Research on Design Realization and Dissemination in Traditional Painting Appropriation in the Context of Digital Technology

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Abstract. Adopting a perspective centered on digital technology, this paper provides a concise overview of the historical development of digital technology and art. Subsequently, it provides an in-depth discussion of the practical experience and application effects of the digital appropriation of traditional paintings created in the context of various digital technological media. In addition, it proposes contemporary innovative approaches to the design of traditional paintings in the context of digital media applications. Finally, it analyzes the dissemination values and influences of advantages and disadvantages of the combination of contemporary digital appropriation and traditional painting creation.

Keywords: Digital Technology; Traditional Painting; Digital Media appropriation; Social Communication.

1. Introduction

The advancement of digital technology serves as the foundation for the evolution of digital art. In 1946, at the University of Pennsylvania, Americans John W. Mauchly and J. Presper Eckert invented the world's first general-purpose computers. The concept of integrating computer technology with art and design was first proposed nearly a century earlier by the British mathematician Ada Lovelace, who is regarded as the founder of computer programs. In 1843, Ada Lovelace translated an article by the Italian mathematician Iggy Federico Menabrea recommending "Babbage's Analyzing Machine" and published it in the British journal Scientific Reports. In the notes to the article, it was mentioned that "If this analyzing machine had recognizable codes, it could be used to edit text, pictures, and sound."[1] She appended numerous notes to this appropriation, which is regarded as the inaugural computer program, elucidating the methodology for executing Bernoulli's numbers (a mathematical series of rational numbers) on a computer.

The evolution of computer graphics technology, Internet technology, and the proliferation of personal computers and mobile media has led to the emergence of new artistic practices that are informed by and contribute to the ongoing development of these technologies. The necessity for artistic innovation drives the virtuous cycle of technological development. The domain of computer art is also founded upon the evolution of diverse digital technologies, which have led to the emergence of Network Art, CG Art, Virtual Reality Art, Digital Image Art, Interactive Art, Generative Art and Lighting Art, among others. The values of digital technology often necessitates the collaboration of artistic content, and the realisation of innovative concepts by artists and designers also requires technological advancement.

In 2008, an ink scroll interactive performance was presented at the Beijing Olympics opening ceremony. The digital version of On the Riverside Scene of Pure Brightness was displayed at the Shanghai World Expo in 2010. In the same year, Borrowed Light Studios released the VR work –The Night Café. The year 2016 is notable for the advent of virtual reality (VR), which was exemplified by the release of the biographical animated film To Love Van Gogh – Mystery of the Stars. In 2019, the immersive spatial video exhibition, The World of Water Particles in Oil Tanks, held by TeamLab in Shanghai, generated a considerable response within the Chinese digital display industry and among the general public. In 2021, the NFT artwork – Every Day: the first 5,000 days was sold at Christie's for a price of $69.35 million, which led to a surge in interest in AI-generated

paintings. These works that have attracted public attention at these moments in time are all inextricably linked to the development of digital technology. At each significant stage of technological innovation, the symbols of traditional painting are reflected in the works, thereby demonstrating the results and influence of digital creation practices on traditional painting in recent years.

This paper is based on an investigation of the diverse applications of digital technology. The conventional practice of digital appropriation design is distinguished into three principal categories. In conjunction with the distinctive attributes of digital technology in terms of display and dissemination, it examines the interrelationship between design innovation, conceptualisation and digital technology, the trajectory of design applications, the evolution of digital technology and the dissemination pathways of traditional paintings and art works.

2. Digital Technology and Application

The categorisation of digital artworks on the theme of traditional paintings can be broadly divided into three principal categories, depending on the digital technology on which they are based. These categories are as follows: digital projection and large screen display; mobile, small and medium screen display; and virtual reality experience.

2.1 Digital Imaging: Immersion, Interaction and Artificial Intelligence Design

The earliest technological field to be employed in the digital reproduction of traditional paintings was digital computer-generated (CG) visualisation. This technical practice is also divided into multiple stages. The initial and most fundamental stage of the process is the transformation of a two-dimensional image into a three-dimensional one, or conversely, the transition from a static to a dynamic representation. This methodology is prevalent in the initial stages of visualising and animating traditional paintings. Around 2008, the emergence of computer 3D technology began to transform traditional flat static paintings into digital dynamic 3D videos. The early designers and artists introduced creative ideas that introduced the concept of linear narrative into traditional paintings, thereby making the visual symbols in the works come alive. This was achieved by employing the concept of dynamic time and space.

