

A Novel Customized Firmware Upgrade Module for Iot Devices

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Abstract

This work designs a set of new customized IOT device firmware upgrade module, and proposes a "smart IOT device upgrade solution" which integrates remote control, online voice control and offline voice control. Starting from exploring the diverse and customized needs of developers and users, this work explores the design elements and design strategies based on users' customized needs, so as to realize the transformation and upgrading of traditional IoT electronic equipment.

Keywords

Customized Firmware Module; Upgraded Iot Devices; Remote Control; Online Voice Control.

1. Introduction

With large-scale expansion, CMOS technology has become the driving force of semiconductor industry growth for more than 30 years [1,2]. With the continuous expansion of transistor characteristic size, the cost of developing new integrated circuits, manufacturing, debugging and mass production is rising. With the transition of industry to 7Nm and higher technology, the cost of developing new SOC, design debugging and design iteration becomes larger and larger [3]. Traditionally, the economic model of the semiconductor industry is based on the scale economy, which is very effective for the large capacity market such as smart devices [4]. However, for a smaller and more dispersed market, the capacity of any chip is not enough to prove the required high investment level, especially for advanced process nodes [5].

This work develops a set of new customized IOT device firmware upgrade module, and proposes a "smart IOT device upgrade solution" integrating remote control, online voice control and offline voice control. For example, if a brand customer wants to upgrade the original equipment, remotely control the switch of the equipment, work mode and record daily use data through the mobile terminal. After evaluation, using the IoT services and the customized module hardware designed by this work to complete the upgrading of the work, the investment cost is far lower than the independent research and development. Finally, a brand completed the system online and work in only one month, which improved the work deployment speed, user satisfaction and product competitiveness.

2. Basic Concept of IoT Service Platform

Firstly, the four interaction design elements of IoT, IoT service platform, users of IoT service platform and typical scenarios of IoT service platform are systematically analyzed from product interaction design elements to form an overall understanding of IoT service platform system; In addition, in the process of in-depth interviews with stakeholders, we found the potential needs of users of IOT service platform; Based on the above research content, through quantitative research, we verified and investigated the needs of subdivided users, the satisfaction and importance of platform functions, summarized the common and individual

needs of users, and created character model, which provided vivid reference for the design strategy; Finally, based on the extracted customized needs of IoT service users, the application management layer, interface presentation layer and value-added service layer are taken as the design principles and design strategies, and specific design strategies are proposed for each level to design the firmware upgrade module of "smart in" new customized IoT devices, so as to help the commercial upgrade of existing products.

(1) The IoT service platform accelerates the application innovation of the IoT and helps the productization and commercialization of equipment. "Smart in" module shows its unique advantages in the innovation of intelligent products and small IoT works with its low cost, high degree of openness, acceleration of application layer development speed and reduction of development risk. Large scale IoT platform needs high development cost, long development cycle, strong pertinence of product function attribute, so it is relatively closed, and it is difficult to expand and upgrade, which has great risk for innovative intelligent product design and small IoT work. The IoT service of "smart in" module can help users realize the function of equipment productization. By adding "smart in" module to the equipment, the integrated product solution can be obtained, which is convenient for users to optimize their own products. This provides business opportunities for IoT service platform users, both individual users and enterprise users, and helps users save development costs to the maximum extent. The value-added value of such firmware upgrade service will lead to a leap in product quality.

(2) This paper puts forward the design principles and Strategies of IOT service platform based on users' customized needs, and proposes four customized customization modes following the design principle of seeking common ground while reserving differences, which enriches the flexibility and diversity of IOT service platform functions. For example, Druid heater is a manufacturer of heater equipment, and its customers hope to upgrade the original equipment, remotely control the switch, working mode and record daily use data of the equipment through mobile terminal. After evaluation, the investment cost of completing the work by using the IOT service platform and the customized module hardware designed in this work is far lower than that of independent research and development, as shown in Figure 1 and figure 2. Finally, Druid heater only took one month to complete the system online and work, improved the speed of work deployment, improved user satisfaction and product competitiveness.



