, status, attributes, energy, etc., and it must also have remote wakeup, control, diagnosis, upgrade, and maintenance information upgrade and exchange functions. Due to the different technical standards used in existing home-aware subnets, and the exchange of information paths between protocols is complex, the gateway must ensure that the management interface is unified and the home-aware application nodes are effectively managed.

### **3.2.3. Powerful Protocol Conversion Capability**

Due to the different protocols of sensing data information obtained from different sensing nodes, the information normalization process has become one of the important functions of the home gateway. The purpose is to ensure that different network protocols can be unified and have a common data form to send to the control end. At the same time, it can accept the command data of the control end, and after translation, it becomes a control instruction that can be recognized by the sensing node in the home.

## **3.3 Function of Remote Communication Module**

The remote communication module is a way for people to get real-time information. Reliable transmission of remote communication and information interaction are important guarantees for smart homes [3]. Only with reliable data transmission can the effective delivery of control data be achieved and the purpose of remote control achieved.

The remote communication module mainly completes the connection function between the home gateway and the Ethernet. The real smart home must be able to be controlled remotely, that is, the information on the internal equipment of the home and the information on the control side are exchanged remotely. In the existing smart home market, the home IP address is assigned by the network operator through DHCP, and the external Ethernet cannot directly communicate with the home internal gateway and perform remote control. Therefore, in this design, the remote alarm is realized through the GSM module, and the remote instruction is implemented by the TCP / IP protocol to set up the LAN of the built network for functional simulation.

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