The second period saw a shift in focus from the technical transformation of traditional painting to an intervention in the concept of contemporary art, with artists beginning to consider the relationship between tradition and modernity. This period is marked by the 2013 introduction of two notable works: the new media series Mirage City Landscape (Fig. 1) by Chinese artist Yang Yongliang, and the Mona Lisa series by South Korean artist Lee Er-Nam. In Yang Yongliang's works, the conventional Chinese landscape painting format is replaced with contemporary elements, including highways, vehicles and modern citizens, thus creating a distinctive modern landscape painting world. This reflects the disharmony between the development of contemporary society and the lives of its inhabitants. Similarly, in Li Ernan's works, the dynamic Mona Lisa is surveying the chaos of human wars and ultimately annihilating herself amidst the turmoil. Contemporary concepts are being infused into traditional paintings, with artists drawing upon the past to convey the nuances of the present.

Fig. 1 Mirage City Landscape (Appropriation of Song Dynasty Painter Qu Ding's Summer Mountain Drawing)by Chinese artist Yang Yongliang

The third period focuses on the audience's sense of enjoyment and experience, increasing the immersion and interactivity of the design. Around 2017, TeamLab began to capture the world's attention by developing a series of immersive spatial interactive video works on the theme of Digitized Nature, bringing more innovative visual shock and pleasurable interactive experiences to visitors. Designers and digital artists have seen the new appeal of digital projection and laser scanning technologies working together to create immersive experiences. In 2019, Imagine Van Gogh: Starry Night (Fig. 2) was launched at the Atelier des lumières in Paris, France. The organisers selected 500 paintings by Van Gogh to be digitised and projected dynamic images synthesised by digital effects onto the walls of the exhibition hall, while the floor was designed as a spatial extension of Van Gogh's brushstrokes to match the works on the walls, creating a dynamic Van Gogh world for the audience. In 2021, this museum has also invited French artist Virginie Martin to mastermind the exhibition Wassily Kandinsky: the Abstract Odyssey, which created an immersive space that combines the musical and painterly aspects of the abstract master's paintings.

Fig. 2 Imagine Van Gogh: Starry Night from the Atelier des lumières in Paris

The fourth period manifests as programming and artificial intelligence technologies intervene in the practice of digital appropriation of traditional paintings. In 2022 ,Chinese new media artist Cao Yuxi created a work – Artificial Intelligence Landscape. The technological core of the Artificial Intelligence Landscape is the application of artificial intelligences with deep learning networks (StyleGAN) to collect a corpus of Rongbaozhai collection of classic works of pixel data. Following this, the data is used to train a big data model for the automatic, unlimited creation of works of landscape art that emulate the style of the masters. Concurrently, the content of the screen is emulated through the utilisation of 3D software, physical algorithms and particle dynamic effects. The landscape painting in the white section of the 'water' screen is represented by liquid particles, and the simulation of the depth of space within the screen exhibits collision, flow and transformation, thereby demonstrating the Naked-eye 3D visual effect. Subsequently, the halftone pattern algorithm is incorporated into a QR code pattern that can be scanned. This process generates an AI robot capable of producing an infinite number of QR code landscape animations in the style of ink paintings. At this stage of the process, the technology is relatively uncomplicated to implement. However, when the technical foundation is initially formed, excellent outcomes depend on the designers' and artists' content, as well as the depth of the AI algorithm database material.

The analysis revealed that the general progression in the digital appropriation of traditional paintings can be summarised as follows: firstly, the design of the display space and volume is intended to create an immersive environment, thereby establishing a distinctive visual style within the domain of painting. Secondly, the audience experience, immersion and interactivity are employed to facilitate a closer proximity between the artwork and the audience, reducing the perceived distance and heightening the interest in aesthetic activities. Thirdly, the application of technology, cross-field integration and the depth of intelligent design participation contribute to the advancement of this field.

2.2 Mobile Media: Free Experience and Distributed Connectivity

The accelerated advancement of microelectronics and mobile communication technologies has led to the pervasive integration of mobile terminal devices (e.g., cell phones, tablet PCs) into nearly

every aspect of social life. As a medium for the exchange of information, the display function has become one of the most fundamental aspects of the device, providing a vast platform for the dissemination of visual symbols such as traditional paintings. The progression of digital re-design of traditional paintings based on mobile media can be broadly categorised into two periods. The most significant demand for such creations is primarily driven by cultural institutions (e.g. museums and art galleries) that assume a portion of the social and public education role.

In the nascent stages of mobile device adoption and the advent of digital media technology in museum exhibitions, digital interactive display products were conceptualised with the utilisation of touch-interactive screens. In this digital media display for traditional painting, the primary function is to facilitate cultural popularisation. This allows the audience to gain a more profound comprehension of the painting and the artist's output, transcending the constraints of conventional museum displays.

