Research on the Application of Interaction Design in the Functional Design of Intelligent-home Products

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Abstract. The networking operation of intelligent-home products can expand more functions and bring consumers more in-depth interactive experience. The effective integration of interaction design, intelligence and info tech in intelligent-home products can effectively solve the shortcomings and problems of home market products. Based on this, this paper first analyses the concept and value of product functional interaction design, then studies the functional design of intelligent-home products based on interaction design, and finally gives the utilization strategy of interactive design in the functional design of intelligent-home products.

Keywords: Interaction Design, Functional Design, Intelligent-home Product

1. Introduction

With the iterative progress and maturity of computer tech, it has obtained extensive and in-depth research and popularization in many fields, especially the utilization of related tech represented by computer interaction design in the field of intelligent-home product design, which greatly accelerates the amelioration and promotion of the function of intelligent-home products [1]. On the other hand, with the rapid development of social economy, the pace of life continues to accelerate, people's pursuit of the quality of life is also constantly ameliorating, especially hope to get a better home experience at home. In this context, a variety of intelligent-home products and systems continue to emerge, and these products are becoming more intelligent, info-based and humanized, which brings people a stronger sense of experience and interaction.

At present, intelligent-home products are still in the stage of vigorous development, and the functionality of their products is still in the stage of continuous amelioration. In addition to the basic residential functions, intelligent-home organically integrates the concept of intelligent control, which brings a full range of info exchange functions. The main functions of intelligent-home products include several aspects as shown in Figure 1 below, which significantly optimize people's lifestyle, home environment and atmosphere. Therefore, they are welcomed and loved by more and more people, and become the development trend of home market. In the process of functional design of intelligent-home products, the organic integration of interactive design can make users easy to accept and use, more convenient for people's daily life, and enhance the harmonious relationship between consumers and intelligent-home products.
First of all, from the perspective of industrial design, the interaction design of intelligent-home products is mainly used to design qualified products with high quality and high aesthetics, and has high attention and emphasis on the use, appearance, and easy maintenance, low cost and easy communication of products. Secondly, from the perspective of human-computer interaction, the interaction design of intelligent-home products pays more attention to the ease of use, reliability, safety, flexibility and effectiveness of product functions, rather than just the command, menu and graph forms of product function realization [3]. In addition, from the perspective of user experience, the interaction design of intelligent-home products pays more attention to the sensory impact, product efficiency, and ease of use, comfort, safety and pleasure in the process of product function realization.

![Figure 1. Main functions of intelligent-home products](image)

In addition, with the in-depth utilization of info tech and network tech, the intelligent and info level of intelligent-home products is also continuously ameliorating, and the requirements of control equipment related to intelligent-home for network quality and status are also constantly strengthened. The networking operation of intelligent-home products can expand more functions, not only bring consumers more in-depth interactive experience, but also open up a home market service business model for businesses. Interactive design makes the intelligent-home more functional and easier to operate, reduces the difficulty and cost of users, and greatly ameliorates the use experience of the product.

In a word, the effective integration of interaction design, intelligence and info tech in intelligent-home products can effectively solve the shortcomings and problems of home market products, and make the functions of home products no longer restricted and affected by consumers' habits and interaction modes. By introducing the concept of interaction design into the functional design process of intelligent-home products, it can make the home products more in line with the actual needs of consumers, market and home environment [2]. Therefore, it is of great practical value to study the utilization of interaction design in the functional design of intelligent-home products.

2. The concept and value of product functional interaction design

2.1. The concept and connotation of product interaction design

2.2. Composition of interactive design system for intelligent-home products
The composition of intelligent-home product interaction design system mainly includes consumers, consumer behavior, product use scenarios, tech integrated in the product and the final finished intelligent-home product, as shown in Figure 2. Among them, the use scenes of intelligent-home products include material scene and non-material scene. The former is the material environment represented by communication space, lighting conditions and other related facilities, while the latter is the non-material scene represented by organization scene and social scene [4]. Secondly, the technical elements of intelligent-home products include speech recognition, image and character recognition, multimedia, info visualization, virtual reality, network, mobile communication, and related hardware and software technologies represented by various sensors, light control and voice control.
Figure 2. Composition of interactive design system for intelligent-home products

In addition, the product components of intelligent home interaction system include tech driven and consumer driven, while consumer components include main, secondary and tertiary consumers. In order to understand the behavior and habits of consumers, it should pay attention to the concrete behaviors of consumers from cognitive psychology and thinking process [5]. The behavior elements of intelligent-home interaction system will be affected by time, environment, response and operation.

