

PAPER • OPEN ACCESS

Software Design of Intelligent Control System Based on Android Platform

To cite this article: Xiaomin Qin *et al* 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **563** 052014

View the [article online](#) for updates and enhancements.

Software Design of Intelligent Control System Based on Android Platform

Xiaomin Qin, Ming Li, Jian He, Lizhao Zhao

(Beijing Smart-chip Microelectronics Technology Ltd., Changping District, Beijing 102200, China)

Abstract: With the development of smart grid, the development of smart community and smart city has been promoted, and the quality of life of the people has been improved. Intelligent power consumption has added low-carbon, energy-saving reforms to people's lives, and provided more convenient intelligent services. This software is based on the idea of intelligent power consumption. MVC architecture is adopted to achieve low coupling between interface and logic, so as to ensure the stability, scalability and maintainability of the software. This software is based on Android mobile client, realizing remote control of household appliances and data query, recording user operations, analyzing user operating habits, and realizing intelligent control. As a micro-intelligent product, intelligent control system software will also contribute to the development of smart grid.

1. Introduction

With the advocacy of green intelligent life, in order to meet people's specific needs for life. Micro-intelligent products are rising in the smart home market. Micro-smart home products are becoming more and more popular with users. Compared with the price of tens of thousands of traditional smart home products, lightweight micro-smart products are more acceptable to users. The linkage of micro-intelligent products can form a larger micro-intelligent system. The intelligent socket can form the intelligent socket system of the living room, bedroom and even the whole room. There are different types of micro-intelligent products can also realize interoperability, interconnection and linkage. Such micro-intelligence must be the future trend.

The intelligent controller APP can clearly display the functions of the intelligent controller, realize the remote control and timing control of the intelligent controller, and real-time view of power consumption. Starting intelligent control can learn user habits. The background server forms a set of control through data analysis to cater to user habits and save the trouble of repeated operation.

2. Android Platform Introduction

Android is the name of the open source mobile operating system based on Linux platform, which consists of operating system, middleware, user interface and application software. Android's system architecture adopts a layered architecture, from the top to the bottom are the application layer, the application framework layer, the system runtime layer and the Linux kernel layer. Android platform has many advantages. First of all, its openness makes it have more developers; secondly, because of the openness of Android, many vendors will launch a variety of products with different functions and characteristics. Functional differences and features will not affect data synchronization, or even software compatibility, so it has rich hardware; Again, Android platform provides a very broad, free



environment for third-party developers to facilitate development; Finally, Android platform mobile phones will seamlessly combine excellent Google services.

In China, the market share of Android devices has exceeded 80%. With the increasing abundance of users and applications, Android platform will soon mature. Therefore, our mobile terminal chooses Android platform to facilitate the use of most mobile users.

3. Architecture of Intelligent Control System

Intelligent control system is mainly composed of three parts: APP application software, master station and intelligent controller, as shown in Figure 1.

