

Research on the Strategy of LED Light Interaction Mode-Based on the Five Senses Experience

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Abstract: LED is a newly emerging light-emitting diode lamp, because of its low energy consumption and long life and other advantages to become the ideal choice of lamp type. In recent years, LED has developed at an amazing speed and has been widely used in various fields of human life. This paper adheres to the concept of human-oriented, based on the theory of five senses experience, analyzes the current development status of LED lamps, as well as its specific applications in a variety of life scenarios, and summarizes and refines the strategy of human-computer interaction mode of LED lamps based on the five senses experience on the basis of the five senses experience; through the study of the five senses experience to enhance the application of LED lamps in the design of human-computer interaction and to improve the emotional communication between people and works, and to design the human-computer interaction mode of LED lamps for the purpose of the human-computer interaction. The research on five senses experience will enhance the application of LED lamps in human-computer interaction design, improve the emotional communication between people and works, and provide more ideas for the design of LED lamp human-computer interaction.

Keywords: Five Senses Experience; LED Light; Interaction; Interactive Device.

1. Introduction

With the energy saving and emission reduction low carbon environmental protection concept, China's lighting technology is booming, LED lights because of its color, small size, long life, low cost, fast response time, controllability and other advantages to become one of the emerging lighting products. People have sight, hearing, touch, smell, taste five sense organs, when different sense organs are mobilized, the formation of intertwined between the five sense organs, can make people a thing to produce their own feelings. In the LED light interaction design, designers can be based on the feelings of each sense of the nature of things to feel to guide the design, can make the audience better understand the concept of the works conveyed. Now in the lighting interaction design, LED lighting interaction design market is developing rapidly, a large number of LED lighting interaction works continue to emerge, including many excellent light source characteristics and creative lighting interaction design works. But unfortunately, the five senses experience elements in the LED lighting interaction design have not been perfected enough, in the innovation needs to be strengthened.

Therefore, based on the theory of five senses experience, this paper analyzes the current development status of LED lamps and its specific applications in various life scenes, and summarizes the strategy of LED lamps human-computer interaction mode based on five senses experience; through the research of five senses experience to enhance the application of LED lamps in human-computer interaction design, to enhance the emotional exchanges between people and works, and to provide more ideas for LED lamps human-computer interaction mode. The research on the five senses experience will enhance the application of human-computer interaction design of LED lights, enhance the emotional communication between people and works, and provide more ideas for the design of human-computer interaction of LED lights.

2. The Origin and Development of LED Lights

2.1. Invention and Creation of LED Lights

LED "electroluminescence" phenomenon was discovered by the British engineers Lund in 1907, and the real LED bulb light is made by the Russian inventor Olegrosev in 1927. But in the way of production difficulties, the cost is still high, and at that time the technology made by the product and no practical benefits, at this time most of the LED is used as a secondary lamps such as indicators, through continuous experiments after different colors and higher brightness LED bulbs have been developed one after another. 1961, LED began to really have the function of illumination and color change. Later, after Hewlett-Packard introduced LED displays that can be used commercially, LED devices including monitors, indicators and other LED devices began to enter the market and become commercial appliances. Into the 21st century, the production cost of LED light bulbs is no longer expensive, coupled with its energy-saving, safe and high-brightness characteristics, gradually replacing the traditional lighting fixtures. More importantly, LED control is simple, compact, colorful, simple manufacturing, which also makes the lighting to diversified development.

Today we can sit in our living rooms and control our home's lighting systems on and off, as well as change the warmth and coolness of the lights via wireless devices, thanks to the thinness of LEDs and their ease of use in integrated circuit control.

2.2. Application and Promotion of LED Lights

At present, China's LED market covers a wide range of applications such as LED displays, traffic signals, headlights, LCD backlighting, cell phone keypads, lighting, street lights and many others. Applications in urban landscape lighting, dynamic light-emitting characters in high-rise buildings, and

human-computer interaction devices are all very popular. [1] LEDs are very popular. In addition to the advantages of high power, the price of LED lamps and lanterns has been close to the lamps and lanterns composed of other light sources, and the comprehensive performance of LED has surpassed other light sources. Therefore, it can be expected that LED become the mainstream light source in the lighting market will be just around the corner.

