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DESIGN STUDY OF NANJING PAPER-CUTTING ART IN ENTITY INTERACTION LUMINAIRES

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Focus on analysing the graphic composition of Nanjing paper-cutting elements and application methods, visually applying the art of Nanjing paper-cutting patterns in the form of hollowing out of thin materials to the design of lamps, in order to play a role in dividing the space and strengthening the role of light and shadow, explore the integration of Nanjing paper-cutting elements and luminaires design, introducing the theory of physical interaction, conforming to ergonomics, bringing visual impact and a sense of hands-on interactive experience, and bringing more innovative design ideas and methods for traditional luminaires design.

Key words: *Nanjing paper-cutting art; luminaires design; entity interaction; ergonomics.*

INTRODUCTION

Nanjing paper-cutting, also known as "paper pattern", "paper flower", "flower-cutting", is a kind of Nanjing folk art of cutting, carving and tearing patterns on paper and other thin materials, and it is an art of visually expressing patterns in the form of thin materials in the form of openwork, and it is a traditional art form with distinctive regional style and strong national characteristics rooted in folklore [1]. It is a kind of Nanjing folk art that visually expresses patterns on thin materials in the form of openwork, and is a traditional art form with distinctive regional style, strong national characteristics and roots in folklore [1]. In the selection of subject matter, Nanjing paper-cutting has its own unique "subject in the subject" characteristics, such as the work "Fu", the theme is the word "Fu", the creator will be the same subject matter in a paper-cut, and then according to the art of visual, spatial, proportionality and other aspects of breakthroughs, not only to make its performance of the strong local flavour, at the same time At the same time, it shows a strong decorative flavour, which makes it vividly express people or objects with distinctive, eye-catching and strong emotional colours. Nanjing paper-cutting adopts the changes and summaries of "roughness with fineness, and clumsiness with spirit"; for example, the mandarin ducks and lotus leaves are mainly composed of red blocks and a small number of fine lines, while the lotus flower is mainly composed of lines, and the top of the petals is a flat surface, and the whole paper-cutting looks like the fusion of lines and



blocks, which is rough and weak, with a harmonious contrast, and is extremely artistic.

PURPOSE

The innovative design of paper-cutting elements and the integration of human-computer interaction with lamps bring more innovative design ideas and methods to promote the development and progress of traditional luminaires design.

RESULTS AND DISCUSSION

Entity interaction refers to a kind of human-computer interaction with physical entities as the interaction medium, also known as Entity User Interfaces (Tangible User Interfaces, abbreviated as TUIs), as a new paradigm of human-computer interaction interface, since the 1990s, scholars from all walks of life have been interested in the growing interest in the Entity User Interfaces (TUIs). Coupling the virtual world and the real physical world, users only need to adopt the natural way of operating between things that they usually do in the real world (grasping, pushing, pulling, and putting together) to manipulate the information in the virtual digital world. Eva Hornecker and Jacob Buur [2] introduced a framework for physical interaction that consists of four interrelated themes, which are focuses on the integration of physical objects and real life, contributes to the understanding of the user experience of physical interaction, and provides concepts and perspectives for considering the real-life aspects of physical interaction. The application of entity interaction theory in the design of luminaires

Entity interaction is a form of human-computer interaction that breaks through the convention and is an innovation in product design [3]. For example, the German lamp manufacturer Dreipuls designed a table lamp called Rima Curtain LED Lamp, which has a simple and elegant appearance with clear lines and delicate materials. Instead of an on/off switch, the lamp's brightness and range are controlled by four rings. The user can turn the light on and off by moving the rings on the lamp's frame like drawing a curtain, which is why the name Curtain is included in the lamp's name.

Chinese designer Ling Junjie has created a series of lamps called A Flash of Sunlight, which has a cord that can be pulled like a curtain to adjust the brightness of the light. This type of interaction makes the relationship between the luminaire and the user more intimate and cosier, rather than cold and mechanical. The luminaire also has a table lamp mode that wirelessly charges mobile phones and smartwatches.

The Z-Lamp, designed by Shenzhen Explorer Industrial Design, is an innovative way of switching on the light, using "folding" and "stretching" actions instead of a light switch. The shade is available in three different brightness lengths: 1) completely unzipped – no light; 2) halfway open – slightly bright; 3) completely open – the brightest. The foldable design of this product makes it very portable and easy to use as a car or travel light.

