

Light-and-Space Integrated Interior Visual Environmental Design

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Abstract. Light is the soul of spatial buildings, which has been proved by buildings at all times and in all over the world. On the stage of history, light plays an important role in artistic buildings, to which high attention is paid. From the perspective of science, the ray of light can be reflected on a solid object, and what we see is not a virtual solid object; we can feel the space, because this is actually the result of joint action between light and solid object. Therefore, there is a great relation between solid object and light; it can be also said that there is a correspondence between them. The light-and-space integrated interior visual environmental design can fully satisfy people's actual aesthetic needs and facilitate development and progress of building industry.

Introduction

On the basis of studying and analyzing the excellent works of our predecessors, the Light-and-space integrated interior visual environmental design is formed based on absorbing excellent design concepts. It is required to take into full consideration the expression interaction factors of solid object and light. It is also required to create the visual effect of interior space via such integrated mode on the basis of continuously satisfying people's psychological and physiological needs, with the main purpose of meeting people's aesthetic needs. The interior visual environmental design mainly includes interior solid object modeling art and interior lighting. The basic core is to create the spatial image. From the perspective of knowledge, as a kind of spatial visual environment design, the lighting design and interior design need to thoroughly review the relation between space and light and analyze the basic connotation of visual space environment design.

Basic connotation of light-and-space integrated interior visual environmental design

Nature of space

Most people thought that space is a three-dimensional concept, and Euclidean geometry theory laid the foundation and regarded the basic dimension of the world as the space, until the seventeenth century when such space theory is completed. With the development of building industry, the building space is basically the same as the inside of hollowed-out building. After formation of modern architecture concepts, Bruno Zevi proposed that the leading role of architecture is space, and criticized the artistic building creation via sculpturing and painting. Meanwhile, this theory also aroused people to understand and explore the concept of building space, but it was only lies on the understanding of solid objects. After the appearance of relativity theory in the twentieth century, people added the time factor into the original static three-dimensional space, to gradually reveal the design concept of flowing space and organic architecture starting from experiencing, appreciating and commenting the architectural space^[1].

Essential relation between space and light

As everybody knows, space has the three-dimensional feature. During the space design, it is impossible to conduct the space creation and design without space.

Light showing the spatial depth

Firstly, the basis of forming the three-dimensional space is the actual physiological characteristics of human eyes. Human eyes have mainly three cues that form the depth perception: The first one is monocular cue. That is to say, one eye can feel the depth cue. For instance, getting familiarized with the height, size, linear perspective and motion parallax, etc. of an object can provide the environment

object with certain relative distance data, so as to achieve the depth perception. The second one is muscle cue. Namely, the eyeball muscle can be utilized to effectively adjust the cues of different distances. What is mainly provided is the scene within two or three hundred meters from the human eyeball; long-distance object cannot be extended. The third one is binocular cue. Two eyes are at different positions to allow deviations of the object seen; the image disparity appeared on retina is called binocular disparity. Such disparity can be used to form the deep space.

Secondly, the basic substance forming the three-dimensional space is the spatial gradient. Three kinds of gradients are used to rationally explain the reasons for the appearance of depth perception, including square distance gradient, square size gradient, and square horizontal deviation. Besides, there are color gradient, texture gradient, and intensity gradient. The most critical space depth is the intensity gradient. For space, the ray of light extending inward from window will diminish gradually in the space and become gentler; such gradient is utilized to create spatial features.

Light constituting the spatial density

Spatial density is a concept proposed by a German scholar and mainly depends on the intensity of light and the distance between interfaces. With the gradual intensification of light and increase in distance, the spatial density will become low gradually. When the distance is increased to be infinitely large, it is called vacant space. In contrast, with the diminishing of light and decrease in light, the spatial density will become high gradually. If the distance is infinitely small, it is called solid object. The two kinds are major chances to form the spatial density and can form the perceptible space. The change to each space may affect the spatial density. The light intensity and interface determine the nature of space. Different spatial perceptions consist of different spatial densities, and there is certain relation between different densities. The light intensity itself will not affect the solid object, but just have a psychological effect via people's vision; thus, the concept of space and light integration appears^[2].