Figure 1. Upgraded controller circuit of a brand

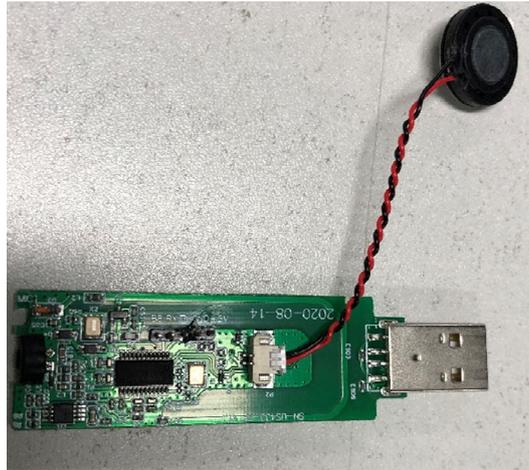


Figure 2. new customized firmware upgrade module for IOT device



Figure 3. using custom module to help quasi IOT devices pair

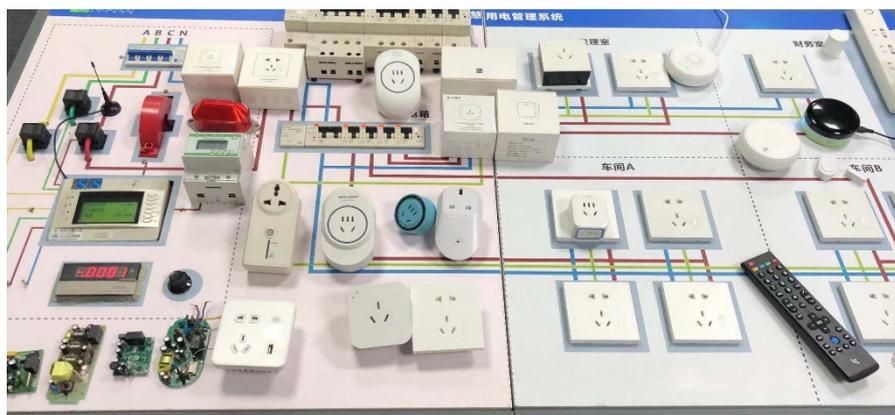


Figure 4. other IOT products using custom modules

3. Cloud + Local Intelligent Chip Terminal Solution

Using domestic high quality chip "hummingbird M" "Develop the world's top intelligent speech recognition and semantic understanding technology with IoT artificial intelligence services and fully independent intellectual property rights, and provide standardized hardware and software integrated voice solutions by using cross hardware platform and cross application

scenario cloud + local intelligent chip terminal solutions, supporting single microphone pickup, front-end noise reduction, voice wake-up and offline recognition Don't wait. Users use the standardized hardware module in the scheme, cooperate with the cloud device platform and related tools, and quickly customize voice products to enable home devices such as air conditioners, refrigerators, lamps, switches, etc., so that they have the ability of intelligent voice interaction and remote control.

In hardware environment, based on the standard hardware board with hummingbird m chip (see Figure 5) as the core, the offline recognition algorithm is integrated. In software, the intelligent device platform that can configure voice and generate software version is used. Intelligent device platform provides different scenarios to customize different voice product forms.

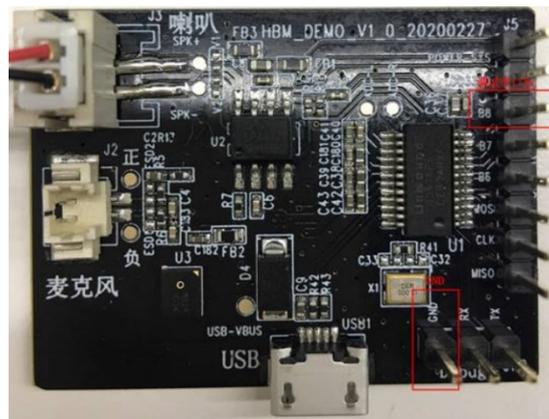


Figure 5. hummingbird m chip and general demo board

4. Application of the Customized Firmware Module

(1) Through on-the-spot investigation and in-depth interview and other design research methods, this paper explores the real situation of users using the IoT service platform based on "smart in" module, understands the real needs and potential needs, uses a large number of first-hand data to study the characteristics of their typical behaviors, needs and scenes, and studies how to fill the gap in the design strategy of the IoT service platform, which is of great significance to the integration of social effective resources, Improving the efficiency of IoT service platform and strengthening the IoT service users play a positive role in promoting the viscosity of the platform, and make a beneficial attempt to explore the user experience optimization under the background of IoT. And through the corresponding incentive strategies for the value-added service layer, the user's enthusiasm to participate in the IoT service platform is higher, so that the IoT service platform has higher social attributes than the technical level.

(2) Through the theoretical research and investigation of IoT service based on "smart in" module, this paper summarizes the design principles of IoT service platform based on users' customized needs, and puts forward the design strategies. The design strategy is brought into practice for verification. This not only has guiding significance for the design and development of IOT service module in the future, but also can be extended to the design practice of general technology service platform.

(3) A few days ago, the State Council issued several policies to promote the high-quality development of the integrated circuit industry and software industry in the new era. All departments and localities should formulate specific supporting policies as soon as possible,

speed up the implementation of policies, ensure the effectiveness, and promote the high-quality development of China's integrated circuit industry and software industry.

In the hardware design of this work, we make full use of the domestic high-quality chip "hummingbird m" as the core chip of the module, aiming to reduce the dependence on imported chips in the process of intelligent product development, and develop the IoT artificial intelligence services, intelligent speech recognition and semantic understanding technology.

5. Conclusion

The IoT service can help users realize the function of equipment productization. By adding "intelligent in" module to the equipment, the integrated product solution can be obtained, which is convenient for users to optimize their own products. This provides business opportunities for IoT service platform users, both individual users and enterprise users, and helps users save development costs to the maximum extent. The value-added value of such firmware upgrade service will lead to a leap in product quality.

(1) Because the IoT service platform is different from the Internet service platform, the IoT service platform involves the interaction between users and hardware equipment and platform, and the interactive information changes in real time with the change of equipment monitoring data, so the factors involved in the interaction process are relatively more complex, so whether it is for the design elements of the IoT service platform itself It is difficult to study the user's needs and behavior, which is one of the problems to be solved in the work.

(2) In order to connect intelligent products or product prototypes to the IoT platform, users need to have a certain understanding of the basic networking principles, and have knowledge of electronics and programming, which increases the difficulty and cost of learning. How to reduce the development cost and improve the use efficiency without affecting users' goal of networking devices and monitoring and controlling the environment or state To meet the customized needs of different degrees of users and improve the user experience is the difficulty of this research.

(3) This paper studies the design of IoT service platform from the perspective of user customized needs. Complete the optimization design and test of the remote-control function and voice interaction function of the firmware upgrade module of the "smart in" new customized IoT device.

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