Research on the Digital Translation of Western Cubism

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Abstract: Cubism, through its 'multi-perspective juxtaposition' and geometric abstraction, broke away from the traditional single-perspective painting method, ushering in a new spatial cognition model. the post-metaverse, as an evolution of the metaverse concept, integrates emerging technologies such as spatial computing, AI-generated content, and embodied interaction, providing a practical platform for the digital translation of art theory. This article focuses on the theoretical connections between Cubism and digital technology, employing methods such as art historical literature analysis, case studies, and comparative research. It aims to explore the theoretical links between Cubism and digital technology, to build a cross-cultural theoretical foundation for spatial design in the era of virtual and real integration, and to provide innovative ideas for post-metaverse architectural design.

Key words: Cubism; Spatial View; Three Distance Method; Digital Translation

1. Cubism

1.1 The Origin of Cubism

Cubism emerged in France at the beginning of the 20th century, marking a pivotal moment in modern art and profoundly influencing the field. the concept of Cubism originated with Cezanne, who used geometric shapes like spheres and cylinders to depict natural landscapes, inspiring artists such as Picasso and Braque [1]. Picasso's "Les Demoiselles d' Avignon" is considered the pioneering work of Cubism, where he abandoned traditional perspective and broke down figures into geometric planes, opening up multi-perspective artistic expression [2], marking a turning point in modern art history. In 1908, George Braque's "The House at Estaque" further emphasized this geometric trend. By using geometric techniques, he transformed architectural landscapes from concrete to abstract, laying the groundwork for the development of Cubism [3]. Critic Louis Vauxcelles described his works as "Mr. Braque reduced everything to cubes, " which is how Cubism got its name.

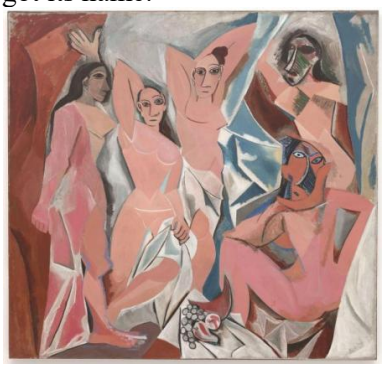

Figure 1. Picasso, Les Demoiselles d'Avignon

Figure 2. George Braque, the House of Estak

1.2 Characteristics of Cubism

Cubist painting is characterized by its multi-perspective observation and representation, breaking away from the limitations of traditional single perspectives. By deconstructing objects and reassembling them subjectively [4], it creates a three-dimensional or four-dimensional spatial effect, showcasing the multidimensionality of space and the continuity of time, thus challenging conventional spatial representation. In terms of composition, artists simplify objects into geometric shapes and incorporate innovative techniques such as letters, symbols, and collage, enhancing the abstract

quality of the artwork and enriching the forms and content of artistic expression, providing a new language for conveying their understanding and feelings about the world. Cubism offers creators a fresh perspective, transforming the way art is expressed and how audiences perceive it.

1.3 The Spatial View of Cubism

The spatial philosophy of Cubism was systematically explored in the book "Cubism, " co-authored by the spatial philosophy of Cubism was systematically explored in the 1912 book "Cubism. " Glaz and Meisinger emphasized that the goal of Cubism is to reveal the essence of objects through artworks, presenting a 'cognitive reality' — the multi-dimensional understanding of objects formed by human movement and thought. By breaking down objects into multiple spaces and reassembling or overlapping them, Cubist artists created more complete dynamic images, fully showcasing the fluidity of space [5-6]. Space is no longer static but changes with the viewer's perspective and perception.

Figure 3. George Braque Collage "the Bottle of Brandy and the Guitar on the Table"

2. Comparison of Eastern Views on Space

2.1 Oriental View of Space

The 'Three Distances Method' proposed by Northern Song painter Guo Xi in his work 'Lofty Ambitions of Forests and Streams' [7] laid the theoretical foundation for traditional Chinese spatial aesthetics. the scattered perspective technique highlights the continuity of space, differing from the Western focal perspective. This concept has influenced the design of traditional Chinese gardens, such as the Humble Administrator's Garden in Suzhou, where the winding corridors not only connect various scenic spots but also guide the viewer's gaze and steps [8]. By skillfully combining scenery with the viewer's line of sight and using techniques like opposite views, it not only provides a visual experience of' a new scene at every step' as the viewer moves but also psychologically engages the viewer in interacting with the space [9], encouraging active participation in the creation of the space.

Figure 4. Aerial View of the Garden

Figure 5. Octagonal Pavilion of the Garden

2.2 Comparison with Cubism

Cubism breaks through traditional perspective by geometric deconstruction and recombination. For instance, in Picasso's "Les Demoiselles d' Avignon, " the faces of the figures are shown from both front and side views simultaneously. This multi-perspective technique not only challenges the conventional three-dimensional representation but also allows viewers to perceive the figures from multiple angles, creating a new spatiotemporal experience. Chinese gardens aim for natural fluidity, adhering to the aesthetic principles of Taihu stones—wrinkled, perforated, slender, and transparent—to define space. the concept of 'center' and 'emptiness' is used, and the 'Youshi Tongzuo Pavilion' in the Humble Administrator's Garden embodies dynamic dialogue. This reflects the Western emphasis on spatial control

and the Eastern focus on the symbiosis between people and space.