3. The Concept of the Five Senses of Experience and Case Presentation

The concept of "five senses" first originated in the medical field in the 1990s. Physiologically speaking, "five senses" refers to the activities of the five physiological senses of human beings - vision, hearing, touch, smell and taste, Touch, smell and taste.[2] The five senses are the five physiological senses of vision, hearing, touch, smell and taste. The perception is caused by external stimuli to the sense organs corresponding to vision, hearing, taste, smell and touch. From a psychological point of view, the "five senses" can be summarized as a higher level of rational understanding formed through the five sensory organs after people perceive, recognize, recall and analyze things, and the five senses can achieve intermingling and mutual influence. It experiences the content of things through the senses, thus triggering changes in emotions. In the process of design, designers can design according to the audience's feelings about the nature of things based on the five senses, so that the audience can better understand the ideology conveyed by the work and at the same time feel the emotional concepts conveyed by the designer's attempts to communicate through the sensory works.

3.1. Visual Experience

Vision is one of the main sources of information, and the information from vision accounts for more than 80% of the information people receive.[3] Therefore, it is crucial to study visual elements when designing LED lighting. In order to let more couples to celebrate Valentine's Day in New York Times Square, every year when Valentine's Day arrives, New York Times Square will hold a design competition, inviting global architecture and design companies to design an installation with the theme of Valentine's Day, and the winning work will be displayed in the most bustling area of Times Square in the month before and after the Valentine's Day. 2012, the creative company from Denmark designed a transparent cube made of acrylic transparent tubes, and the whole installation is roughly the same. The entire installation is about 3 meters high, with hundreds of 3-meter-high acrylic tubes embedded with red LEDs, which are arranged in the shape of a heart. The LEDs in the installation are in a luminous state, and from a distance, it looks like a heart swaying in a sea of people. When people get close to it and touch the sensor next to the device with their hands, the brightness of the red LED lights will increase, the more people, the brighter the brightness, and even send out flashing lights, like a beating heart in the period of passionate love with soaring hormones, which is particularly fascinating in the dusk. Designer with the help of his work to convey to everyone a heartbeat, love, the concept of beauty, so that lovers regain the feeling of heartbeat.

3.2. Olfactory Experience

The sense of smell plays an equally important role in

human sensory stimulation. Odors are the same, people are different and their sense of smell produces different levels of acuity, and people in specific environments develop their own olfactory memories of specific odors.[4] . On the one hand, this olfactory memory can be preserved for a long time in the depths of one's memory, and on the other hand, memories related to specific odors can be evoked in an instant under certain stimuli. An example of this is the Japanese Teahouse Light Installation located at the Royal Academy in London, which consists mainly of odors, LED lights and bent bamboo sticks. The whole installation is five meters high, using white bamboo sticks with a diameter of 4 mm twisted into a pyramid shape, with lights underneath the bamboo sticks for decorative embellishments. The designers built two houses inside the room, one representing reality or the father, and the other representing nothingness or the mother, and the room representing the reality is filled with the fragrance of Japanese cypress trees, and the other is filled with the smell of tatami mats. When one enters the room filled with the scent of cypress, one feels mellow and comfortable, and the smell easily reminds one of the role of the father. When people enter a room with tatami mats, they feel warm and relaxed, and the scent is reminiscent of spending time with their mother when they were young. People can capture certain information or memories through different smells, and this is how the interactive device brings people a psychological experience and impact from the perspective of smell.

3.3. Auditory Experience

Hearing, as an important way to convey information and hit people's heart, is often incorporated by designers into the design elements of their works in interaction design. Through the auditory system people can not only recognize the strength, urgency and proximity of the sound, but also produce different emotions to the sound of things, in the case of the environment temperature remains unchanged, the same sound pressure level (DB) of the music listener produces a sense of anxiety is significantly lower than that of the noise produced by the sense of anxiety.[5] . Swiss sound artist Zimoun has created a major work of art with large-scale installations and kinetic sculptural art in the interior of an abandoned chemical building. His work consists mainly of many plastic bubbles and a large fan. When the fan unit is activated, the plastic bubbles are blown by the wind and make a sound, like waves that are constantly tossing and turning, and the sound is very similar to the flow of water. Some of the plastic spheres are equipped with motorized motors and are constantly hitting the walls to create sound. Through viewing the work, one can feel that when the sound in the space is fast and chaotic, the listener tends to feel uneasy, and when the sound in the space is soft and slow in frequency, the listener's heart becomes calm and healed. Sound itself has the ability to carry information, and artist Zimoun's approach shows us the infinite possibilities of sound in interaction design.

