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Research on the Application of Visual Form in Space Design in Digital Media Art

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Abstract

Under the background of the prevailing visual culture, the role of visual communication design is becoming increasingly prominent, and its importance cannot be ignored. With the continuous development of science and technology, digital media technology has become an important support for graphic design (that is, visual communication design), and its application scope has expanded from traditional print media to network media. With digital technology as the core, network media has had a profound impact on the method and thinking mode of visual communication design. This influence is not only reflected in the expansion of the design from two-dimensional plane to three-dimensional space, but also includes the integration of time and motion elements into the visual composition, making the design content and layout from static to dynamic and interactive direction. In such a design environment, the design forms that can provide rich visual stimulation and aesthetic experience have received extensive attention and research. This paper aims to deeply explore the spatial visual form in digital media art design from the perspective of visual perception, and comprehensively analyze and elaborate the construction methods of three-dimensional space, four-dimensional space and surreal multi-dimensional space.

Keywords

digital media art, visual form, space design, hyperrealistic multi-dimensional space, visual communication design

1. Introduction

Based on the theory of visual communication design, through the analysis and study of different ideological themes in the development of Chinese and Western painting art, this paper discusses that people's understanding of "space" is constantly changing, and this change reflects that people's cognition of self, nature and the universe is also constantly improving, so that the aesthetic experience brought by visual space has more profound significance. Through the study of digital media, it is clear that visual communication is endowed with new forms and characteristics in the new design environment (Niu, 2019; Ni, 2024; Zhou & Dongn, 2021; Qi, 2017). Based on a more scientific and rational analysis of visual design elements in visual communication design from the perspective of human visual perception, this paper demonstrates the unique realization method and expression form of visual space design in digital media art design, and brings different aesthetic experience after "space" is given a new expression form. Through design practice, the aesthetic experience brought by visual space is expressed more concretely.

The cognition of "space" has long been reflected in the cultural process of human beings. In its pursuit of "artistic conception", it can be seen that "space" is fluid and not limited by the appearance of things. The "empty" and "white" in the painting make "artistic conception" break the limitation of time and space and become profound with the viewer's heart. In Western painting, from the limited space of classical realism to the infinite freedom emphasized in surrealist painting, the cognition of "space" has long been reflected in the cultural process of human beings. In its pursuit of "artistic conception", it can be seen that "space" is fluid and not limited by the appearance of things. The "empty" and "white" in the painting make "artistic conception" break the limitation of time and space and become profound with the viewer's heart. In Western painting, from the limited space of classical realism to the infinite freedom emphasized in surrealist painting, the cognition of "space" has risen from the real space to the thinking space.

The spatial expression of painting art is in the two-dimensional plane. With the development of The Times, the expression of visual space has a new way of expression. The invention of the camera made the "time" element of space visible; The emergence and development of Internet technology, 3D technology, virtual reality technology, sensor technology and other technologies have made the expression of space more changeable (Li & Guo, 2019; Wang, 2013; Xu, 2023; Yao et al., 2022). It also forces people to rethink the relationship between "space" and "man", and hopes that through scientific and rational research, people can realize more perception of "space" (Yao & Li Ying, 2022; Sun, 2023; Sun, 2023; Xu, 2023). Also emerging are studies of ergonomics and cognitive psychology. The research results in many fields provide favorable conditions for using digital technology to represent visual space.

