Research and Application of Color Distribution and Color Diversity of Complementary Light Sources in Spatial Reconstruction

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Abstract: The Interior environment is inseparable from the expression of color, and the color requires the illumination of light to show its own effect. The beauty of modern interior design is largely reflected by lighting, so in a sense, lighting is the soul of interior design and decoration. In this paper, through the analysis of the placement of used items in the space and the analysis of the dynamic natural light activity, the design method of supplemental light source is adopted to dynamically adjust the spatial light distribution according to the environmental needs of livable life.

1. Introduction
The role of the light is extremely important for the visual function of the person, because there is no color feeling without the light, and nothing can be seen. Lighting is not only the physiological needs of the shape, space and color of human visual objects, but also the indispensable material condition for beautifying the space environment. Light can make up space and change space; it can both beautify space and destroy space. Different lights not only illuminate all kinds of spaces, but also create different spatial moods and atmospheres. The same space, if different lighting methods, different positions, angular directions, different lamp shapes, different light intensity and color, can obtain a variety of visual spatial effects. Lighting plays a very important role in interior design.

Light has a very important shaping effect on space. The three-dimensional sense, spatial dimension, artistic state and environmental art atmosphere in space all require light participation. And the light of different states is also an integral part of modern life.

British architect Norman Foster: I think architecture should give people a sense of emphasis, a dramatic effect, and bring peace. The airport is a place to travel and it must help turn air travel from an annoyance process to a lighthearted experience. If you go to Stansted Airport, you will definitely enjoy the fun of natural light, you will see a clear roof structure, you are like going back to the old airport with rain and light. Many things follow this form. It re-evaluates the naturalness of the building. The messy pipes, wiring and lighting, and the problem of hanging the ceiling do not exist. Instead, the structure is clear and the fun of natural light. The roof is actually a lighting screen while protecting the interior from the outside weather. At the same time, this reflects a spirit. [1]

Venturi also believes that: the modernist architectural language does not understand the masses, and the buildings that the masses like are often ordinary, lively, decorative, and metaphorical. He believes that the Las Vegas look, including narrow streets, neon lights, billboards, fast food restaurants and other trademark-style shapes, just reflects the preferences of the masses, the architects must talk to the masses, it is necessary to Las Vegas Gass learning. [2] Light is the color of architecture, "Let the light come to design" is the famous saying of Bayes. In his work, the combination of light and space
makes the space change. The entrance to the Louvre Pyramid in Paris introduces a lot of light into the
dead museum, letting the past history sunbathe the sun of today. Through the transparent glass, it is
projected into the space and the wall and the ground to form a courtyard of light. "Light is very
important. Without the change of light, the form loses its anger, and the space becomes powerless."
Light is the first question that Pei first considered when starting a building. [3]

Ando Tako believes that light gives beauty a dramatic, wind and rain to add color to life through
their role in the human body. Architecture is a medium that allows people to feel the existence of
nature. In my work, light is always an important element in the drama of space. In the courtyard,
nature shows a different aspect every day. The courtyard is the core of life in the house. It introduces
natural phenomena such as light, wind and rain, and they are being forgotten in the city. [4] Renzo
Piano's architectural practice, invention, innovation, and breakthrough have always been his magic
weapon to explore the "dimension" of space. In the design of the Menil Museum, he will be in a
simple form of aesthetic proportion. The beauty of the building reverts to functionalist design
ideals and invents solar lighting devices that allow sunlight to stay in place, introducing non-
material components such as sunlight into the building and becoming part of the building. [5]

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2. Principles for rational lighting design

2.1. Functional principle
The lighting design must meet the functional requirements, select different lighting methods and lamps
according to different spaces, different occasions, different objects, and ensure proper illumination and
brightness. For example, the lighting of the bedroom requires comfort, elegance and sentiment, so
low-intensity ordinary light can be used for diffuse lighting; the lighting of the living room should be
warm and soft, so that the interior forms a warm and soft atmosphere. In terms of height, the height of
the 2.8m can be used to hang the chandelier. The following should choose the ceiling lamp; the
lighting of the restaurant should be brighter. It is better to use the hangable chandelier. Not only the
retractable line can adjust the height of the lamp freely. Red or orange shades can also increase
appetite and more. Design lights according to the different functions of the room. It shows on Figure 1.

Figure 1. Lighting design and function implementation issues

2.2. Aesthetic principle
Lighting is an important element in decorating the interior environment and creating a space-art
atmosphere. In order to decorate the interior space, increase the level of space, render the atmosphere,
and use decorative lighting, it is very important to use decorative lighting. In the environmental design of modern home architecture, movie architecture, commercial architecture and entertainment architecture, lighting is a part of the whole. The luminaire not only plays a role in ensuring the illumination, but also pays attention to its shape, material, color, proportion and scale. The luminaire has become an indispensable decoration for the interior space. Through the rhythmic control of light, darkness, faintness, suppression, strength and weakness, the lighting designer gives full play to the brilliance and color of the light, and uses transmission, reflection, refraction and other means to create warm, soft, quiet and elegant. It shows on Figure 2.

