

“Interplay of Reality and Illusion” in Virtual Reality Technology (VR): A Visual Study with Ink Painting as an Example

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Abstract:

Virtual reality technology is increasingly popular today, finding applications across a broad range of fields. In the realm of painting, it serves as a bridge to contemporaneity, building upon traditional techniques and introducing novel, youth-oriented approaches that blend reality and illusion - a concept referred to as “the interplay between reality and illusion.” With the aid of virtual and augmented technologies, paintings transcend the confines of two-dimensional, evolving into three-dimensional, spatially-aware creations.

Keywords:

Virtual Reality, Interplay of Reality and Illusion, Technology, Landscape Painting

1. Introduction

In the context of ink landscape painting, VR technology allows for the emergence of depth and spatial perception that echoes the overlapping layers found in traditional Chinese ink washes. This paper particularly emphasizes leveraging technology to address spatial complexity and the dynamic interplay of reality and illusion in virtual ink landscape painting.

2. Current Research Status

2.1. The Concept of “Interplay between Reality and Illusion”

The principle of “interplay between reality and illusion” is a salient feature reflecting the philosophical characteristics of pre-Qin schools espoused by Laozi and Zhuangzi. Laozi posited that phenomena must embody both tangible and intangible elements to exert their effects within the cosmos and its myriad things. In Cai Jian's work titled “The Vigorous Dance of Ink: Creative Thoughts and Practice in Artistic Gymnastics-Inspired Ink Paintings,” it is argued that artistic representations must harmoniously integrate reality and illusion to genuinely reflect the vitality of the world. This underscores the significance of mutual penetration between the real and the illusory—where the illusory contains the real and vice versa—as a key issue in

Chinese aesthetic thought. According to Bao Yue and Shen Aifeng in their study “From Ancient Landscape Paintings to the Understanding of “Void” and “Solid” in Chinese Art Philosophy,” the origin of the theory of interplay between reality and illusion can be traced back to Laozi’s philosophy rooted in the concept of “Dao”, which views the essence of all things as the unity of being and non-being. They also contend that the creation of artistic conception in works manifests through this very principle of “interplay between reality and illusion.”

2.2. The Current State of Research on the Concept of Virtual Reality (VR)

Virtual Reality (VR) is an emergent technology in the field of computer science that integrates multiple scientific disciplines, including computer graphics, multimedia technology, sensor technology, human-computer interaction, networking, stereoscopic display technology, and simulation techniques. At its core, VR technology involves creating a simulated environment, providing sensory experiences, and achieving a high degree of verisimilitude for the user. As Li Min and Han Feng point out in their overview, “The simulated environment in VR is generated by computers and consists of real-time, dynamic, and highly realistic three-dimensional imagery. Ideal VR should provide all the senses humans typically experience.”

In China, research into VR technology started relatively late compared to developed countries abroad, but it has since garnered significant attention from national authorities and scientists. As outlined in various overviews, such as those under the Ninth Five-Year Plan and supported by the National Natural Science Foundation of China and the National High-Tech R&D Program (863 Program), VR has been included as a key area of research. According to Jiang Xuezhi and Li Zhonghua's summary in “The Current Status of Domestic and International Research on Virtual Reality Technology,” Beijing University of Aeronautics and Astronautics’ Computer Science Department is among the earliest and most authoritative institutions in China conducting VR research, having achieved notable accomplishments in areas such as distributed virtual environment network design, real-time three-dimensional dynamic databases, virtual reality demonstration environments, VR systems for pilot training, and development platforms for VR application systems.

2.3. Research Status of Combining the Spatial Depth and Virtual Reality in Landscape Painting

Virtual reality primarily focuses on human-computer interaction and tool development, contrasting the uncharted virtual space with the physical world. The progressive integration of advanced science and art offers the public a new way to appreciate fresh concepts and experience the allure of virtual spaces while also provoking reflection on how these technologies impact traditional crafts, such as landscape painting. The distinction between “virtual reality” and the traditional concept of “reality-illusion” lies in ergonomic considerations in VR devices, the novel experiences they bring to ink painting, the juxtaposition of virtual and real spaces, and the meticulous crafting of virtual models within interactive systems. Presently, there is less emphasis on the thoughtful fusion of traditional art forms with VR, with the focus tending more towards VR itself rather than a balanced integration.