2. Visual Form Is the Expression of Depth in Three-Dimensional Space

2.1 The Relationship between Two-Dimensional Space and Three-Dimensional Space in Visual Perception

The two-dimensional space in physical space usually refers to the plane constructed by the two dimensions of height and width, but the pure two-dimensional plane in visual space does not exist. Even if you draw just one line on a piece of paper, This line in the visual perception will not be equivalent to using only millimeters, centimeters, meters and other length units of the sense of the line, the line on the paper in different positions, the different thickness of the line, or the different direction of the line will bring people different feelings, since the same line in different positions to bring people different feelings, this can not prove that people in the process of watching Will subjectively construct a virtual space? If this is true, All the visual features of objects in the two-dimensional plane will have an impact on the visual perception of the original two-dimensional space, which has already virtual the object and the surrounding blank environment in another space. Moreover, due to the influence of human visual experience, the orientation of objects in the space can also make the perceptual space go beyond the original height and width Pure two-dimensional space does not exist. However, everyone has different perceptual sensitivity, so in visual design, if another two-dimensional space is to be perceived more intuitively by the viewer in three-dimensional space, it is still necessary to use some design rules to exaggerate the perceptual power in two-dimensional space.

In a static two-dimensional picture, to create a three-dimensional spatial property, it is generally necessary to achieve through indirect means, that is, to translate the physical space through two-dimensional arrangement, such as a flat expansion of a cube or multiple views. This indirect way of communication weakens the immediacy of visual expression and requires the viewer's thinking construction to restore it Three-dimensional physical space image. In the digital imaging technology, such as hologram imaging and 3D model, when the final visual rendering output, there will be a virtual camera representing the viewer's research position, and the field of view presented by the camera is the perceptual content that needs to be received by the viewer.

The third dimension in the physical space comes from the perception of distance, which refers to the distance between the position of the object and the viewer. If the distance is described by a line with direction, then the center of the origin is the viewer, and the object is just a point on the line. If there are multiple visual objects, the multiple distances show a radiality from the viewer as the center point. Therefore, when creating space, the description of "object far away" and "object very close" refers to the distance between the object and the viewer. The perception of "distance" in physical space adds another dimension to the concept of space - depth. Based on this concept, it is not difficult to understand the realization of creating a three-dimensional sense of space in a two-dimensional space (physical space). If depth is the expression of three-dimensional space, then for two-dimensional planes, the sense of depth can be achieved through the superposition of shapes and images, repetition, and hierarchical manufacturing.

In physical space, "three-dimensional" has one more dimension than "two-dimensional" is "depth", so to realize the "three-dimensional space" that is easily perceived by the viewer in "two-dimensional space", it can create an illusion of depth to the two-dimensional plane. But how is "depth" perceived? Only by understanding this can we create or imitate it in visual communication design.

2.2 Depth Perception in Visual Space

When tilting is perceived as deforming a structure that is perpendicular to the horizontal, it creates a sense of depth. Louis Kahn once said, "To design space is to design light." As a rich and varied design element, light sense shows strong plasticity, which gives different artistic conception of visual space. In physical space, light and shadow interact with the surrounding environment at different levels, thus enriching the perception of depth in visual space. The "depth perception" mentioned here is a concept of perception in cognitive psychology, also known as "three-dimensional perception", or "distance perception". It refers to people's perception of the distance or other three-dimensional characteristics of the object when they look at the object. According to the correlation research of contemporary western psychology, the retina can only receive the stimulation of two-dimensional space, and the perception of three-dimensional space is mainly realized by binocular vision. The clues that produce depth perception are physiological clues such as the adjustment of the viewer's lens, binocular parallax, motion parallax, binocular convergence, etc., and objective factors such as the overlapping, perspective, texture changes, and light and shade changes of the object being viewed. In art design, it mainly uses the depth clues reflected by objective factors to create visual space. If we want to create an authentic visual space, we need to consider all the depth clues in the design, but each depth clue has its own unique attributes, and the selective use of the depth clues in the design can bring unusual effects to the visual space, and is also the embodiment of the unique aesthetic that art is higher than life. Of course, realistic visual design also has its own aesthetic experience, which requires the designer to not only grasp the characteristics of all the depth clues in the space, but also to consider and assign different levels of expression according to the ideas that need to be expressed.