3.4. Taste Experience

The sense of taste can be said to be the core driving force of human evolution, from vegetarianism to omnivory, from raw food to cooked food, the taste system plays a key role. Taste can be divided into physical taste and chemical taste, the shape, color and luster of things have an effect on the heart taste, the taste, temperature and rejection of things have an effect on the physical sense of taste, chemical taste is generally generated from the smell of things, through the

influence of the sense of smell to form a taste experience. [6]. Located in Hongmei Cultural and Creative Park in Tiexi District of Shenyang, the Taste Museum uses different lighting effects to express different flavors: sour is a sharp light that continues to rise and fall, sweet is a circular light overflowing, bitter is a sharp light colliding with each other, and spicy is a triangular light colliding fiercely. The entire pavilion consists of a curved sound and light interactive installation with four cylinders, each of which holds four audible sound clips symbolizing sweet, sour, bitter and spicy, combined with different movie soundtracks to tell the story of the characters in the movie. At the same time, with the design of the code into the program to generate the resulting artistic background light effects, the fusion of the composition of life's taste of a hundred twists and turns. Visitors can listen to the different tastes of people's lives while immersed in the sound effects.

3.5. Tactile Experience

The sense of touch is an important way for people to know the world, and among the five major sense organs, touch is the most cumbersome, people will be in actual contact with the object after the real feelings transmitted to the brain to analyze and then the expression of tactile elements [7] The sense of touch is the most complicated among the five sensory organs. The sense of touch is the bearer of vision and the added value of vision, which conveys information that cannot be conveyed by other senses. 2017 TeamLab organized a light and shadow art exhibition titled "Flowers and People, Not Controlled but Symbiotic - Time is like a Year". Entering the exhibition hall, the dark and turbulent space seems to travel to another time and space, and the flowing water and dynamic flowers are directly reflected in the eyes. The whole exhibition is a computer program that draws out the entire process of flowers from birth, growth, blossoming, withering, wilting, and death. The flowers in light and shadow also bloom in different and ever-changing states depending on the season. As visitors move through the installation, the blooming and withering of the flowers are deeply affected by people's every move: when visitors gaze at the growth of the flowers, they will bloom more abundantly than usual, and when they start to touch or step on the light-shadowed flowers, they will gradually wither. In this way, the author tries to arouse people's thoughts about the relationship between man and nature, which is not an antagonistic concept, but a state of harmonious coexistence.

4. Based on the Five Senses Experience of LED Lights Human-Computer Interaction Mode Strategy to Explore

The interpenetration of the five senses experience with LED lights can be carried out in the following ways.

4.1. Concept and Styling Fusion - The Attraction of Shape

Interactive lighting design as an interactive entity, the shape of the work is essential, usually, the shape of the interactive lighting design should be based on the design concept to design a reasonable shape. Improving the attractiveness of the shape mainly emphasizes that the work is reasonable and effective in visual communication effect. In the interactive design of LED light works, the color,

arrangement, shape and other elements must be consistent with the audience's visual logic, the presentation of the theme of the work to selectively emphasize, so that the audience in a shorter period of time to leave a clearer impression.[7] For example, the Vallero Plaza in Jerusalem. For example, in Jerusalem's Plaza Vallero, there are two giant red flowers, which in their normal state shrink downwards as if they had been dried out in the sun and were in a state of withering, but when pedestrians pass by from below, the sensors in the stamen area detect the scent of the flowers, and the giant flowers slowly blossom as if they were being awakened by pedestrians passing by. When the pedestrians leave, the flower will gradually shrink again, and when night falls, a dim light source will emanate from inside the flower, which is wrapped in red petals, and from a distance looks like a red rose glowing in the dark. The shape of the device references the appearance of natural plants, but magnifies it and interacts with passers-by in a fun way, making it very easy to create a deep and clear impression in a short period of time. This kind of sensory flower is also often seen in some parks or squares in China and has become a popular photo spot.

The application of LED light source is very dynamic, can be designed into a variety of forms of products, such as points, lines, surfaces, etc., and at the same time in the operation is also very convenient, only the current to adjust the light can be adjusted at will, but also can be a flexible change of the different light colors with the time sequence with the control of the circuit, you can make the works of the final rendering of the effect becomes more colorful. Therefore, in the LED light interaction design, the author can grasp different sensory stimulation method for different scenes and needs, to improve the audience's sensory pleasure, enhance the appearance of the work's attractiveness, so as to realize the real meaning of the five senses design.