The above lamps are trying to break the traditional light switching form, and also do not use the current popular Intelligent APP Networking light switching form, but the use of physical interaction form, such a form is intended to break through the limitations of the interaction form of traditional lighting products, to expand the design thinking, the physical interaction logic and intelligent lamps and lanterns



products for the combination [4]. Study of Nanjing Paper Cutting Art Expressions in Physical Interactive Lamps and Fixtures – Case Study of Joe Fentress "Nio" Floor Lamp.

Joe Fentress of Iowa State University, USA, designed a Nio floor lamp, which has a lampshade that can be pushed and pulled up and down so as to adjust the brightness of the light. Instead of a traditional switch, this lamp has human-computer interaction through the movement of the lampshade, which adds to the fun and intimacy of the product.

Paper cutting in the form of dots, lines, surfaces combined with cutting and engraving techniques constitute works, with the characteristics of ten thousand cuts, to two-dimensional plane paper in the form of positive and negative shapes to show the graphics, so that it has become a unique art with a strong decorative and practical, paper-cutting because of its hollow characteristics in the lamps and lanterns in a very wide range of applications in the form of lamps and lanterns to make the shape of the more varied in the functionality of the lamps and lanterns to increase the sense of translucency, the light through the lamps and lanterns through a variety of texture in the indoor can be formed by mottled light and shadow, so that the level of indoor lighting is richer.

Floor lamp is a kind of light fixture which consists of a bracket, lampshade and light source, etc. It is often called Floor Lamp. This kind of light fixture has the characteristics of diversified forms and easy to move, which can create a unique decorative effect. Floor lamps are popular among consumers and can be used not only for living room lighting, but also for bedroom auxiliary lighting or study reading lighting and other occasions [5]. Due to its diversified design, it can also be used to create different light effects through different light sources and lampshades, thus meeting the needs of consumers for lighting and decoration. Based on the principle of ergonomic design centred on the "human being", the "Nio" floor lamp is ergonomically designed to be turned on in the most comfortable way, whether standing or sitting.

Nowadays, ordinary household lighting fixtures product categories are basically full coverage, consumers in the purchase of lamps and lanterns, not only consider the lighting function [6], more is the aesthetic design of the lamps and lanterns product modeling and attention to the lamps and lanterns in the human-computer interaction aspects of the experience. The addition of physical interaction technology allows users to directly interact with luminaires in a physical or non-contact manner, without the need for other intermediary devices or platforms, simplifying the operation process and enhancing the interaction efficiency and reliability. At the same time, the entity interaction technology can also make the lamps and lanterns have richer expressiveness and perceptibility, through the lighting changes or other feedback methods [7], to convey information or emotion to the user, and enhance the interactive fun and communication. It can provide users with a more humanised, natural and intelligent lighting experience, and at the same time provide lighting designers with more creative space and possibilities.

CONCLUSIONS

Through the research on the design of Nanjing paper-cutting art in physical interactive lamps and lanterns, we can conclude that the integration of Nanjing



paper-cutting art and physical interactive lamps and lanterns has great potential and development prospects. JoeFentress "Nio" floor lamp, as a typical example, innovatively combines the art of Nanjing paper-cutting with physical interactive lamps, showing a unique sense of beauty and cultural connotation [8]. The use of entity interaction technology to improve the ease of use, fun and personalisation of intelligent lamps and lanterns, so that users can more naturally and flexibly control the switch, brightness, colour and mode of the light, and at the same time increase the user's understanding of the use of intelligent lamps and lanterns by using new scientific and technological means in conjunction with the traditional lamps and lanterns products, and by changing the user's way of using the lamps and lanterns, the traditional lamps and lanterns into intelligent and controllable lamps and lanterns, opening up a new product design Ideas. In terms of users, through the Internet of Things technology, the interaction between people and products also presents a more natural human-computer interaction. The emotional connection and sense of belonging of smart lamps and lanterns to meet the growing needs of people's lives. This design concept and application not only enriches the form and function of lamps and lanterns, but also injects new vitality into the art of Nanjing paper-cutting. With the continuous progress of technology and people's pursuit of culture and art, the integration of Nanjing paper-cutting art and physical interactive lamps will be more widely applied and promoted, bringing people more beauty and cultural heritage.

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