The so-called gradient is the tendency of a certain perceptual property to gradually increase or decrease in the spatial or temporal dimension. All gradients have the ability to create spatial depth effects, and brightness gradients are one of the most effective means. In the visual space, a gradual brightness gradient creates a spatial effect, the contrast between the distance and the distance of the objects in the picture space is relatively small; When the brightness difference between the subject object and the background is large, it indicates that the distance between the two is far away, so the contrast in size is relatively large. Therefore, using the change of brightness gradient is also an effective way to construct visual space. With the distribution of brightness, it is possible to define the location of an object in visual space, and at the same time, it is also possible to show how different parts of a complex object are related to each other to form a whole. Areas with similar spatial orientation are visually related to each other because of the colors they share. The closer they are to the point where they meet the incident light vertically, the brighter they will appear. In perception, visual units of similar brightness

tend to be organized together, so that your visual grouping due to similar brightness will indirectly lead to visual grouping according to the principle of spatial orientation similarity.

In the construction of visual space, the reasonable layout of light can not only establish the sense of spatial integrity and spatial order, but also make the shape of objects in space become clear. For example, the use of strong side light in the picture to express the object and space, all the light is concentrated on the same side, and the other side is completely the dark side, so that the light and darkness are concentrated on an object, the resulting combination of light and shadow arrangement, the viewer's line of sight is divided into two halves, compared with the distribution of light and shadow in multiple places, it is less likely to cause visual confusion Simplified visual spatial structure.

3. The Expression of Time in Four Dimensional Space by Visual Form

3.1 The Relationship between Space and Time

The research results of modern physics show that time and space are mutually dependent and permeable, there is no space without time, and there is no time without space. In the famous German philosopher Oswald Spengler's book The Decline of the West, there are a lot of discussions on the relationship between time and space. In the book, he believes that because time is the manifestation of the causes and consequences of things, it is the existence form of the life cycle of living organisms, and it has continuity and memory, so it can arouse people's emotions. Time is an interval that carries the original emotion and is used to divide the space. Time represents both the direction and the present moment, and is generally irreversible. If you project time onto space, time is a straight line with direction. Time is the combination of fate and sense of movement, but also contains the meaning of imitation, because of some meaning, the reproduction of direction.

In physicist Stephen Hawking's "A Brief History of Time", the quantum state of the universe is considered to be in a ground state (under normal conditions, atoms are at their lowest energy level, when electrons move in the closest orbit to the nucleus, this stationary state is called the ground state). Think of spacetime as an unbounded four-dimensional surface. All structures in the universe originate from the smallest fluctuations allowed by the uncertainty principle of quantum mechanics. Inferences consistent with astronomical observations can be derived from simple model calculations, such as the cluster structure of galaxy clusters, galaxies, stars, etc., the large-scale homogeneity and isotropy of the universe, the flatness of space-time, the dimensions of space-time, primordial gravitational waves and primordial black holes, and the arrow of time. Hawking's quantum cosmology is that it really makes cosmology a full-fledged science. It is a self-contained theory that, in principle, we can predict everything in the universe from the laws of science alone. He uses quantum theory to explain that it is empty, and if this theory is visualized, it may help to understand the "four-dimensional plane". For example, when a branch is far away from us, this branch is a line, when the distance is closer, we will see that there are ants on the branch crawling around the branch, and the branch is an individual at this time, so if the distance is far enough, even if the body is large, it is also a point on the surface where it

is located. Therefore, space-time is regarded as a borderless plane of thought, and seemingly separated beings in the universe are connected, and from one point, everything in space-time can be inferred, so everything in the universe can be predicted.

These are the views of time and space obtained by the rational mind to explain the universe, so "time" and "space" are inseparable. If people believe in this concept of time and space, then it is to admit that the development of everything is established, and to abandon the negative concept it will bring to people, so the concept of time and space in reality can be used in the design, which will bring different inspiration and breakthrough.