In the second stage of the typology's evolution, mobile devices reached performance levels comparable to those of PCs, effectively addressing the initial challenge of distribution constraints due to inadequate hardware. As a result, traditional cultural education and promotion digital artworks, specifically designed for mobile devices by influential museums and art museums, emerged. In 2015, the Palace Museum of Beijing launched a mobile application for the Night Banquet of Han Xizai (Fig. 3), exemplifying this trend. 'The Night Banquet of Han Xizai, a handscroll attributed to the Southern Tang artist Gu Hongzhong (fl. mid–tenth century). In radiant colors and exquisite brushwork, the painting portrays the life of Han Xizai (902–70), a Southern Tang official whose nightly banquets with wine, women, and entertainment led Emperor Li Yu (r. 961–75) to spy on Han. '[2] In advance of the release of this mobile application, the Palace Museum had previously made three mobile applications available to the public: Yinzhen Beauty Picture, Auspiciousness of the Forbidden City, and A Day of the Emperor.

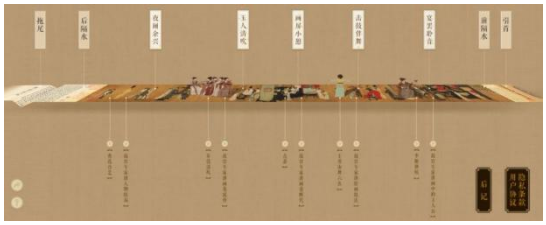

Fig. 3 App's display interface for the Night Banquet of Han Xizai

"The mobile app of The Han Xizai Night Banquet has been designed with a three-layer, multi-dimensional appreciation mode, comprising an overview layer, an appreciation layer and an experience layer. This enables users to view the digital scroll from afar, to approach it for closer appreciation and to access detailed explanations of the painting. The digital engine animates the figures in the painting, the music player plays the pipa, and the dancer performs, enabling the audience to become immersed in the artistic ambience evoked by the scroll. The ancient scrolls and their modern interpretations are mutually reinforcing and integrated, creating an experience that is both engaging and thought-provoking."[3] The release of this project primarily addresses the issue of traditional painting treasures being unable to be exhibited to the public for extended periods due to the deterioration of their material attributes. The application of digital technology enables the provision of high-definition images of cultural relics, accompanied by professional academic information, extensive multimedia content and innovative interactive design.

The primary tendency within the domain of digital appropriation of conventional painting is the progression towards a model of individualised and dispersed connectivity. Furthermore, the intrinsic nature of the mobile terminal medium fosters privatisation and flexibility, transcending temporal and spatial limitations, and conferring greater autonomy upon users. Concurrently, distributed links facilitate the formation of community circles, a defining feature of mobile terminal

products. These social attributes enable individuals with shared interests to congregate, establishing networks for information sharing and exchange.

2.3 Virtual Reality: Immaterial Activities

In the context of virtual reality technology, there is a paucity of digital design practices for traditional painting art in comparison to the preceding two technology types. However, from another perspective, traditional paintings that have been digitally visualised have the potential to serve as the foundation for VR/AR due to the fact that the production of virtual reality digital works involves integrating digital material through a virtual engine and then presenting it in a VR/AR format. In this way, the physical constraints of traditional display media can be circumvented, allowing for a broader digital dimension to be explored or for the fusion of digital and real space to be realised.

In 2015, Borrowed Light Studios released the VR work – The Night Café (Fig. 4), which enables viewers to explore the stylised world depicted in Van Gogh's oil paintings by wearing a VR headset. This piece incorporates scenes, objects and characters from Van Gogh's paintings, including The Artist's Bedroom, Twelve Sunflowers, Van Gogh's Self-Portrait and so on. Furthermore, The Night Café is integrated narratively through three-dimensional modelling, displayed in a real-virtual space for the user, who is free to navigate this space as if it were the paintings themselves, passing through the door and viewing the interior from a window. The result is a three-dimensional Van Gogh painting.

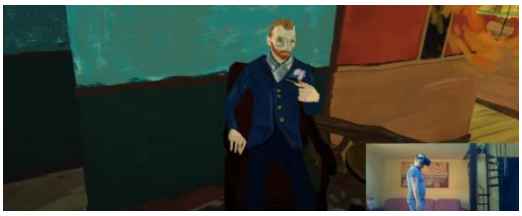

Fig. 4 Screenshots of the VR work – The Night Café

The adaptation of traditional paintings into VR/AR formats entails a higher technical threshold, more sophisticated production techniques, and more advanced hardware requirements. However, the characteristics of this technology demonstrate a greater reliance on computational performance, with a lesser dependence on the physical space of the work. The immateriality of the work is more pronounced, affording the audience a more free and immersive appreciation experience. The creation of this type of artwork is contingent upon the advancement of VR technology and the development of VR equipment. Consequently, the next phase of this artistic endeavour will be contingent upon a technological breakthrough in either of these two areas. Nevertheless, the potential for integrating VR technology with traditional painting techniques is a fascinating prospect.

