Original Research Article

Research on the development trends of traditional photography under the influence of virtual reality: A case study of the application of 360°VR photography in digital cultural and tourism products

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Abstract: Following the process of "panoramic capture—Image stitching—Virtual presentation," 360°VR photography creates a brand-new immersive travel experience for users, driving the tourism industry to transition from traditional image recording to interactive, immersive experiences. By comparing the technical foundations, creative models, and aesthetic values of 360°VR photography and traditional photography, this paper reveals how 360°VR photography breaks free from physical space constraints, reconstructs the photographic creation process, and reshapes the role of creators through virtual space construction and audience interaction. The research further explores specific application cases of 360°VR photography in digital cultural and tourism, analyzing its prospects and challenges in cultural heritage preservation, virtual tourism navigation, and scenic area digitalization. 360°VR photography is not merely a continuation and expansion of traditional photography, but a core driving force for the development of digital cultural and tourism products, heralding the in-depth integration and innovative development of photographic art and the tourism industry.
Keywords: 360°VR photography; virtual reality; digital tourism products

1. Theoretical foundations of 360°VR photography and comparison with traditional photography

1.1. Definition of 360°VR photography

360°VR photography captures 360-degree field-of-view images or videos using panoramic cameras or multi-lens arrays, generating immersive visuals that can be displayed on virtual reality devices. Unlike traditional photography, which relies on optical imaging and physical exposure, 360°VR photography employs multi-perspective and image stitching technologies to construct three-dimensional virtual spaces, allowing audiences to freely explore and interact within the virtual environment. The early QuickTime VR (QTVR) format provided technical support for interactive panoramas; with the advancement of Web technologies, 360°VR photography has been widely popularized, especially in the field of digital cultural and tourism products, becoming a core tool for virtual tourism and interactive navigation. Through 360°VR photography, users can freely browse cultural heritage sites and natural scenic spots in a virtual environment, achieving remote immersive travel experiences that break the constraints of time and space, and promoting the innovation and upgrading of digital cultural and tourism products.

1.2. Technical and aesthetic foundations

Developers need to figure out how to assemble individual 360° images into coherent and interactive virtual tourism routes; otherwise, users are likely to get disoriented during the immersive experience, resulting in a fragmented user experience. From an aesthetic perspective, the creation of 360°VR photography must pay attention to the aesthetic effect of images, but also consider how to guide the audience's attention and how to leverage interaction to enhance the immersive experience. Therefore, the immersive and visually rich attributes embodied in 360° virtual tourism experiences can significantly boost users' sense of presence and emotional engagement, thereby stimulating their behavioral intention for real-world travel at the cognitive level and providing behavioral mechanism support for the design of digital cultural and tourism products. This aligns with the notion proposed in the Journal of Aesthetics & Culture (2025) that "the aesthetics of AI images are no longer based on the contingency of light and shadow, but on the statistical nature of datasets[1]". The creative inspiration

for 360°VR photography has shifted from photographers' perceptual intuition to the underlying patterns of algorithms.

1.3. Comparative analysis of 360°VR photography and traditional photography

Traditional photography captures a moment in the real world using cameras, lenses, and photosensitive materials, and audiences usually perceive photos as reflecting objective scenes of reality. In contrast, 360°VR photography simultaneously captures full-angle images through multiple lenses, creating a virtual "sense of space." This change is not only a technological advancement but also an innovation in narrative methods: from the "observation and recording" of traditional photography to the "spatial navigation and interactive experience" of 360°VR photography. From a technical perspective, the technical foundation of traditional photography is optical imaging and physical exposure, while 360°VR photography mainly relies on image stitching and 3D modeling. In terms of creative form, traditional photographers act as observers of scenes, while 360°VR photographers can be described as "designers of space," constructing virtual scenes through lens array arrangement and post-image processing. The future of photography is no longer just recording the world, but training the way the world is seen[2], which reflects that the essence of 360°VR photography is not to imitate reality, but to reshape the way images are viewed and their cultural significance through algorithms.

2. Manifestations of the impact of 360°VR photography on traditional photography

2.1. Technical threshold

Image stitching algorithms require precise feature point matching and image registration to ensure the seamless connection of generated panoramic images[3]. Virtual space design is not merely a simple visual presentation; creators must also consider how to guide the audience's focus, design interactive elements, and provide users with a smooth experience process. For example, the results of 3D modeling can be used to build digital cultural and tourism platforms such as virtual tours of grotto heritage sites like the Mogao Grottoes, the Digital Palace Museum Relic Library, and Peking University Archaeological Virtual Simulation Experiment Center, providing users with immersive browsing experiences without leaving home. These technical challenges and requirements go beyond the boundaries of traditional photography technology and also drive 360°VR photography creators to gradually transform into virtual space designers.

2.2. "Authenticity" and copyright

Although 360°VR photography creates a more realistic visual experience, its essence is still the digital restoration of real scenes. In digital cultural and tourism products, when conducting 360°VR shooting of scenic spots and sites, it is sometimes necessary to restore some missing historical details or carry out artistic processing, making the boundary between "reproduction" and "creation" blur and the authenticity issue tricky. Especially when involving historical and cultural heritage and public spaces, creators must ensure that all generated content is both legal and authentic, avoiding false discourse and cultural misinterpretation. The "credibility" of images is giving way to "generatability"[4]. From the perspective of copyright issues, 360°VR photography involves the copyright of shooting equipment, the portrait rights of characters in scenes, and the copyright of derivative content in virtual spaces. If 360°VR photography works involve supplementary content generated by artificial intelligence, creators must clarify the ownership of these contents to avoid infringing on others' copyrights.