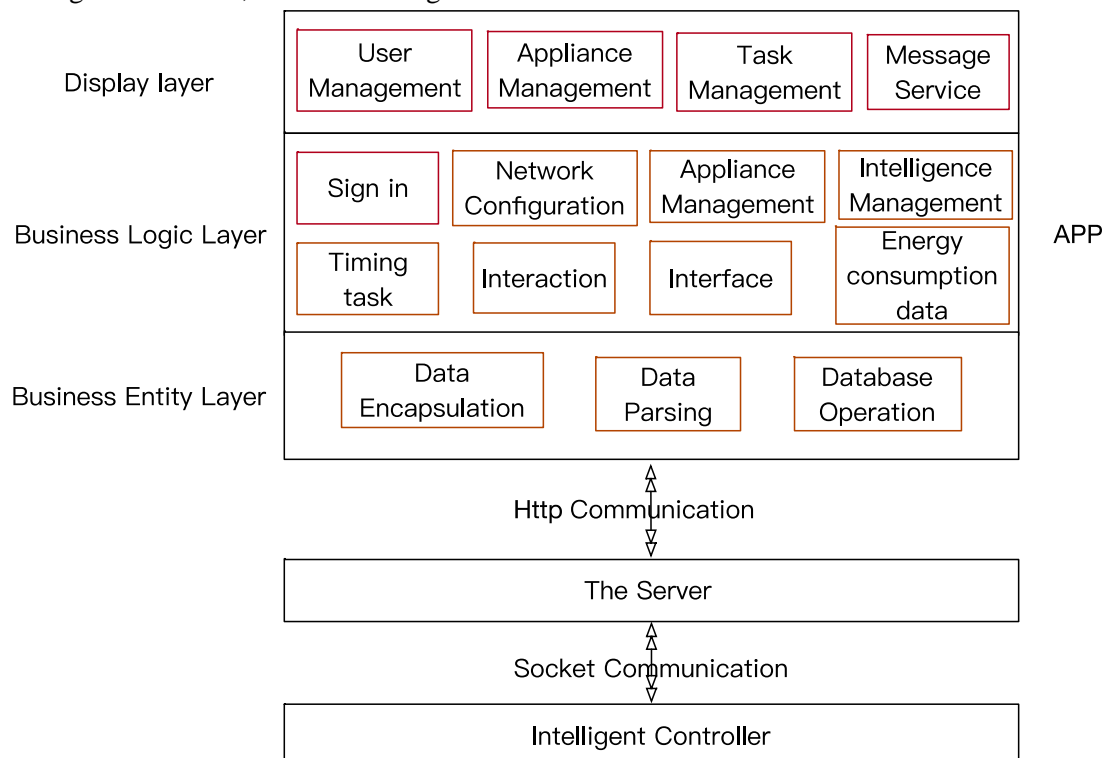


Figure 1. Architecture of Intelligent Control System

APP application software is divided into three layers:

The display layer, also known as the view layer, is an interface that interacts with users. When interacting, the interface of business logic layer will be invoked, and different interfaces will be displayed to users according to different responses;

Business logic layer, according to the user's interaction, processes the actual events logically, and queries the data from the server or database;

Business entity layer, each business entity, is responsible for the request of data encapsulation and return of data analysis.

The server, also known as the master station, is the data master dispatching center. It not only stores data but also carries out large data analysis, searches for user habits and realizes intelligent control, but also communicates with hardware to realize real-time control and data acquisition.

Intelligent controller is the hardware facility of the whole system. Its software design is divided into two layers: the application layer mainly completes the actual business logic, including the data communication of the server, the reading of local data, the control of relay state and LED lamp state, the data storage of relay state, current, electric energy and other parameters; the driver layer completes the driving of various peripherals and hardware devices.

4. Main Function Design of Software

App software uses M-V-C architecture. The reason why App adopts this architecture mode is that business logic and interface display are removed, which is convenient for later code maintenance and system function expansion. The main functions of the software are household appliances management, energy consumption data and task management. These three functions are the core functions of the software. They mainly realize the addition and deletion of household appliances, the display of energy consumption history data and real-time data, as well as the timing task management and intelligent control.

4.1 Household Appliances Management Function

The management of household appliances mainly includes the addition, deletion and editing of household appliances. When adding household appliances, we need to configure the intelligent controller network, get the Mac address of the intelligent controller, and then add it. Network configuration is required when adding intelligent controllers. The process of network configuration is to encrypt the Wi-Fi name and password of the user equipment connection, and then send it through UDP multicast message. Messages will be sent repeatedly until the distribution network is successful to ensure that the intelligent controller receives all the information and parses it correctly. When the distribution network is successful, the intelligent controller connects the network successfully. The distribution process is shown in Figure 2.