![Figure 2. Expression of aesthetic factors in lighting design](image1.png)

2.3. Economic principles
The lighting is not necessarily as good as it is. To win, the key is scientific and reasonable design. The lighting design is to meet the needs of people's visual physiology and aesthetic psychology, so that the interior space maximizes the practical value and appreciation value, and achieves the unity of the use function and the aesthetic function. Glittering lighting can not only add to the icing on the cake, but also add to the snakes, causing power consumption, energy waste and economic losses, and even causing pollution of the light environment and detrimental to the health of the body. It shows on Figure 3.

![Figure 3. Ergonomic factors are applied in lighting design](image2.png)

2.4. Security principles
Lighting design requires absolute safety and reliability. Since the lighting comes from the power supply, strict safety measures such as electric shock prevention and breaking prevention must be taken to avoid accidents. It shows on Figure 4.

![Figure 4. Safety issues and lighting planning](image3.png)

3. Classification of Interior lighting

3.1. Glaring lighting
This kind of illumination has a strong contrast between light and dark, and can create interesting and vivid light and shadow effects, which can highlight the dominant position of the working surface in the whole environment, but due to the high brightness, glare should be prevented. It shows on Figure 5.
3.2. Soft lighting
The light is softer. This type of luminaire is often used for general lighting in lower rooms. Since the diffused light can illuminate the flat top, the height of the top of the room is increased, resulting in a higher sense of space. It shows on Figure 6.

3.3. Artistic lighting
When this type of illumination is used alone, pay attention to the heavy shadows on the lower part of the opaque lampshade. It is usually used in conjunction with other lighting methods to achieve special artistic effects. Shopping malls, clothing stores, conference rooms, etc., generally use as ambient lighting or improve the brightness of the scene. It shows on Figure 7.

3.4. Semi-indirect lighting
This method can produce a special lighting effect, so that the lower room has a higher feeling. It is also suitable for small space parts in residential buildings, such as entrance halls, aisles, clothing stores, etc. It is usually best to use this lighting method in the learning environment. It shows on Figure 8.

3.5. Diffuse lighting
The light is emitted from the upper opening of the lampshade through the flat top, both sides are diffused from the translucent cover, and the lower part is diffused from the grille. The other is to use a
translucent lampshade to completely block the light to create a diffuse. This type of lighting has soft lighting and visual comfort for the bedroom. It shows on Figure 9.

Figure 9. Soft diffuse reflection source creates space atmosphere

4. The functions of Interior lighting

The color of the wall of the living room is closely related to the lighting effect. If the Interior walls are blue or green, it is not advisable to use fluorescent lamps. Instead, you should choose a yellow-colored light with a sunlight-like color to give a warm feeling.

- Divide area: This method is usually used in the decoration of the living room. If a long arm chandelier is hung above the dining table and warm lighting is placed around the dining table, then the dining area will be defined in the living room. The advantage of the light partition is that it can not only perform functional partitioning, but also maintain the relative integrity and permeability of the space, which is both disconnected and connected. It shows on Figure 10.

Figure 10. Lights distinguish different functional areas

- Emphasize the focus: It’s a good idea to use lights to emphasize the interior decoration. For example, a few small decorative paintings hanging on the wall are not obvious at first, but each painting is lighted with small spotlights. It was possible to change different priorities at different times by switching the lights. It shows on Figure 11.

Figure 11. Emphasis on part of the lighting design

- "Adjust" height: If the height of the room is too high, you can use the wall lamp that projects upwards, and divide the wall into two sections. The original space is too high, and the effect of the light is equivalent to the role of the wall skirt. If the height of the room is too low, you can make a narrow ceiling around the top surface, and the built-in lighting will make the space high. It shows on Figure 12.
Figure 12. Light can create a stronger space height

- Create an atmosphere: Different lights can create a different atmosphere. Even if the desk lamp is carefully arranged, the projection effect and mood produced by it will change a lot. Light and transparent paper shades, the light that shines through to the surroundings, appears soft and ethereal; and those that are not light-transparent will condense the light down to produce a variety of different effects. It shows on Figure 13.

Figure 13. Good public area environment

5. Conclusions
Designers should be able to create the atmosphere they need in a variety of moods, such as the tranquility of the study, the warm living room, the lively children's room, the bright kitchen, and the privacy of the bathroom and bedroom. It can even create a special atmosphere with your host's preferences.

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