Application of Cloud Computing in Product Design

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Abstract. On the basis of big data, cloud computing and algorithm updating, artificial intelligence has achieved a qualitative leap from theoretical exploration to application research. For product design, the opportunity and assistance brought by artificial intelligence make the design method more meta and the design purpose more novel. The purpose of this paper is to explore the application of cloud computing in product design. First of all, the advantages of cloud computing in home product design and application are summarized from three aspects of security, comfort, ease of use and economy. Secondly, the key technologies of cloud computing in product design are deeply studied, and the significance of cloud computing technology in data analysis of healthy life is discussed. Finally, taking the design of intelligent children's table lamp as an example, through the collection of competitive brands and user visits to obtain experimental data, the experimental results show that after most consumers buy, the main body of using the product is primary school students, the age range is between 7-13 years old. Most children work at night for more than 2 hours, and long-term night work has a continuous negative effect on young people who are still in the stage of eye development. Therefore, the health intelligent lamp plays a great role in children's eyes and sitting posture.

Keywords: Cloud computing technology, Artificial intelligence, Product design, Children's lamp

1. Introduction
People to people communication can be realized in various ways, whether meeting or not; real-time or delayed, because modern products are different [1-2]. But in a practical sense, these diversified products have not changed people's surface activities, but fundamentally changed people's lifestyle [3]. Industrial design aims to guide innovation, promote business success and provide better quality of life. It is a design activity that applies the strategic problem solving process to products, systems, services and experiences [4]. In the context of intelligent manufacturing, with the rapid development of network technology and information communication technology, cloud computing technology has been developed rapidly in recent years [5-6]. Cloud computing can solve the complex and large-scale computing limited by personal computer resources; it can also solve the situation that single computer computing resources can meet the computing requirements, but it is hoped to improve the computing efficiency and save time and cost [7-8]. Cloud computing is a new high performance computing mode after grid computing, parallel computing and distributed computing. It has the characteristics of
hardware isolation, reliability and security, hardware configuration can be separated and combined, dynamic expansion and so on. Applying it to engineering simulation and industrial large-scale calculation can solve the problem of limited computing resources in the industrial field and save project cost budget [9-10].

SAMY used cloud computing infrastructure to provide knowledge integration services for collaborative product design and development. This paper describes the potential of cloud computing to support knowledge integration by providing knowledge mapping, merging, searching and transferring in the process of product design. The proposed knowledge integration service supports users by providing real-time access to knowledge resources. The framework has the advantages of availability, efficiency, cost reduction, shorter result time and scalability [11]. Jenn Wei Lin studied a new product design service model based on cloud computing. Using this new mode, the cost of developing new products can be reduced, and the development time can be shortened, so that manufacturing enterprises can launch new products faster than before. This paper first analyzes the new model of product design service. Secondly, the priority model of design information resource collection is established by using multi-attribute decision-making method. Thirdly, the software interface of how to choose the best collection according to the preferential mode is developed. Finally, the validity of the new model is proved [12].

This paper focuses on cloud computing and integrates cloud computing into product design. With the intelligent children's lamp as the carrier, through scientific methods to investigate the problems of children's learning and life in using the traditional lamp, through intelligent design methods to solve these problems, and finally show the research ideas and results. Investigate the user problems in the process of daily product use, and use the relevant design and research programs to find solutions to the user problems. The idea of this paper is to combine the design of children's desk lamp with intelligent technology to guide healthy life style. Traditional industrial products are promoted by means of design, so as to make more innovative research on human health and perfect experience.

2. Proposed Method

2.1 Application of Cloud Computing in Household Product Design

The correct introduction of cloud computing technology into the existing product design can not only better improve the overall intelligent level of the product, but also bring users safer, more comfortable and more high-end life experience, but also effectively reduce the burden of the existing intelligent product control system, and improve the reliability and stability of the whole system. The specific performance advantages of introducing cloud computing technology into product design are as follows:

First of all, security is very important for product requirements. The application of cloud computing technology in the whole system can effectively ensure the security of products. In the traditional safety monitoring subsystem, in order to ensure the safety of family life, all kinds of monitoring equipment and automatic alarm devices will work day and night. However, the emergence of monitoring storage cloud can solve the problem of mass storage data of these devices.

Secondly,. Demand is also a key factor to reflect the quality of smart home system. The introduction of cloud computing provides a reliable guarantee for home comfort. Its most expressive aspect is the temperature and humidity control of the living environment. Through cloud computing technology, real-time monitoring of the current temperature and humidity information collected by the temperature and humidity sensor, and timely feedback to the cloud computing service background, and then timely adjust the current temperature and humidity according to the needs of the protagonist, to achieve the comfort of the whole home living environment.

Finally, ease of use and economy play an important role in a mature system solution. Because cloud computing technology provides services for product control system rather than hardware devices, a single home user can access cloud computing data through various terminals and follow their own wishes without knowing the specific implementation process of the system. At the same
time, the emergence of cloud computing technology has changed the way that previous intelligent product design solution providers designed and purchased different types of home gateway and system component modules and other devices according to the size of different smart home scales, and changed them to the way of batch and unified purchase, which has realized the batch and unified purchase of smart home products and greatly reduced the cost of the system.

2.2 Key Technologies of Cloud Computing
(1) Data storage technology
In the face of the information explosion of the Internet, the storage and processing requirements of various information data and files have exceeded the requirements of traditional basic hardware devices. The emergence of cloud computing technology can deal with the storage and management of current massive data. Cloud computing technology mainly adopts GES and HDFS, two mainstream mass distributed data storage technologies.