Space-and-light integrated design concept

Brightness of object is the result of joint action between the surface material of object and the light source, involving the interactive relation. As for solid object and light source, the change to any of them will result in different degree of brightness. Solid object or light cannot exist independently, and the lack of any one of them will result in invisibility of the solid object, which has the corresponding consistency with the spatial density. To find out the appropriate brightness, it is required to select appropriate light source. Besides, it is required to fully analyze and control the texture and optical properties of the surface material, and practically grasp the relation between solid object and light source; then, carry out the rational design, so as to obtain the space-and-light integrated design concept. People are used to setting the light as simple bright environment and paying attention to the spatial composition of solid structure, which is non-standard. Therefore, during the design, it is required to sufficiently analyze the importance of light source and material, none of which is dispensable; the dynamic and bi-directional construction is required, with the main purpose of designing a good visual space environment.

Fundamental principle for designing space-and-light integrated interior visual environment

To change the concept of designing interior visual environment

As a matter of fact, the space-and-light integrated interior environment visual design is the result of comprehensively utilizing illumination design and interior solid object design and is also the result of organic integration of arts and science. The interior space visual environment effect mainly relies on the interior surface treatment, spatial configuration, rays of light and furniture furnishings etc. IN the actual process of design, the designers are often influenced by pure technologies and restricted by standards and norms. In current stage, generally speaking, the design of interior environment won't fully consider the visual effect; even the decorative lamps also play roles in showing off. Such design only pursues for the actual illuminated effect without fully analyzing the actual condition. Therefore, when they design illumination, they only do it in accordance with the codes and the design of a whole

building also complies with one standard, so they do not choose the lamps based on the actual working schemes, resulting in all the same light sources and lamps chosen. It is required to deal with the visible light in the process of design, so it is required to design the illumination ways and light sources according to the space-and-light integration pattern. The professionals and designers need to fully analyze the possibility between illumination and structures, practically handle the surface conditions and guarantee the design quality^[3].

Brightness minimalism

The minimalism proposed in the 1960s can describe the style of interior design and architectural design to some extent, which has certain emphatic function features, which are only the anti-ornamentalism in form. In the process of design, the minimalism highlights space design, especially the space integrity. Paying attention to the design cost and expenses in the design process and integrating economic problems in design will be the main analytical factors in future design so as to play a economic and practical role. Such design style is mainly to clearly oppose decoration and needs to keep the original structure and subjects in a building by getting rid of all the decorations and those which can be eliminated. The fundamental purpose of reasonably utilizing the minimalism in the process of using space design is to make people feel the space image and circumstance to be clearly reflected in designing the interior visual environment and in the premise of being capable of controlling the illumination. Besides, it is unnecessary to give too bright rays of light for some unimportant articles in the design. In design of environment space, it is required to establish a design concept of brightness minimalism. That is to say, the emphases are the solid objects or space in the design process. For some auxiliary spaces, it is only necessary to guarantee the normal illumination and to make the design have certain rhythm and tempos^[4].

Parellalism

The brightness minimalism reflects the energy-saving theory to some extent and can also show the relationship between space and light. As a matter of fact, the fundamental principle in the design process is the parellalism, which can be embodied from the following three aspects: firstly, there is certain parellalism between solid objects and light. It is mainly because there is no true feeling of light and an illuminated face is required to feel the light source, which is the parellalism. Secondly, after the appearance of space and light, it is required to lay emphasis on showing the space, and it is possible to properly increase the intensity of light; some unimportant space will have dimmer light source, to form the parellalism and allow the space to have corresponding change to brightness. Thirdly, excessively bright light source cannot be used as space brightness structure; therefore, the design concept of "visible light ray and invisible lamp" is required, to form the parellalism between solid object and light. To make the light source invisible, it should be concealed by solid object, and the solid features of light should be revealed; this is the parellalism between space and solid object.

The image of space and light is reflected with the correspondence of solid objects and light. For instance, in the Amun Temple of Karnak in Ancient Egypt, in specific seasons, the sunshine will shine among the gate towers through the stone pillars thoughtfully arranged in the hall. The ancient people's design concept is the instinctive understanding of light by using the parellalism to show images. The space images are also reflected with the parellalism in modern architectural design.

