

Intelligent digital cultural tourism - Design and research of digital art in urban cultural tourism

Zhiyong Yang^{1*}, Ning An², Junliang Liu³

yangzhiyongda@163.com^{1*}, 2355070@qq.com², 452957183@qq.com³

Jilin Animation Institute, Changchun, China

Abstract: The fusion of digital art and cultural tourism has emerged as a trend and presents an opportunity for future growth. This article delves into the design and research of digital art in the realm of urban cultural tourism. Urban cultural tourism, as a crucial component of modern tourism, is confronting ever-evolving demands and obstacles. Digital art, as an innovative cultural expression, has introduced fresh trends and opportunities for urban cultural tourism. Taking the digital implementation of Lianhua Island Tourism Resort in Jilin Province as a case study, this article delves into the intelligent design of digital art in urban cultural tourism and explores the innovative technology application of digital art in cultural tourism projects.

Keywords: Digital art, Urban cultural tourism, Innovative technology application, Tourism project operation.

1. Introduction

In today's digital era, digital art has become a compelling emerging force in the field of urban cultural tourism. The vigorous development of digital art has brought unprecedented opportunities to the cultural tourism industry. Through its unique creative and technological means, digital art provides new dimensions and depth for cultural tourism, making tourist destinations more attractive and focusing on the interaction and emotional resonance between tourists and culture. With the support of digital art, cultural heritage can be presented more vividly to tourists, which can better help protect and maintain cultural heritage, thus increasing the balance between tourism experience and cultural protection. Digital art has become a force that cannot be ignored in urban cultural tourism, bringing new opportunities and challenges to the tourism industry and cultural heritage, and injecting new empowerment into urban cultural tourism. The integration of digital art and cultural tourism can open up new market areas, bringing more opportunities and challenges to the economic growth and development of cities.

2. The trend and opportunity of digital art in cultural tourism projects

Cultural tourism has emerged as a prominent trend in the worldwide tourism industry in recent years. Tourists are now showing a growing inclination towards seeking out enriching cultural and historical experiences, as opposed to solely traditional vacation and entertainment activities.

The increasing emphasis on cultural diversity and the desire to explore and understand local cultures are the main reasons behind this trend. Cultural tourism involves visiting cultural attractions, participating in cultural festivals, and experiencing local traditions and cultural characteristics. Not only does it enrich the travel experience of tourists, but it also creates new economic opportunities for destinations. The increasing trend of cultural tourism offers a vast platform for the implementation of digital art in urban cultural tourism. Digital art is an art form that relies on digital technology, utilizing computers and other digital tools to create, exhibit, and interact with art. It stands out from traditional art forms as it is no longer constrained by traditional materials and media. The forms of digital art are diverse, encompassing digital painting, digital sculpture, virtual reality art, and many more. Digital artists have the ability to craft breathtaking visual and sensory experiences through the use of computer-generated images, sounds, and interactive elements[1]. This burgeoning art form has sparked broad interest within the art world and the field of science and technology, offering pioneering methods for showcasing and exchanging cultural tourism[2].

The fusion of digital art and cultural tourism has generated fresh opportunities for urban cultural tourism. Cities can offer more captivating tourist experiences by integrating digital art into cultural tourism destinations. For instance, cities can employ digital art to revive historical scenes, enabling visitors to have firsthand experience of past cultural landscapes. Furthermore, digital art can enhance cultural festivals and events by means of projection, interactive installations, and other methods, thereby increasing participation and providing more entertainment. Not only does this help attract tourists, but it also enhances the popularity and attractiveness of the destination. The integration of digital art opens up new avenues for cultural education and dissemination, fostering the preservation and exchange of culture[3]. The emergence of digital art within cultural tourism has opened up new possibilities for urban cultural tourism, offering visitors richer, more varied, and more enlightening cultural experiences, and providing opportunities for growth and development for destinations.

3. The utilization of innovative technology in digital art

3.1 Immersive experience technology in digital art

Digital art offers audiences a more profound and engrossing art experience through immersive technology. Technologies like virtual reality (VR), augmented reality (AR), and mixed reality (MR) are extensively utilized in digital art, enabling viewers to engage with and contribute to artworks. This immersive experience is achieved by utilizing virtual reality headsets, AR glasses, or MR devices, enabling the audience to fully engage with the digital creation[4].