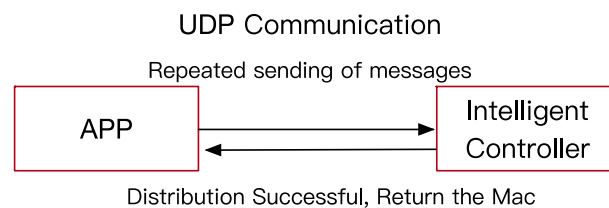


Figure 2. Network Configuration Process

When the distribution network is successful, it returns to the intelligent controller Mac, and APP calls the server interface to add the intelligent controller Mac. When deleting household appliances, the data and tasks of household appliances will be deleted at the same time.

In addition, the management module of household appliances will display the real-time status of household appliances, which is convenient for users to operate and view.

4.2 Energy Consumption Data

Energy consumption data are mainly household electrical appliances consumption data, including daily, weekly, monthly, annual and total electricity consumption display. Energy consumption data will be displayed in the form of charts. Users can understand and compare electricity consumption in different periods at a glance. The specific process is that the APP software invokes the interface to query some kind of power consumption data from the server, and the server returns the query results in a certain order. After receiving the returned data, the APP software displays the data.

4.3 Task Management

Task management is divided into timed task management and intelligent control management. Timing task management can realize the setting of timed tasks. It can be executed in a single time or in a weekly or daily cycle, setting the specific time and action for executing actions. Timing tasks can be set, queries can be deleted; Intelligent control management can set intelligent control on or off. When the intelligent control is open, the background will record the user's operation and analyze the big data to get the user's usage habits, and control the household appliances according to the data obtained from the analysis. Intelligent control function does not need every operation of the user, and it can also be closed when the intelligent control is not needed.

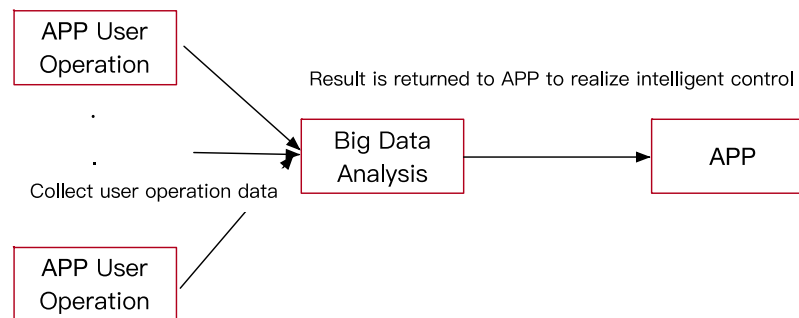


Figure 3. Intelligent Control Function

5. Conclusion

Intelligent power consumption is an important pillar of building a strong smart grid, and also the focus and foothold of building a strong smart grid. The development of smart grid improves people's quality of life and makes people's life more convenient. It can realize remote control, monitoring at any time, and inquiry of electricity information. This paper expounds the software of intelligent control system based on Android platform. This software realizes remote and intelligent control of household appliances and makes a contribution to the development of smart grid.

Acknowledgments

Thank you for your participation in this project. It's your hard work that makes us such an excellent software product. Thank my colleagues in the project team for their help in writing my paper.

Reference

- [1] Shugang Yin, Yu Zhang, Keming Bai etc. *Intelligent Power Utilization System Based on Real-time Electricity Price*. Power grid technology, 2009
- [2] Dongdong Li, Longlong Cui, Shunfu Li etc. *Research on home intelligent power system and development of intelligent controller*. Power System Protection and Control, 2013
- [3] Xingmei Teng, Ping Wang, Lei Jiang etc. *Discussion on the Architecture of Intelligent Electricity Interaction System [J]*. Scientific Research, 2015(17):00192-00192.
- [4] Xi Chen, Yanling Zhang. *Design of intelligent parking management system based on Android platform[J]*. Computer and Information Technology, 2018, 26(3):39-45.
- [5] Zhenwen Lin. *Application Design of Mobile Intelligent Terminal Security Protection System Based on Android Platform[J]*. Journal of Changchun Normal University, 2018.