The development of combining VR with traditional skills relies heavily on cultural heritage, carefully examining the differing technical aspects. Key to this is exploring how to merge the spatial depth and illusion-reality techniques characteristic of traditional Chinese landscape painting into the virtual reality environment. While VR

technology enables the creation and appreciation of beauty, it is crucial to innovatively blend these two realms, treating VR as an emotionally expressive medium. When it comes to virtual painting, much consideration goes into translating two-dimensional scenes into three-dimensional ones, allowing users to create immersive, three-dimensional ink landscapes within a virtual setting where depth perception simulates the far and near distances depicted in traditional paintings. Ultimately, enhancing user experience and interaction is at the heart of this exploration.

3. The Existence of Virtual-Physical Aesthetics in Virtual Reality (VR) Technology

3.1. Lack of Empathy in Virtual Visual Imagery within VR

The traditional painting model creates on a two-dimensional canvas, where artists strive to render three-dimensional effects that simulate the real world and spatial environments. In contrast, virtual reality (VR) painting represents an emerging artistic medium and form in contemporary VR technology. It integrates the content, expression, and external form of art pieces. Creators use a three-dimensional virtual space within computer-generated realms to paint, employing VR tools instead of a canvas with limited dimensions. They collaborate with painting controllers to create art within this digital expanse, allowing for artwork that can be viewed from different angles and even altered through virtual traversal by the artist themselves. Viewers can don headsets to appreciate these paintings, navigating through them and experiencing the artwork from multiple perspectives. The creation process can also be observed on external screens.

This fusion of new technology and art presents distinct modalities, thereby raising philosophical and theoretical considerations. Scholars both domestically and internationally have focused their research on issues concerning virtual reality technology, particularly regarding its application level. In VR, there is a separation between the body and mind where the physical body resides in the real space while the consciousness is projected into the virtual space, hence VR technology engenders a disconnection between the two. Relative to traditional painting, does this imply a similar separation of body and mind? Has the spatial order been altered? What is the relationship between bodily space and virtual space? These questions arise as VR has yet to achieve a seamless human-machine integration that rivals the emotional resonance found in traditional painting.

3.2. Difficulty Fusing Reality with Imagination in Visual Perception Due to the differential sensory content experienced between the real space and the virtual reality space

the situations encountered by creators and viewers, along with the varying degrees of immersion in the virtual space, lead to discernible differences in bodily experiences. For creators, the interactive process in VR painting involves constructing artworks within a hollow space that is an inseparable counterpart to the real space. Under full interactivity, the deepened painting space allows the creator to develop a spatially-aware embodied experience, integrating the perception of the virtual space into their physical space, forming muscle memory and physical habits. For viewers, the bodily space serves as the starting point; however, there is no clear boundary between the body space and the virtual reality space. Projection of space, interaction between the

body and the world, and sensory experiences all undergo changes compared to the conventional forms of appreciating paintings, where the body plays a passive role. Here, the virtual reality space opens up to the body space to enrich the aesthetic experience of the pseudo-space, engaging the viewer and expanding their sense of bodily space. Simultaneously, it shapes the viewer's cognitive understanding through the transformation of body habits, as the format of painting within virtual spaces prompts the formation of new bodily routines that reshape people's perceptions.

4. The Fusion of VR Technology with Contemporary Technology

4.1. The Interplay of Solid and Void in Ink Painting and Current Technological Aesthetic Trends

In the creation of calligraphy and paintings, the strategic use of negative space provides ample room for viewers' imagination. In traditional Chinese painting, artists place great emphasis on the utilization of such white space, which can metaphorically be referred to as "emptiness" or "void," reflecting the artist's unique emotional expressions and pursuit of profound spiritual ideals. This empty space may represent sky or earth, effectively directing the visual focus of the audience onto the central theme and broadening the imaginative scope. As seen in recent works, for instance, poster designs utilize blank space, often employing white as the primary background color. The harmonious combination of water and white elements infuses the design with rich Eastern cultural essence, echoing the blend of reality and abstraction found in traditional Chinese paintings. The five applications of white space in these new poster designs showcase not only the fusion of tangible and intangible aspects but also the interplay of white and black. The expansive white scenes lend the designs an elegant semblance of ink wash paintings, with ink elements flowing seamlessly throughout, manifesting distinct aesthetic characteristics and cultural depth.