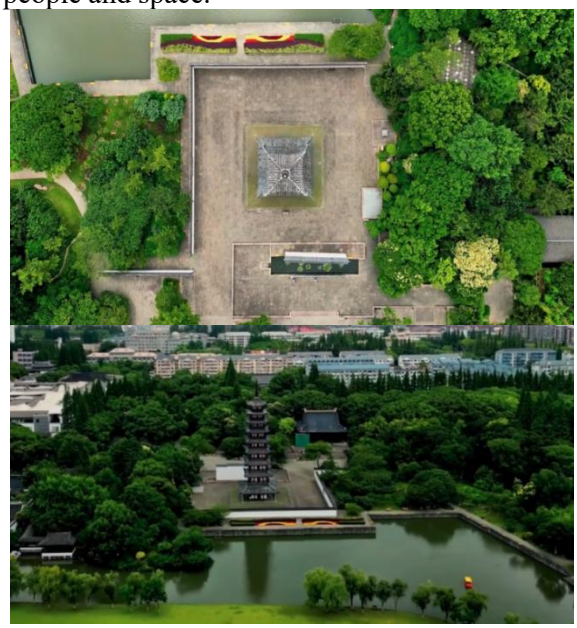

Figure 6. Partial View of Shanghai Fangta Garden

2.3 Implications for the Post-Metaverse

The spatial perspective of Cubism has profoundly influenced the development of 20th-century art. This innovative concept of juxtaposing multiple perspectives and geometric abstraction has provided a wealth of theoretical resources for subsequent artistic practices. In post-metaverse design, the wisdom of Eastern space offers harmonious solutions. the Suzhou Garden AR tour project alleviates VR visual fatigue and enhances the experience by integrating Kunqu opera. In virtual reality, users are no longer passive observers but actively construct and experience multi-perspective spaces through their own movements and interactions, enhancing immersion and reinterpreting the spatial concepts of Cubism in the digital age.

3. Cubist Practice of Digital Technology

3.1 Artistic Translation of Spatial Calculation

Refik Anadol's "Machine Illusion" installation serves as a standardized practice for digital Cubism. the work uses neural network algorithms to transform the geometric deconstruction principles of Cubism into dynamic data landscapes. By processing hundreds of millions of New York photos through multiple layers, the computer-generated visual scenes are stunning [11]. Anadol creates a rich immersive environment using digital and artificial intelligence, blending light, shadow, and sound to reshape the relationship between people and space, breaking down the invisible barrier between the digital and real worlds. As viewers move, the device captures their position data, which changes the perspective of the projected content in real time, creating multi-layered visual effects reminiscent of Braque's collages. This treatment transcends mere technical implementation and is essentially a digital interpretation of Gleizes' "mobile perspective" theory. Anadol also intentionally retains the "digital brushstroke" traces in the algorithmic processing, further enriching the artistic expressiveness of the work.

Figure 7. Partial Exhibition of Machine Illusion

3.2 Cross-Cultural Experiments in Generative Art

In Mario Klingemann's Memory Veins series, AIGC technology is extensively utilized. the artist trained a neural network [12] to autonomously generate a' cultural hybrid 'space by using a mixed dataset of images from both Eastern and Western art history. the most

innovative aspect of this work is the' aesthetic mediator 'module: when the system detects that the generated geometric structures are too rigid, it automatically injects organic curves similar to those found in Chinese garden rock formations; when the image becomes too naturalistic, the algorithm enhances the visual elements of Constructivism. This dynamic balancing mechanism results in a stunning' digital eclecticism 'style ——, which maintains the structural tension of Cubism and the breath of Eastern aesthetics in a single piece, offering new possibilities for cross-cultural spatial design. Klingemann's work not only achieves the fusion of Eastern and Western aesthetics technologically but also delves deeply into cultural expression.