3.2 The Dynamic Screen Makes time Visually Visible

The carrier of the dynamic picture in digital media art design is the screen interface. Compared with the real world in the screen itself, the content in the screen is another space, because the time in the world on the screen is separated from the time in the real space. The reality is spring, the screen can be a description of summer; In reality, the object changes minute by second, but the world on the screen can be stationary, accelerated, and slowed down, and the relationship between the transformation of the object and the point in time is adjustable. The direct manifestation of time is not limited to this, and people's visual perception of the picture is also directly limited by the time in the dynamic picture, which is also an important reason for the difference between the expression of visual space in the dynamic picture and the traditional painting or static graphic design.

The bearing medium of the dynamic picture is the screen interface, and the characteristics of people's information reception on the screen interface determine the change of visual design thinking, and the design dominated by user experience is regarded as the mainstream. Therefore, the various needs of people - the object of information reception and feedback are paid more attention, and the human engineering research is carried out, one of the important aspects is the "central vision" of the human eye when watching Awareness of the importance of attention. The light-sensitive neurons in the retina of the human eye are composed of rod cells and cone cells, among which the cone cells play a key role in color recognition. The most sensitive area of human vision is called the "fovea", and the vision when recognizing with "fovea" is called "central vision". The fovea is the area with the largest distribution of cones, so during viewing, the color of the image in the central vision will be more easily perceived, while the image in the peripheral vision area visually loses some of the perception of color purity. This is the natural visual attention characteristics of the human eye, if it violates this natural physiological phenomenon, it will cause the viewer's visual perception lag. This has far less impact on the static picture than the dynamic video, because in the face of the static picture, the time of visual stay in the picture is controlled by the subjective will of the viewer, you can have enough time to watch each area of the picture at will, because the picture will not disappear or change immediately. For a dynamic video with 25 frames per second or 30 frames per second, it means that the viewer will receive information in 25 or 30 pictures in one second, and it can be imagined that the importance of "central vision" when using dynamic pictures to build visual space.

Only relying on the physiological characteristics of human "central vision" is not enough to achieve the ideal effect of visual experience. Artificially creating "central vision" increases the viewer's ability to receive information and conforms to the physiological needs. For the dynamic picture, there is a space conversion between the conversion of each frame of static picture. When the human eye watches a dynamic picture, although the visual center can be swept, it needs to accept the impact brought by the transformation between each static frame, so the perception brought by the visual moment increases, and the field of vision staying on the picture will tend to be centered. In order to better convey information through dynamic images and reduce the viewer's visual fatigue, the black edge will be pressed around the screen. The black edge here is not directly covered in the screen with pure black in the colorless system, but the reduction of color purity and brightness to reduce the visual impact brought by color.

Although we often say that "seeing is believing", this is not always the case. For example, when the screen switching speed is very fast, the vision of the human eye temporarily brings about the optical illusion space formed by the overlap of different pictures. Therefore, in the dynamic picture, it is necessary to show the superposition of two or several visual elements, and they can be arranged in order to achieve the superposition effect through visual errors. For example, the former shot is a train passing in the picture, the latter shot is a close-up of a person's eyes, there will be a moving train in the eyes, of course, the proportion of the two in the picture is reasonable.

4. Beyond the Fourth Dimension-Time Creates a Surreal Visual Space

4.1 Concept of Thinking Space

When "space" rises from physical space to mental space, the parallel relationship between "time" and "space" is broken, then "time" is free from the limitation of "space", and "space" can also be free from the bondage of "time". As mentioned above, this concept of space is reflected in the expression of "time" and "space" in traditional Chinese culture and Western painting. In the thinking space, "time", as the "fourth dimension" of "space", plays an important role in visual space design, which enriches the expression form of visual space design. It can be said that the transcendence of "time" breaks the "reality", and the "thinking space" or "imagination space" is the transcendence of "space".