2.3. Reshaping the role of creators

Traditional photographers are usually regarded as observers and recorders of reality. Through unique composition, light and shadow, and timing capture, they endow their works with personal perspectives and emotional expressions[5]. In the context of 360°VR photography creation, the identity of photographers has gradually transitioned to directors and world builders. Creation no longer relies on real scenes but proactively builds new visual narratives from scratch. Similar to the "Remix" function of AI platforms, which allows users to restructure the structure of any generated video and reset scenes, objects, and narrative logic, this indicates that the boundary of works has shifted from shooting to creating what kind of space. To maximize the effectiveness of 360°VR photography in digital cultural and tourism, creators must pay attention to content quality and interactivity, ensure high-quality images and experiences to meet

tourists' high expectations for details and interaction, thereby promoting the transformation of creation from "recorders" to "conceptualizers."

3. Reshaping of traditional photography by 360°VR photography

3.1. Reshaping the creative process

The traditional photography process focuses on single-perspective capture and the presentation of physical scenes, with a linear flow of composition, exposure, shooting, and post-adjustment. In contrast, 360°VR photography constructs a complex process integrating multi-perspective collection, panoramic image stitching, 3D space construction, and immersive interaction design, requiring creators to have higher comprehensive capabilities in multi-dimensional space composition, user interaction logic, and real-time rendering. This process restructuring is particularly evident in digital cultural and tourism products: virtual reality experiences have a significant positive impact on tourists' perceived destination image, and high-quality VR content and sensory stimulation are key technical components to achieve immersion and enhance user behavioral motivation.

3.2. Reshaping aesthetic values

360°VR photography reconstructs the concept of "the decisive moment" in traditional photography. Through panoramic images and 3D space design, 360°VR images require creators to conduct more complex artistic design and planning on spatial layout, interactivity, and emotional guidance. Immersive virtual experiences can significantly enhance the audience's cognition and emotional investment in destinations, especially in virtual tourism navigation and cultural heritage preservation. The adoption of 360°VR technology breaks the boundaries of physical space, bringing audiences an immersive interactive experience. Within the virtual environment, creation is no longer the "reproduction" of static images, but the construction of multi-layered narrative structures through the continuous changes of time and space and users' interactive participation, redefining the essential significance of photographic creation and emphasizing the transition from single technical operation to a comprehensive creative process. Therefore, the artistic expression of 360°VR photography has completed the transition from "technical scarcity" to "conceptual scarcity."

3.3. Reshaping the role of creators

In the traditional model, cameras are tools fully controlled by humans. 360°VR imaging does not eliminate photographers but guides their role to transform from technical operators to meaning planners. Photographers' artistic creativity is reflected in the creative control within the algorithmic context, indicating that the professional identity of "photographers" is in the process of reconstruction, with core competitiveness shifting from proficient technical mastery to creative semantic capabilities.

4. Development trends of 360°VR photography

4.1. Ethical and institutional construction

360°VR photography is widely used in the field of digital cultural and tourism. Currently, urgent issues to be addressed include ensuring the authenticity of virtual spaces, protecting user privacy, and reasonably using the copyright of generated content. 360°VR photography and digital cultural and tourism products need to formulate stricter ethical guidelines and copyright management methods to ensure that all generated and displayed content complies with legal and moral norms.

4.2. Normalization of human-machine co-creation

360°VR photography is not only a personal creation of photographers but also a collaborative result of interaction with artificial intelligence, generative models, and users. Traditional photography relies on photographers' personal experience and observation, while 360°VR photography is generated through model learning and deduction. When the two are combined, creation enters a stage driven by dual motivation, and photographers no longer only act as observers but as directors collaborating with algorithms. Systems such as Runway Gen 3, Midjourney V6, and Sora 2 allow users to create personalized images through semantic prompts, style weights, and lens control, and creators will transition from "operation" to "curation" during interaction. Future image creation will take "Prompt engineering," "style fusion," and "semantic curation" as core components, and photographers must possess algorithmic literacy and semantic expression capabilities. This co-creation model will change the production method of works and blur the clear boundary between authors and tools, making human-machine collaboration a new norm in visual art.

4.3. Transformation of aesthetic concepts

When people appreciate photographic works, they mostly focus on how realistically they reflect the world. In contrast, 360°VR photography emphasizes a sense of space and interactivity. When people begin to appreciate intelligent images, they care more about the emotions, styles, and ideas they express rather than whether the photos actually exist in the real world. Future image art will further emphasize emotional construction, conceptual expression, and symbol generation, creating a diverse and interactive visual cultural system.

5. Conclusion

360°VR photography is not merely an extension of traditional photography but a brand-new creative approach in digital cultural and tourism products. 360°VR photography leads visual art from two dimensions to spatial dimensions, redefining the creative process and aesthetic significance. With the development of technology, human-machine co-creation will become the core method of future photography, driving image creation into a new era of immersive interaction.

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References

[1] Ogundipe, A. Generative Artificial Intelligence, Agency, and Aesthetic Subversion in Photographic Art[J]. Journal of Aesthetics & Culture, 2025, 17(1). DOI:10.1080/20004214.2025.2557675.

[2] Transbordeur. Photography and Algorithms[J]. Transbordeur. Photographie, Histoire, Société, 2025(9): 1–230.

[3] Argyriou, L., Economou, D., Bouki, V. Design Methodology for 360° Immersive Video Applications: The Case Study of a Cultural Heritage Virtual Tour[J]. Personal and Ubiquitous Computing, 2020, 24(5): 843-859. Springer, https://doi.org/10.1007/s00779-020-01373-8.

[4] Li, M. Z. The Impact of Generative Artificial Intelligence on Image Authenticity and the Repositioning of News Photography[J]. Journalism & Communication Review, 2023(4): 56–63.

[5] Barthes, R. Camera Lucida: Reflections on Photography[M]. Beijing: SDX Joint Publishing Company, 2015.