Light-and-space integrated interior visual environment design

The starting point of space-and-light integrated interior visual environment design

The light and interfaces of solid objects jointly decide the space. During the process of designing space-and-light integrated interior environment visual design, it is required to fully analyze the light and space factors and to dynamically and bidirectionally design solid objects and light. Therefore, during design, foundation is a world without any solid object and light and is the starting point for design space and light integration. During design, darkness is the main melody, so the darkness will submerge the space without light and light can make the space displaying itself. If you desires to

complete feel the light, you need to find the illuminated face. Thus, we need to synchronously and simultaneously construct the above-mentioned two parts.

Space-and-light integrated interior visual environment design languages

To design a foundation without objects and light as a colorful and gorgeous world needs to construction solid objects and light simultaneously. A shadow, another element, which appears during making gorgeous and colorful illumination on solid objects, brings certain rhythms and changes in the brightness of spatial structures. Solid objects, light and shadows are the principal languages in the design of space and light integrated interior environment vision. With the continuous development of science and technology, there are many types of light sources and a growing number of solid object materials. How to reasonably match the solid object materials of different types and the light sources of different types to reach the favorable effect reflects the congruity of designing space and light integration and forms the language expression of space-and-light integrated interior environment visual design.

Space-and-light integrated interior visual environment design patterns

In the course of design, it is required to reasonably design a building entity but one cannot visually feel the solid object actually, so irradiation of light beam is needed to form a beautiful vision. Use the strong and weak lights to reasonably illuminate the solid object to show the shade, highlight, shadow and other light-shade interlaced gradation with rich brightness, which makes the vision more full and around. The design space effect mainly relies on the dynamic and bidirectional relationship between the solid object and light, so the design of space and light integration cannot be carried out in the bright time. The bidirectional design of solid objects and light shall be conducted in the darkness. Therefore, the design of building space needs not only to pay attention to the model of solid object but also pay attention to the overall light-shade effect. During designing the space and light integration, the brightness of spatial structure primarily relies on the surface materials of solid object and light. Since, to some extent, the distribution of brightness and darkness can affect people's spatial feelings, i.e. space image, it is also an important factor for designing the space visual environment. The design of space and light integrated environment vision can be concluded into the patterns below: in the beginning, there is zero brightness, which means the dark environment without any solid object and light. Finally, there is a interior space with a favorable visual effect. Dynamic, bidirectional and simultaneous design of solid objects and light are required in designing space so as to reach the space visual effect from zero brightness to the ideal condition. That is the basic pattern of design^[5].

Conclusion

To sum up, the space-and-light integrated interior environment visual design, which is a visual environment design method, needs to analyze the visual environment design from lighting design and interior design, needs to give consideration to light environment design and artistic modeling design and needs to get rid of the restrictions of standards and norms furthest with the final purpose of expressing space images. From the foundation without light, synchronously constructs light and entities. Make full use of space-and-light integrated design pattern and closely pay attention to the expression of design languages. Don't just show the illumination and light sources while neglect the features of material optics. It is also not proper to neglect illumination due to materials. It is required to fully combine the light with solid objects to form the needed spatial environment so as to realize the best environment visual effect.

References

- [1] Yang Chunyu, Zhang Qingwen, Liang Shuying etc. Night Space Light Environment Design and Energy-saving Methods for Urban Administrative Office Buildings – Take the Design of Chongqing NPC's Building for Example [C].//2011 (Tian Jin) Collected Papers in Lighting Science and Technology Forum for the Four Directly-controlled Municipalities. 2011:25-28.

- [2] Liu Huan and Liu Xiumei. Space-Image-Based Interior Light Environment Design. *China Real Estate Industry*, 2012(10):109.
- [3] Zhang Lin, Du Cai. Discipline Construction Conception of Light Environment Design. *Modern Communication*, 2013,35(12):118-121.
- [4] Shi Xiaona, Xu Zhao, Guo Jing etc. Analysis on the Relationship between Light and Space in the Indoor Environment. *Art Science and Technology*, 2014(6):286-286,245
- [5] Wang Haifan. Brief Analysis on Light Environment Design in Interior Design. *Journal of Changzhou Institute of Technology*, 2011,24(3):43-45.