4.2 Anti-Conventional Logical Thinking Creates Surreal Visual Space

There is always the law of diminishing marginal utility in economics, and there are many angles and methods to explain its rationality, but if it is used in design, it can be understood in this way: if the audience has never seen a red circle, when he sees it for the first time, his brain will be stimulated, and if this circle always appears in front of him, his reaction to it will be generated It will gradually decrease, or to the extent of "seeing" but "not noticing", then the degree to which he is stimulated by the red circle in this process is in a gradually decreasing trend, and the utility (stimulus) of the red circle to him is decreasing. For art design, especially in modern and contemporary times, it is important to pursue the improvement of the effectiveness of information transmission and the innovation of

design works. Only innovative design can achieve the maximum effect on the audience. Of course, the stimulation brought by it can be divided into positive and negative. If the stimulation brings excitement to the audience, then it is positive and effective; otherwise, it will have a negative impact. So how to achieve design innovation has always been the focus of design attention.

Anti-conventional logic design thinking can bring different impact to the design. However, anti-conventional logic does not mean that there is no logic. It means that designers present objective things from a different perspective from ordinary people on the basis of rational cognition, so that viewers can have a new understanding or a deeper understanding of the things they have already known. It is an intentional design concept.

Surreal space is the application of unconventional logic. Surreal space is different from two-dimensional space or three-dimensional space. It is an innovative space that surpasses the natural laws in reality based on the combination of the two. In the construction of surreal Spaces, the boundaries between reality and imagination, between present and past, become more and more blurred, and the material of the real world and the elements of imagination can be merged in a single picture and presented in a more powerful way.

4.3 Color Contrast Creates a Sense of Superspace

Sensitivity to visual complexity and color is the basic condition for creating clear visual information. Color is the source of vitality, can enhance visual perception and response, can summon viewer emotion, enhance the meaning of visual information processing flow. When color is carefully arranged and applied, it can substantially improve communication and help understanding. The three properties of color can also build an orderly visual language that establishes meaning and evokes emotion. Color, as the intrinsic visual characteristic of visual spatial form, plays the function of language and information. By controlling the relationship between hue, brightness and saturation contrast, the viewer's cognitive ability can be enhanced. In cognitive psychology, it is believed that the eyes in the mind cannot immediately assign visual order to colors, so inefficient color application will always lead to visual confusion, but through the control of hue, brightness and saturation, the eyes in the mind will immediately perceive the existence of visual order. Therefore, the rational principle of color organization can provide a reliable objective standard for the choice of color combination. The color structure contains an inherent pattern of visual harmony. Color harmony has an internal ordered structure, which constitutes a dynamic balance between similar and contrast components, and the end result is a harmonious arrangement of components.

From the "colorful red is always spring" to the snow-covered winter, in nature, the change of color is the performance of life, is the embodiment of time change. In life, objects also fade over time. The visual experience given by nature and life tells us that color is the beginning of life and will fade with the passage of time. When all the colors are lost, what is left is black and white (gray is a transitional color between black and white, so it is also included in the black and white colorless system). There is a "time dimension" in the perception of visual space brought by color and black and white, especially

in the picture space which is easier to evoke people's memory image, this perceptual feeling is more obvious. In film art, the use of color to construct space is a common technique. In films with time-lapse or emotional recall, the transition from reality to the past is accompanied by a change in color contrast in the picture, from the present (color) to the past (black and white) to the past (color). This technique of expressing the transfer of time through color contrast is also applicable in visual design, but there are static pictures in visual design, in order to avoid the blunt performance of the picture, so the application of this technique will take into account a more complex logical layer.

5. Conclusion

This paper aims to deeply explore the spatial visual form in digital media art design from the perspective of visual perception, and comprehensively analyze and elaborate the construction methods of three-dimensional space, four-dimensional space and surreal multi-dimensional space. Through specific design works, this paper explains in detail the application of these spatial construction methods in practical design, aiming to provide a new perspective and method for the theory and practice of visual communication design. In this way, this paper not only shows how digital media technology promotes innovation in visual communication design, but also emphasizes how designers can enhance the visual impact and aesthetic value of designs through multi-dimensional space construction in the context of the digital age.

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