In VR, head-mounted devices are worn by viewers, immersing them in a fully virtual environment where they can interact with digital artworks. This virtual environment can exist as a digital world or a simulated real-life scenario, enabling viewers to freely explore its elements, interact with virtual objects, and even alter the environment's dynamics. This experience significantly enhances the viewer's perception, creating an immersive sensation of being within the artwork. AR technology allows for the superimposition of digital content onto the real world, which can then be displayed to the audience through either AR glasses or mobile applications. This technology enables viewers to engage with digital art while experiencing natural or urban landscapes. For instance, when visiting art museums, viewers can witness

interactive elements or interpretive information about the artworks through AR. By doing so, AR enhances the interaction between the audience and the artworks, providing them with more information and emotional connections. MR seamlessly combines elements of virtual reality and augmented reality, enabling a more intertwined experience between digital art and the real world. In MR, viewers can perceive the presence of both the real world and virtual elements, enabling them to interact with the former while also experiencing the latter. This technology integrates artworks with the environment, providing a more comprehensive and rich digital art experience for the audience, creating unique emotional and thoughtful experiences[5].

Immersive experience technologies such as VR, AR, and MR have provided digital art with unparalleled interactivity and emotional depth. Not only do these technologies enrich the audience's perception and participation experience, but they also offer a novel form of expression for digital artists, thereby advancing the application and evolution of digital art in cultural tourism and other domains[6].

3.2 Light interaction technology in digital art

Lighting Interaction Technology in digital art is a significant technology that enables the control and interaction of light, thereby creating a more profound and engaging artistic experience for the audience. This technology is crucial in showcasing digital art works, requiring the integration of various professional concepts and technologies.

- **Gobo Projection:** Gobo projection is a technique that utilizes light to project unique patterns or images onto a surface. In the realm of digital art, light sculpture enables artists to infuse their works with distinctive patterns, textures, or visual elements, thereby altering the appearance and ambiance of their art. This technology is frequently employed to produce a powerful artistic lighting effect.
- **Light Painting:** Light painting is a technique that involves drawing patterns or shapes by moving a light source. In the realm of digital art, artists have the ability to create captivating artistic effects through the use of light painting techniques, which involves drawing light trails or shapes, and seamlessly integrating them into their pieces. The audience can participate in the artwork by interacting with the light source to alter the form of the light painting.
- **Projection Mapping:** Projection mapping is a technique that accurately projects image or video content onto objects or building surfaces. In the realm of digital art, projection mapping serves to modify the appearance of structures, transforming them into colossal art screens or crafting visual effects that perfectly fit the building's shape. This technique is frequently utilized in urban cultural activities and architectural installation art.
- **Color Rendering:** Color rendering refers to modifying the color impact of a piece by adjusting the color of the light. Digital artists have the ability to create various emotional and visual impacts by utilizing color rendering, for instance, conveying warmth and comfort through warm colors or creating a mysterious and science fiction ambiance through cool colors.
- **Lighting Interactive Control System:** The Lighting Interactive Control System is a specialized system designed for digital art that facilitates accurate control over lighting interaction. Typically, these systems consist of hardware and software components that enable artists to modify parameters such as light intensity, color, movement, and more, through programming or real-time control in response to audience interaction and variations in the work.

By utilizing lighting interaction technology, digital artists are able to produce distinctive, vibrant, and captivating artworks, while audiences are given the opportunity to actively engage with the artistic experience, thereby altering the appearance and emotional expression of said works. This technology is crucial in showcasing and expressing digital art, providing audiences with an unparalleled interactive artistic experience.

3.3 Computer graphics generation technology in digital art

Computer Graphics Generation is an essential component of digital art, encompassing diverse technologies such as the creation of virtual environments, synthesis of images and videos, and the addition of special effects. Digital artists have the ability to produce diverse forms of visual art through the use of computer graphics generation technology, ranging from abstract digital paintings to highly realistic virtual reality scenes. Modeling of virtual environments is a crucial concept in the generation of computer graphics. It utilizes mathematical modeling techniques, including polygon meshes, curves, and surfaces, to represent and simulate the shape and structure of objects. These mathematical models offer a solid foundation for digital artists to construct virtual landscapes featuring intricate structures. The synthesis of images and videos is another crucial aspect of computer graphics generation. This encompasses the process of integrating diverse visual components into a single image or video, in order to produce imaginative and artistically significant works[7]. To ensure that the work achieves the desired appearance and feel, this synthesis typically incorporates various techniques including color correction, lighting effects, texture mapping, and perspective projection[8]. The incorporation of special effects is a vital element of computer graphics generation, encompassing the inclusion of distinctive visual and sensory effects in the work. Special effects can be either optical effects, such as blurring, refraction, and reflection, or dynamic effects, such as particle simulation, physical simulation, and liquid animation. Digital artists are equipped with abundant creative tools thanks to these special effects technologies, allowing them to freely express unique artistic perspectives and ideas.