4.2. Analysis of the Representation of Ink Brushwork's Solid and Void in VR

4.2.1. Immersion in the Painting - Virtual 3D Painting

The personal relationship between humans and technology is reborn under the continuous evolution of virtual reality (VR) technology. VR tool designs adhere to ergonomic principles, with the controller serving as the "brush" enabling creators to capture colors, draw scenes, and trace 3D lines within the virtual realm. Traditional landscape paintings encapsulate a dispersed perspective that embodies the unique aesthetic interpretation of trees, mountains, and waters in Chinese painting. Artists face challenges in adapting their thought processes and viewpoints to restore and fill collapsed spaces, and to accurately express the aesthetic features of landscape paintings through depicting spatial structures. For viewers, VR-rendered ink paintings like those by the artist Wu Guanzhong depict Jiangnan watertowns not merely as distant, flat images but as immersive, three-dimensional landscapes one can traverse visually. Visitors can wander amidst the misty rain of Jiangnan depicted in a Chinese painting, experiencing a perfect synthesis of natural scenery and the charm of painting arts. VR painting realizes the aesthetic situation of "immersing oneself within the painting," demanding a corporeal experience from the creator within the VR space. For example, the brush techniques in traditional painting form part of the artist's bodily practice during the creative process. In VR painting, the representation of traditional brushstrokes lies in the selection of strokes within the virtual space and the development of spatial structures and other body techniques through ongoing

interactions with technological objects. Only then can VR painting enhance the Gestalt content of bodily schemas, thus prompting the body to adopt new habits and form novel bodily techniques specific to VR painting.

4.2.2. Unity of Virtual and Real - Integrating Interactive Installations to Express the Beauty of Ink Brushwork

The application of VR technology to ink painting not only disrupts traditional methods but also constitutes a perfect amalgamation of science and traditional art. Technological advancements offer new mediums for artistic creation and introduce innovative techniques and languages. In today's information society, these changes have significantly transformed original work methods and efficiency, leading to increasingly impactful shifts in human life. This technological revolution is reshaping various aspects of human life, altering lifestyles and updating concepts. Virtual reality technology transcends the conceptual boundaries we once held, presenting a new world requiring fresh contemplation and comprehension. Traditional arts, as part of this trend, are undergoing digitalization processes. Digital art liberates artists from traditional studios and materials such as brushes, ink, paper, inkstones, replacing them with a virtual world composed of mice, keyboards, digital brushes, and screens. VR art achieves unprecedented integration across various art forms, incorporating the latest research findings in computer graphics, advancing computer-assisted art while catering to artistic demands.

The complexity of the painting process in ink painting, due to its unique attributes like dynamic brushstrokes, non-overlapping layers, and distinctive texture rendering techniques unlike other painting genres, gives rise to its own appeal and atmosphere. Research results in simulating and generating ink paintings using VR technology hold vast application prospects in graphic technologies, including non-photorealistic rendering, automatic processing of ink painting effects, ink animations, virtual reality environments, cross-disciplinary painting, and planning of the painting process. These advancements play a positive role in enriching graphic rendering techniques and developing computer simulation technologies. The interactive simulation and rendering software systems developed based on these VR ink painting simulation studies have promising applications across diverse user groups - from professional ink painters and practitioners in the fields of advertising, film, and television design to amateur enthusiasts with a foundation in Chinese painting, as well as young learners seeking to acquaint themselves with the knowledge of Chinese painting. These users could potentially rekindle public interest in traditional artistic accomplishments, acting as gateways to widespread fascination. Moreover, the protective restoration research and the provision of new computer-aided techniques and methods for reproducing ancient, precious ink paintings for preservation or tomb replicas have significant practical value.

5. Conclusions

Virtual Reality Art, as a distinctive form of new media art, embodies unique aesthetic characteristics. However, it is still in its nascent stage, with certain issues concerning content and technology. For instance, prolonged use often leads to dizziness among users, and there is room for improvement in camera handling techniques within VR photography. The ecosystem construction of the virtual reality industry currently fails to match the pace of VR technology advancements; thus, VR content remains significantly scarce. The integration of virtual reality technology into

traditional painting represents both an innovative breakthrough and a latent threat to the arts. The rich array of digital art display formats not only provides high-quality experiences but also influences public attitudes toward art; the intervention of technology in the art domain may inadvertently foster a public aesthetic mindset that values technology over art. Consequently, we should delve into the coexistence issue regarding the sustained development of traditional painting alongside the potential leapfrogging effect of modern virtual painting. Although virtual reality art in China is still in its infancy, it undoubtedly holds vast prospects for future development; meanwhile, the potential threats it may pose to the art realm require close attention from both the art community and academia.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author Contributions

Conceptualization: Haiyi Ren; Methodology: Haiyi Ren; Software: Haiyi Ren; Validation: Haiyi Ren; Writing—original draft preparation: Haiyi Ren, Tong Zhang; Writing – review and editing: Haiyi Ren, Tong Zhang; Formal analysis: Heyi Liu; Investigation: Heyi Liu; Project administration: Tong Zhang.

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