4.2. Combination of Fun and Creativity - The Joy of Interaction

The main purpose of the interactive work design is to realize the human-computer interaction, but only a single dynamic effect will make people feel monotonous, so we need to integrate the interesting and creative design into it, to break certain rules and regulations, and to enhance the creativity of the design, so as to be able to bring the audience a richer emotional experience, and the audience to get a richer emotional interaction at the same time can get more emotional feedback to promote the human-computer for Deep-level interaction. In the use of LED lighting media for interactive design, through the combination of fun and creativity can attract the audience to stay in front of the work, improve the audience's interactivity, or the audience's feelings into the creation of the work, so as to carry out human-computer interaction. The former can effectively evoke the audience's unique emotional experience, while the latter can let the audience fully resonate[8] The former can effectively evoke a unique emotional experience, while the latter can fully resonate with the audience. A streetlight called Shadowing was designed by British architecture student Matthew Rossyer and Canadian interaction designer Jonathan Jomco. Although this street lamp looks and ordinary street lamps in general, but when someone passes by this street lamp, will find the ground suddenly appeared a shadow does not belong to their own, so that passers-by feel very surprised. Because this interactive street lamp inside the hidden an infrared camera, can record any through the light under the movement

of the shape, whenever a passer-by, after the computer processing to create an artificial shadow effect will be projected onto the road, it looks like the side of the passer-by to accompany the passer-by with walking. In addition, in the absence of passers-by, it loops the shadows previously recorded by the computer, as if recalling the changes in the street.

By breaking through the traditional interactive device one-way transmission of information, customized with creative, interesting personalized interaction, so that the audience to obtain a multi-directional, three-dimensional perspective of the interactive sensory experience, to enhance the LED lights works of interactive design of innovation and fun.

4.3. Multi-dimensional Communication-Emotional Communication

As long as there is an external stimulus, human sense organs will feel it and transmit the felt information to the brain for analysis and categorization. Human emotion is mainly influenced by the sensory organs, and plays an important role in interactive devices. Good interactive works can reasonably and adequately trigger emotional communication between humans and machines. In actual cases, many conceptual art creation elements seem to be irrelevant, but after the designers bring the audience a combination and arrangement, they can bring the audience an unexpected emotional experience.[10] The principle behind this is that the conceptual art is a combination of the conceptual art and the conceptual art. The underlying principle is that it utilizes the multi-dimensional flux of the audience to complete the emotional communication of the artwork. Multi-dimensional empathy creates the integration of interactive works with the surrounding spatial environment, media and audience, which can maximize people's imagination of the work and the ideology that the author wishes to convey. [11] The work will be presented at the Wzjczyszczewski On the facade of the Wzjardins Hotel in São Paulo, Brazil, the designers created an interactive LED wall that responds to the noise, air quality, and interactive behaviors of the people on the corresponding software based on the actual situation - using LEDs with controllable motion, changeable color, and adjustable brightness to create a dynamic and static effect that makes people The interactive LED wall By installing noise-collecting microphones and air-quality sensors on the interactive façade, the soundscape of the day's surroundings is presented as audio waveforms or in different colors: warm tones indicate that the air is polluted, while cooler tones indicate that the air quality has improved, allowing people to visually see how the city's living environment has changed. Through the regulation of the background music and the arbitrary change of the color of the LED lights, you can make the audience to achieve a sense of immersion. the emergence of LED for the interactive design of lighting opened up a new design ideas, its design is no longer just a single two-dimensional elements of the traditional image, text and color, but in the works into the time and space, perception, psychology and the environment and other factors, to guide the audience's organs of feeling changes, so that the audience more easily immersed in it, thus realizing the experience of mind flow.

5. Conclusion

The development and application of LED light source can be increasingly mature and widespread, not only due to its own technical advantages, but also due to the vigorous development of China's lighting technology and vigorously advocate the concept of environmental protection, energy saving and emission reduction. This paper is based on the theory of the five senses of experience, the LED light interaction design to explore, from the audience's five senses, deepen the audience's impression while mobilizing the audience to receive information from a variety of senses, to promote the integration of information and the audience. Integration of the five senses experience into the LED light interaction design reflects the human-oriented concept, improves the practical communication effect of the LED light, and also conforms to the development trend of the times, while providing more design ideas for LED lights in human-computer interaction design. The "five senses" experience does not exist in isolation, but needs to be combined with each other from various perspectives, in order to bring the diversity of the "five senses" experience. At present, in the LED lighting interaction design will be the five senses of experience well into most of the visual experience, tactile experience and auditory experience, in the olfactory experience and taste experience on the research is not perfect. Therefore, it can be predicted that the main development direction of the future LED lighting interaction design will be the five-dimensional experience design that synthesizes the five senses experience.

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