4. Intelligent cultural tourism project operation innovation brought by digital art

The utilization of digital art in urban cultural tourism not only enriches cultural experiences, but also enhances sustainability, promotes cultural heritage, increases cultural participation, and breaks the monopoly of traditional culture. Utilize intelligent technologies such as the Internet of Things, artificial intelligence, and big data to design customized solutions and services for digital art elements[9]. These projects have not only introduced new tourism opportunities for the city, but have also fostered the cultural heritage and advancement of the city.

4.1 The operational mode of digital art and cultural tourism projects under intelligent design

In traditional tourist attractions, the approach of "restoring the old as the old and imitating the real scene" is typically taken. This implies that scenic spots will endeavor to preserve the authentic appearance of historical assets or natural landscapes, and endeavor to restore past scenes. Tourists primarily experience the scenic spot through viewing and listening, which is "spectator-based, static, and single-sensory". The on-site experience plays a significant role,

whereby tourists must personally visit scenic spots, follow tour guides, or participate in live performances and other activities in order to comprehend history or culture.

Digital technology has revolutionized the experience mode in scenic spots enabled with AR/VR, integrating virtual reality and acousto-optic technology to offer tourists an immersive, highly interactive, and multi-sensory travel experience. This innovative model breaks the constraints of time and space entirely, enabling tourists to experience and fully feel the allure of the scenic spot through digital technology and the cloud, rather than being confined to the scene itself. Advanced technologies are gradually replacing traditional two-dimensional code recognition methods, and ticket revenue is no longer the sole economic pillar of scenic spots. The introduction of AR/VR technology offers visitors a diverse and abundant selection, including AR real-time navigation, which facilitates the exploration of every corner of the scenic spot with greater ease. AR attraction games enhance entertainment and interactivity, providing visitors with the opportunity to engage in the scenic spot's story. Co-creating an augmented reality experience offers visitors opportunities for meaningful engagement, enabling them to deeply experience and integrate into the culture of the scenic spot. Furthermore, the launch of AR-IP cultural and creative products has led to the continuous expansion of the scenic spot's value chain, thereby not only enriching tourist experiences but also greatly improving the scenic spot's economic benefits. The fusion of digital technology and digital art not only enhances the content and experience of cultural tourism endeavors, but also significantly impacts the operational mode of scenic spots. There exists a discernible contrast between conventional scenic spots and those enabled with AR/VR technology. The former emphasizes traditional on-site viewing, whereas the latter concentrates on digital innovation and virtual interactive experiences. This transformation underscores the pivotal role of digital technology in cultural tourism initiatives, and how digital art enhances tourists' cultural tourism experience, elevating the scenic spot experience to a whole new level.

4.2 The difference between intelligent design digital art tourism projects and traditional scenic spots

The traditional digital space operates primarily on QR code recognition technology, utilizing it to offer a multitude of information and experiences such as ticket revenue, live performances, voice explanations, and tour guide explanations. The provision and communication of these elements are centered around the physical attraction tour, and in order to fully immerse themselves in the culture and history of the attraction and enjoy the richness of these information and experiences, visitors must travel to the site in person. Furthermore, traditional digital spaces encompass elements such as celebration events, map navigation, food and snacks, and entertainment facilities, all of which exist to offer a more comprehensive tourism experience. In the traditional digital space, tourists typically have to purchase tickets and subsequently rely on physical signs or QR code scanning to acquire information within the scenic spot. Live performances and audio tours typically necessitate visitors to either arrive at designated attractions or attend specific performances in order to acquire pertinent information and enjoy entertaining experiences. The effectiveness of tour guide explanations hinges on the expertise of professional tour guides, requiring tourists to remain attentive and follow the guide's pace in order to fully appreciate the stories and history of the scenic spots. Celebration activities, map navigation, food and snacks, and entertainment facilities are designed to enhance visitors' entertainment and leisure options, but they also necessitate on-site participation. The

characteristic of the traditional digital space is that it relies on the presence of physical scenic spots and the actual visit of tourists. This model places emphasis on personal experience and on-site interaction, particularly the importance for tourists to visit scenic spots.

