Research on Design Strategy of Computer User Interface Based On Smart Home for the Elderly

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Abstract. The smart home of the elderly presents new challenges to the user interface design, interactive experience and barrier free use of its control terminal, especially the adaptability of the elderly. Based on this, this paper first analyses the composition and function of smart home based on the elderly group, then studies the control realization of smart home based on the elderly, and finally gives the computer user interface design strategy and practice of smart home based on the elderly.

Keywords: User Interface Design, User Interface, Computer Elderly

1. Introduction

With the iterative progress and maturity of computer tech, it has been widely and deeply studied and popularized in many fields, especially the utilization of info tech represented by intelligent equipment in the field of home furnishing, which greatly ameliorates the intelligent and info degree of home furnishing system [1]. On the other hand, with the continuous amelioration of people's living standards and economic conditions, people's requirements for the functionality, intelligence and interconnection of household equipment are gradually improving. In this context, the concept and research of smart home is gradually warming up, and more and more enterprises and institutions begin to set foot in the field of smart home. Smart home not only creates comfortable home space, but also challenges the control performance of home equipment and system, especially the integrated control ability. Smart home can bring good utilization experience to users through the control terminal and good interaction design, and ameliorate the convenience of home equipment, so it can adapt to more groups, especially the elderly people with mobility difficulties.

At present, China is facing a serious trend of population aging, as shown in Figure 1 below. With the continuous growth of the number and proportion of the elderly population, there are a large number of empty nesters in the whole society who lack effective care and care [2]. Due to the limitations of social care institutions, there are still quite a number of elderly people choose home-
based care. But home-based care for the elderly will bring a lot of pressure and problems to the quality of life and health protection of the elderly, and the utilization of smart home system can effectively ameliorate the quality of life of the elderly and ensure the level of life service of the elderly [3]. Draw support from smart home system to monitor the behavior and status of the elderly, it could grasp and understand the health info of the elderly in real time, and provide targeted nursing response.

Figure 1. The trend of population aging in China

In addition, the intelligent home of the elderly presents new challenges to the design of user interface, interactive experience and accessibility of the control terminal, especially the adaptability of the elderly [4]. Therefore, the interactive design and research of the user interface of smart home should be carried out according to the psychological and physiological characteristics of the elderly. The function and interface design and analysis should be carried out comprehensively from the perspective of psychology, product design and sociology. Smart home should bring spiritual comfort to the elderly group while improving their home life experience.

In a word, the dynamic heterogeneous architecture of smart home can effectively manage home devices and provide more intimate and humanized home services for the elderly users. Draw support from smart home system, the multi info interaction in the living environment and the info exchange inside and outside the family can be realized, so as to create a safe, comfortable, manageable and service-oriented intelligent home environment for the elderly [5]. Under the background of the diversification of smart home functions, the friendliness of its operation interface affects the use effect of the system and the convenience of the elderly. Therefore, the research of computer user interface design based on the elderly group smart home has important practical value.

2. Composition and function of smart home based on the elderly group

2.1. Composition of smart home based on the elderly group

The composition of smart home based on the elderly group is shown in Figure 2 below.
2.2. The function of smart home based on the elderly group

The functions of smart home based on the elderly group mainly include safety protection and fire alarm automation, intelligent household appliances, property management automation, info and communication automation, collaborative work among various devices, environment and energy saving, etc [7]. Among them, safety protection and fire alarm automation are the most basic requirements of smart home. Intelligent household appliances are an important part of smart home. Through the intelligent control of household appliances and household electrical facilities, the elderly users can be liberated from many household chores. Through the networking with the intelligent system of the community, the elderly residents can monitor and manage the use of water, electricity, gas, telephone and network.