3. Contemporary Design Thinking : Visual Symbol Deconstruction

In the existing works of digital appropriation of traditional paintings, it has been observed that artists often choose to reconstruct the original works from the perspective of visual symbol reconstruction, thereby subverting the core concept of the original works. The application of design thinking in this process results in a shift in focus from the traditional aesthetic qualities of the original paintings to a more contemporary perspective. This approach encourages the audience to engage with the design logic and concepts underlying the transformation of symbols, rather than solely focusing on the aesthetic aspects of the original works. This illustrates the significance of selecting and utilising design techniques that capitalise on the strengths of the chosen technical media.

The Mirage Landscape series, as previously mentioned, represents an exemplar of this conceptualisation in practice. In another digitally generated art installation – the Dwelling in the Fuchun Mountains (2019) (Fig. 5), new media artist Cao Yuxi incorporates QR code symbols into their work, relying on AR display technology. The artist designed Huang Gongwang's Dwelling in the Fuchun Mountains ,which is a work by Huang Gongwang, a painter of the late Song and early Yuan dynasties, created between 1347 and 1350. The painting features the Fuchun River in Zhejiang Province as the backdrop, with the mountains and the water depicted sparsely. This ancient Chinese painting was rendered in the style of a halftone print from a newspaper, and the original painting was then divided into a 3x53 two-dimensional code array. This approach conceals the appreciation of the work as a complete single painting, demonstrates the importance of QR codes in today's society, and emphasises the thinking behind the 2D totem.

Fig. 5 AR Installation Art – the Dwelling in the Fuchun Mountains (2019) by Cao Yuxi

There are significant differences in the conceptualisation of tradition between Eastern and Western cultures. The evolution of Western painting appears to have been predicated on a single opposition to its predecessor. Conversely, the Eastern cultural tradition places greater emphasis on the concepts of inheritance and development. The concept of "restoration" is frequently emphasised in the context of traditional painting, particularly in relation to the digital appropriation of existing paintings. This approach emphasises the technical ability to accurately reproduce the original painting in a digital format. The values of innovative approaches, which are more aligned with the demands of the contemporary era, has been undervalued. Consequently, in the digital appropriation of traditional paintings, the application of innovative thinking that is in opposition to tradition becomes a crucial element.

4. Realization of Communication Benefits

The social dissemination of traditional paintings following digital appropriation plays a role in determining the extent to which their social benefits are realised. Primarily, the domestic dissemination channels for the realisation of the relevant benefits can be categorised into three principal types: television dissemination, self-media dissemination, and offline display.

4.1 Television Dissemination

Notable television communications projects such as the 2022 Spring Festival Gala debut of the performance art programme – Memory of the South of the Yangtze River were digitally synthesised and created against the backdrop of a 3D restoration of the Dwelling in the Fuchun Mountains combined with live-action keying. The television series The Song Palace, featuring a live-action video adaptation of The Night Banquet by Han Xizai, was subjected to a restoration process.

4.2 Self-Media and Game Dissemination

The self-media platform is currently the most widely accessible means of disseminating video content, whether in the form of short videos, YouTube channels, news apps, or other video-sharing platforms. The advantages of the multimedia platform are most evident in the context of short video content, which has experienced a significant surge in popularity. In terms of mobile communication, investment in game-based communication is relatively high. The most costly and risky option is to develop a new game project based on a traditional painting. However, a more prudent choice would

be to co-brand with an existing game project IP, as this allows one to leverage the user base of the existing game project, thereby reducing publicity and project production and development costs. For example, the dissemination of the Black Myth : Wukong to traditional Chinese temple Buddhist architecture is a phenomenon that warrants further investigation.

4.3 Offline Display

The principal benefit of offline display and dissemination is that the audience is able to appreciate the works in a more optimal manner. The audience is able to appreciate the work in an exclusive artistic environment, which is created through the offline dissemination of the exhibition. This allows for a more intuitive appreciation of the aesthetic qualities of the work. This offline sense of presence is unparalleled by any other means of communication. The principal disadvantages of offline exhibitions are the limitations imposed by time, space and the need for maintenance personnel.

5. Conclusion

The application of digital technology in traditional painting, digital appropriation and design determines the final presentation of the work. From a design perspective, the choice of designers in line with the concept of creation and the technical approach is to complete the work of the basic elements. In addition, the same should not be ignored in the process of digital media appropriation and design innovation thinking. By employing contemporary design thinking, one can facilitate the digital reproduction of traditional culture and art, thereby guiding public culture and serving the specific characteristics of the cultural field. This approach also has the beneficial effect of diminishing the barrier to participation in social aesthetic education.

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