3. Function design of intelligent-home products based on interaction design

3.1. The goal of functional interaction design of intelligent-home products

The goal of functional interaction design of intelligent-home products includes usability and user experience. Among them, the usability goal refers to the intelligent-home super functional practical, safe and effective, cost-effective, and easy to operate, visibility, to provide users with correct operation tips, feedback, easy to learn and master, reliable performance [6]. Secondly, at the level of user experience goal, the main functions of intelligent-home products can bring consumers pleasure, satisfaction, aesthetic feeling, support creativity and valuable experience. The key elements of user experience of intelligent-home products include brand, usability, functionality and content. The usability goal of intelligent-home product function is the basis of user experience goal, and without user experience goal product will make the use of the product become no sense of experience.

3.2. Demand analysis of functional interaction design for intelligent-home products

In the process of demand analysis of interactive design of intelligent-home products, it is necessary to determine the consumers and users of intelligent-home products, transform the target users into personas, and determine the common characteristics of the target population, such as the objectives, motivations and behaviors of the products, and determine the differences between the target groups and other personalized data [7]. Secondly, it should expand consumers and users, including product users, potential users, and product development team members, project managers and relevant managers, as well as partners, product testers, marketing personnel, customer service personnel, product maintenance personnel and relevant field experts.

In addition, in the aspect of confirming the demand method of the functional design of intelligent-home products, the plot description can include the characters of the target user, the user's needs, the behavior taken, and when and under what environmental conditions to use the products.
3.3. Function design of intelligent-home products based on interaction design

The function design of intelligent-home products based on interaction design can sense anything the user does at home, and can give the user life support through intelligent functions at any time. At the same time, it can provide intelligent services according to the timeliness needs of users [8]. The value essence of intelligent-home is that everything is around people's needs, not around linkage control and space scene. Secondly, through the IoT of a large number of devices, the interconnection between the bottom layer and the cloud is further deepened. On the basis of a large amount of user data precipitation, it could carry out big data analysis, build character portraits, realize active intelligence, and realize the operation under the terminal.

4. Utilization strategy of interactive design in function design of intelligent-home products

4.1. Utilization value of interactive design in function design of intelligent-home products

The utilization of interactive design in the function design of intelligent-home products makes the seamless interconnection and cooperation between different brands of intelligent-home devices from the bottom protocol, cloud interconnection or AI, which will completely eliminate the island effect that intelligent-home cannot be interconnected comprehensively [9]. The utilization architecture of interactive design in the functional design of intelligent-home products is shown in Figure 3 below. The collaborative innovation of multi ecological platforms is strengthened. The huge amount of intelligent product genes and connection demands accelerate the industry to the ultimate goal, namely, the interconnection between the whole product chain and multi brands, and break the product category and language boundary.

![Figure 3. The utilization architecture of interactive design in the functional design](image)

4.2. Development trend of intelligent-home products based on interactive design

Under the non-contact economy in the post epidemic era, because of the non-contact interaction ability, AI's enabling intelligent-home products and scene utilizations are more prominent, and users pay more attention to safety and health [10]. Secondly, relying on all the space of the family as the platform, integrating the software and hardware equipment of intelligent-home to build the family intelligent management and control system. The intelligent home based on scene intelligence is being applied to more indoor environment space, mainly expanding the scene around the intelligent hotel and intelligent office scene. In addition, driven by "space intelligence", the design of intelligent-home products is no longer centered on control, but based on the layout of users' scenes and life demands, and the operability has been popularized from app to voice. In the future, it will focus on visual and sensor control, and the user's scene and life needs will be expanded around safety, comfort, health, convenience and warmth, among which the safety scene will become the necessary scene needs of every family.

5. Conclusion
In summary, interactive design makes the intelligent-home more functional and easier to operate, reduces the difficulty and cost of users, and greatly ameliorates the use experience of the product. Based on the research of the concept and value of product functional interaction design, this paper analyzes the composition of intelligent home product interaction design system. By analyzing the function design of intelligent-home products based on interaction design, the function design of intelligent-home products based on interaction design is studied. Through the research on the utilization strategy of interactive design in the functional design of intelligent-home products, the development trend of intelligent-home products based on interactive design is analyzed.

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