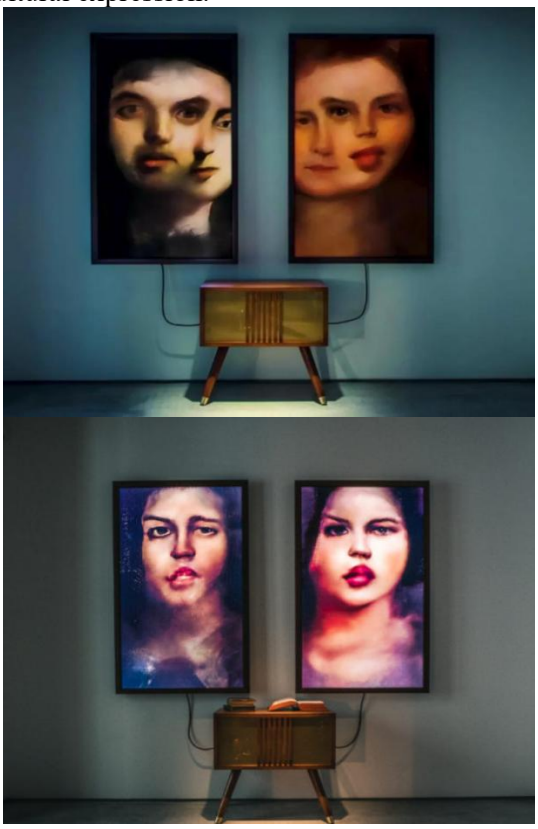

Figure 8. Some Works of Memory Vein

Olafur Eliasson's "Escaping the Scene" uses light environment adjustments to simulate the light and shadow effects of Cubism, without requiring complex technical equipment [13]. TeamLab's immersive installation achieves a digital transformation of "changing scenes with each step, " guided by Guo Xi's' Three Distances' perspective principle to explore how culture and technology can be integrated into various installations, offering the public more inspiring and imaginative thinking and providing a rich dynamic visual experience for the audience. These examples maintain the purity of artistic language, showcasing the depth and breadth of the integration of art and technology.

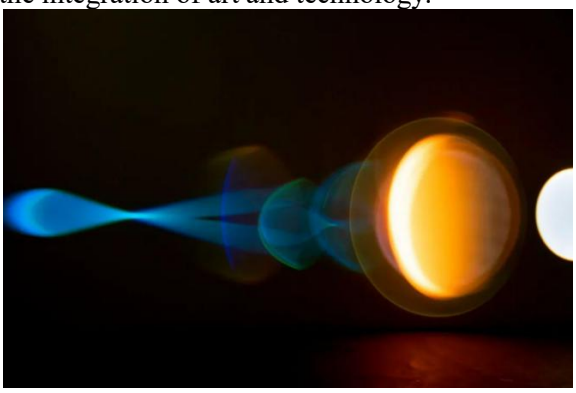

Figure 9. The Escaping Landscape

4. Build The Theoretical Framework Of "Digital Cubism"

4.1 Definitions and Principles

The core of the "digital Cubism" framework is to reconstruct the "dynamic geometry" relationship in the virtual and real space, and pay attention to the sensitivity of multiculturalism. This theoretical system is built on three mutually supporting elements, and is committed to creating a digital space creation system with both technological advancement and cultural inclusiveness.

The 'composable module' draws inspiration from the collage techniques of Cubism, deconstructing digital space into intelligent units that can be edited in real time. Each unit features an adaptive geometric parameter library, allowing for dynamic adjustments to fit different environments and user needs. This modular design enhances spatial flexibility and scalability, providing artists and designers with a rich array of creative tools to freely combine and reconfigure geometric elements in the digital realm. the 'intelligent narrative' system leverages generative artificial intelligence (AI) technology to dynamically generate personalized spatial exploration paths based on the viewer's cultural background and behavioral patterns. Through deep learning and data analysis, the system can respond to user interactions in real time, offering unique spatial experiences that enhance user engagement and immersion, meeting their individual needs. The' cross-cultural adjustment' mechanism uses deep learning to study Eastern and Western aesthetic classics, establishing a dynamic balance model with over 200 adjustment dimensions. This ensures that the

model maintains spatial structure while adding organic fluidity, making the digital space both geometrically tense like Cubism and naturally elegant like Eastern aesthetics. These three elements collectively form a culturally resilient digital space creation system, promoting the development of digital space design through technological innovation and cultural inclusiveness.

4.2 Application Scenarios

In the concept of the "Post-Meta-Verse Art Museum, " digital cubism scenes utilize biometric recognition technology, including micro-expression analysis and pupil tracking, to monitor the audience's emotions and attention in real time. When the system detects that the audience is experiencing aesthetic fatigue with a particular geometric form, it can automatically adjust the fragmentation of the space, using dynamically changing geometric structures to re-engage the audience, enhance their viewing experience, and extend their stay.

More innovative is the "Mixed Reality City" project, which transforms physical building facades into dynamic canvases, achieving a Cubist-like spatial overlay through projection mapping technology. In Berlin's "Digital Bauhaus" experiment, this approach has expanded traditional buildings' spatial perception by an average of 47%, while maintaining 82% of their cultural identity. This practice not only validates the feasibility of digital Cubism theory but also broadens the dimensions of architectural aesthetic expression, opening up new perspectives for urban space design. These applications highlight the potential and rich diversity of cultural expression enabled by digital Cubism technology, integrating advanced technology with deep cultural insights to guide future art and architectural design, inspiring new ideas.

5. Conclusion

The study explores the innovative value of Cubist spatial theory in post-metaverse design, highlighting its potential to address cognitive load issues in hybrid virtual and real environments. It emphasizes that to fully leverage this theoretical framework, continuous adjustments are needed at both technical and cultural levels. This includes enhancing AIGC algorithms 'ability to recognize Eastern aesthetic elements and improving the design system's adaptability to user preferences from different regions. These findings provide significant theoretical references for spatial design in the digital age. Future research should focus on the multi-sensory coordination mechanisms in embodied interaction, exploring how cross-modal interaction protocols can enhance user immersion.

Acknowledgements

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