In comparison, AR smart space has created a unique experiential environment by ingeniously fusing the virtual and real worlds, providing tourists with a more diverse and three-dimensional perception. One of them, AR real-time navigation, has emerged as an indispensable aid for tourists looking to explore scenic spots, enabling them to navigate to different attractions with ease and convenience. Introducing entertaining elements into AR attraction games enables tourists to not only learn during their cultural tourism journey but also to enjoy the fun of games, adding an interactive and joyful component. The co-creation of AR experiences offers a distinctive opportunity for tourists to engage actively in the scenic spot's creative and interactive activities. The AR Smart Tour presents visitors with more detailed and vivid information, showcasing history, culture, and stories in an engaging manner, thereby enriching the visiting experience with greater depth and richness. The introduction of AR-IP cultural and creative products not only enables visitors to preserve the memory of the scenic spot after the tour, but also allows them to bring the culture and characteristics of the scenic spot back home, thereby achieving emotional continuity. Furthermore, AR space advertising and AR landscape interaction offer visitors additional opportunities for engagement and participation, enabling them to fully immerse themselves in the ambiance of the scenic spot. AR storytelling integrates digital art and scenic storylines to provide visitors with a richer and more engaging experience, making them feel as if they are stepping into a world full of surprises and artistic sensations.

When combined, the innovative construction of AR smart spaces and the utilization of diversified experiential elements significantly enhance the connotation of cultural tourism projects, offering tourists a more profound and multi-layered cultural tourism experience. Not only does this new model enhance the interaction and participation between tourists and scenic spots, but it also makes cultural tourism projects more attractive, drawing in more tourists to explore and experience their charm.

4.3 The application of intelligent design in urban cultural tourism on Lotus Island, located in Jilin Province

Lotus Island is an important cultural tourism project in Jilin Province in recent years. It is a leisure tourism resort with themes of film and television culture, northeast anti-japanese alliance red culture, and northeast folk culture, providing visitors with a rich and colorful cultural tourism experience. Lotus Island actively applies digital art technology, combining its traditional culture and natural landscape with modern technology, and has now become a new star in the tourism industry of Jilin Province.

Lotus Island Scenic Area is located in Yongchun Town, south of Changchun City. Previously, it was a barren mountain, wasteland, and marshland that had been abandoned for decades. Although the project has been completed, the tourist flow is continuous, but the radiation and popularity are limited to local tourists. In recent years, Lotus Island has adopted digital technology in a positive manner, and is committed to recording and inheriting the rich history and culture of the local area. This includes creating digital archives, providing online historical education resources, and establishing virtual museums and mobile game applications. Through these digital technologies, tourists can have in-depth understanding of the history and tradition

of Lotus Island at any time and place, no longer limited by time and location. This initiative provides a new way for the protection and inheritance of Lotus Island's cultural heritage, and enriches the cultural tourism experience of tourists. At the same time, Lotus Island has introduced a virtual reality (VR) guided tour system, which brings a wonderful journey of time travel for tourists. It seems that tourists can travel through time and visit the famous historical sites, historical buildings, ancient villages, and natural attractions on Lotus Island, and experience the past life of the Northeast Anti-Japanese United Army. This virtual guided tour system enriches the experience of tourists in an unprecedented way, enabling them to have a deeper understanding of the history and culture of Lotus Island, while immersing themselves in the immersive feeling. In the museum and cultural center of Lotus Island, holographic projection technology is fully utilized to create a unique cultural exhibition. These exhibitions vividly present historical events and cultural stories through holographic projection technology, attracting tourists' attention and enabling them to have a deeper understanding of Lotus Island's cultural heritage. It seems that tourists can experience important moments in history and feel the inheritance and innovation of culture. This holographic projection exhibition has become a highlight of Lotus Island's cultural tourism. Through the application of digital art, Lotus Island successfully integrates traditional culture and modern art, providing tourists with more diversified and rich cultural experiences, further promoting the prosperity and development of Lotus Island's cultural tourism industry, enabling tourists to have a deeper understanding and appreciation of Lotus Island's history, culture, and art, leaving them with unforgettable memories. The application of digital art has brought new development opportunities for urban cultural tourism, and promoted the prosperity and inheritance of local cultural heritage.

The case study of Lotus Island in Jilin Province shows that the successful application of digital art in urban cultural tourism provides useful experience and inspiration for other regions. The development of digital cultural tourism projects requires cooperation among the government, cultural institutions, and enterprises to promote innovative applications of digital technology and digital art. Future research should continue to focus on the development of digital art in the field of cultural tourism, in order to continuously expand the prospects and possibilities of urban cultural tourism.

5. Conclusion

The use of digital art in cultural tourism has become an unmistakable trend, and it has achieved success with technical assistance and practical applications. Digital art offers novel possibilities to meet the increasing demand for unique cultural experiences among tourists, particularly in the era of cultural tourism. As technology continues to advance and innovate, we can anticipate digital art to assume a more significant role in cultural tourism, offering visitors more immersive and profound cultural experiences, fostering the preservation of cultural heritage, and contributing to the success of urban cultural tourism. This has made the integration of digital art and cultural tourism more vibrant, with digital art emerging as a critical force behind the future growth of cultural tourism.

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