In addition, at the level of info and communication automation, the use of computer network resources, from community info services, property management services, residential info exchange and other Internet functions. The cooperation between devices can provide more abundant system association functions. The function of environment and energy saving can monitor the indoor environment state value, and adjust and control according to the habits of elderly residents, so as to make their living space more comfortable and environmentally friendly.
3. Intelligent home control based on the elderly

3.1. Control mode of smart home based on the elderly

The control methods of smart home based on the elderly include local switch, remote control, scene control, centralized control, network control, and computer control and telephone communication remote control. Among them, the local switch control is the most traditional form of control, according to the actual needs of the elderly, set the switch control object and control time; remote control has become a more common form of control [8]. Scene control is based on the actual needs of elderly users to carry out different control content for different scenarios of home equipment. Centralized control controls the actions of electrical equipment distributed in different parts of the network through a centralized controller placed somewhere. In addition, draw support from computer software, the control signal sent by the computer system is converted into power carrier signal through the network or interface equipment to control the household appliances connected to the network.

3.2. Smart home security for elderly users

For the elderly users with home-based care, the security threats to their home environment include external invasion and internal hidden danger. Smart home can deal with specific danger. Based on the smart home, the family security system includes indoor anti-theft alarm, indoor fire alarm, emergency help, access control, gas leakage alarm, peripheral anti-theft, door access intercom and other subsystems [9]. Home linkage judgment and linkage processing mainly coordinate the work within the family security system and between the family security system and the home control system through the preset logic rules. The logic rules and system composition are shown in Figure 3 below.

In addition, based on the security mode, according to the different state of the family to control the working state of the smart home system, to achieve the interaction between the elderly users' activities in the home and the family control system, and set different scene modes and rules to achieve the collaborative work of the various parts of the smart home.

![Figure 3. Smart home security logic rules and system composition](image_url)

4. Computer user interface design of smart home for the elderly
4.1. Usability design of smart home operation interface for the elderly

The purpose of the usability design of the intelligent home interface of the elderly is to realize the elderly users to meet their own needs of home life by using the smart home function. Through the task decomposition of the elderly users using smart home function, the usability problems of the elderly are found [10]. By learning the task info, executing the task and completing the task, the task of operation control is finally completed. Secondly, when analyzing the structure of operation tasks, due to the decline of the physical function of the elderly users, in order to strengthen the convenience of the elderly in the process of using smart home, in order to reduce the complexity of the operation task structure, the wide and narrow structure is adopted as much as possible. According to the needs of the elderly, remove unnecessary tasks, merge the operation steps without affecting the operation, and decompose the huge tasks.

In addition, the use of new tech to change the operation process, the appropriate addition of voice operation control, set automatic operation. It provides guidance and assistance for operation tasks, including semantic guidance, cultural guidance, logical guidance, feedback assistance and third-party assistance, so as to enhance the communication ability of operation task info.

4.2. Practice of intelligent home control interface design for the elderly

The design of smart home control interface based on the elderly should first simplify the operation task structure. According to the elderly's home needs and the characteristics of smart home, set up the task function structure in line with the elderly's thinking and behavior characteristics. Secondly, we should simplify the interface of operation tasks, merge and decompose operation tasks appropriately according to the needs, eliminate unnecessary task structure appropriately, and establish flexible operation interface hierarchy. In addition, we should provide the elderly with guidance and assistance of operation tasks use semantic guidance, cultural guidance and feedback assistance, and feedback of execution results and status, so as to make the elderly users have a stronger sense of operation experience.

In addition, the communication ability of operation task info should be enhanced. In the layout planning level, the browsing and operation sequence of the elderly users are considered to facilitate the elderly users to view important info. At the level of color planning, the color planning and design of user interface are carried out from two dimensions of the elderly users' visual identification and the symbolic meaning of color. At the level of icon planning, redundant decoration elements are removed, and simple and symbolic graphics are used to facilitate the understanding of elderly users.

5. Conclusion

In summary, The dynamic heterogeneous architecture of smart home can effectively manage home devices and provide humanized home services for the elderly users. Draw support from smart home system to achieve multi info interaction in the living environment, it can create a safe, comfortable and service-oriented intelligent home environment for the elderly. Through the research on the composition and function of smart home based on the elderly group, this paper analyzes the control mode of smart home based on the elderly. Through the analysis of the control mode of smart home
based on the elderly, the usability design and design practice of smart home operation interface for the elderly are studied.

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