(2) Virtual dexterization Technology
Virtualization technology is to separate the hardware, software, data, storage and network of application system one by one, break the single division of server, storage, data, network and physical equipment in application system, so as to realize the dynamic utilization of physical resources and the new deployment of virtual resources. From the essence of cloud computing technology to socialized enterprise service, it is a virtualization technology in socialized enterprise IT system service.

After more than half a century of development, virtualization technology has developed from a single data center resource integration as the center to a comprehensive virtualization strategy solution. It can adapt to the current business environment, and according to the specific needs of enterprises, so as to improve the security and flexibility of the system, and realize the optimization of enterprise benefits resources.

2.3 The Significance of Cloud Computing Technology in Data Analysis of Healthy Life
With the support of cloud computing technology, big data of target products can be exported in the early stage of design. Through data analysis, designers get different dimensions to consider the impact of user behavior on health. So as to objectively guide the designer to change the user's operation behavior and experience through the power of design, so that the newly designed product can meet the function and avoid unhealthy behavior in the operation process, and ultimately maximize the health status.

3. Experiments

3.1 Collection of Competitive Brands
The main brands in the market are: OPP, Rex, OSRAM, etc. conduct intelligent data survey through the city's data network, including the data collection of large-scale e-commerce platform, and investigate the monthly sales volume, the highest single product sales, and the feedback of users on how to purchase products for different brands and products. After collecting the data, we classify them, and find out the advantages and disadvantages of using the product and the inconveniences put forward by users through data analysis.

In terms of user feedback, consumers have questions about the service life, operation convenience, product materials, electric shock protection, etc. of lamps. From this aspect, the author can see that more and more consumers pay more attention to the safety of products in the use process. The target group is young children between the ages of 8 and 18.

3.2 User Visit
There are two ways to visit users: A. online questionnaire. b. Supermarket users visit.

The Internet questionnaire is based on the advantages of network convenience and communication. Through the current popular wechat platform, the author has released 22 questionnaires about product
use, which are aimed at different groups of people. Finally, 222 valid questionnaires were obtained, and the main users and inconvenient problems in the process of using children's table lamp were concluded.

4. Discussion

4.1 Intelligent Perception and Camera Sensing Technology
According to the available data, most children work more than 2 hours at night, as shown in Figure 1. The long-term night work has a continuous negative effect on young people who are still in the eye development stage. Therefore, the health intelligent lamp plays a great role in children's eyes and sitting posture.

![Operation time](image)

**Figure 1. Operation time**

Through intelligent perception and camera sensing technology, the user's factual behavior is conveyed to the lamp, and the lamp's color temperature is adjusted by different behavior modes. For example, when the desk lamp senses that the ambient light is lower than the color temperature of 5000K, it will automatically light up the desk lamp. At the same time, the camera detects whether the user's activity behavior is reading or playing games, so as to match the illumination and color temperature most suitable for the eyes. When children use the lamp, they will have a unique visual experience from the color of the light, and feel that the lamp has a unique interaction with him; when he has different activities, the lamp feedback wants to match the lighting and color wetness. When children use it, they will feel particularly interesting and enhance their taste experience.

4.2 Internet of Things and Optical Sensor Technology
Based on the on-the-spot investigation, we found that the price, service life and product beauty of children's desk lamp are not the most important factors for consumers to purchase. The primary concern is whether the desk lamp will harm children's health when it is used. After most consumers purchase, the main body of using the product is students from primary school, whose age range is between 7-13 years old. Incorrect sitting posture is considered as the main cause of myopia of children,
as shown in Table 1.

**Table 1. Causes of myopia**

| What do you think may cause myopia in children (multiple choice) | Subtotal | Proportion |
|---------------------------------------------------------------|----------|------------|
| Improper illumination                                         | 57       | 25.68%     |
| Tube blue strobe                                              | 17       | 7.66%      |
| Book font is too small                                        | 30       | 13.51%     |
| Genetic factors                                               | 95       | 42.79%     |
| Incorrect sitting position                                    | 132      | 59.46%     |
| Inappropriate light color                                      | 65       | 29.28%     |
| Continuous operation time is too long                         | 119      | 53.6%      |
| (empty)                                                       | 3        | 1.35%      |

The wireless connection between the mobile device and the table lamp is realized through the Internet of things technology. Each mobile device can realize the remote control of the health intelligent table lamp through the app. Through the remote Internet of things technology, users can check the running status of the desk lamp through the mobile terminal. Parents can remotely check the continuous working time of the desk lamp on the mobile phone, and actively adjust the lights in different situations to prompt their children to switch the behavior state, which can enhance the sense of communication between children and parents.

In the light sensing technology, the photoresist is used to detect the change of ambient illumination. When the illumination is detected to be lower than the healthy illumination, the signal is automatically sent to the chip to control the lamp to be on automatically. Table lamp can remind children to stop what they are doing to have a rest and do some other activities through intelligent switching of lighting situation mode. This kind of intelligent reminder is a non-indoctrinated reminder. Children's subconscious initiative to do other things after perceiving the change of light color temperature can effectively reduce the rejection of children. On the contrary, it can enhance the users' needs that children are also reasonably respected.

5. Conclusions
As a new technology trend, cloud computing develops rapidly. Judging from the maturity of cloud computing industry chain, the innovation ability of products and services, and the actual needs of users, more and more enterprises and enterprise services around the world are turning to cloud computing. This paper mainly studies the application of the combination of cloud computing and product design. Taking children's eye health problems as an example, through the systematic study of the target users, we found the existing problems. Combined with the concept of age and intelligent means, the intelligent children's lamp is designed to solve the problem of children's eye use behavior.

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