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Research on the application and communication of VR video in tourism culture Promotion

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Abstract: The rapid development of VR video technology leads the innovation of digital media. This paper points out that VR tourism is faced with challenges such as technology cost, equipment popularization, content creation and user acceptance, and puts forward technology collaboration, content innovation and cognitive improvement strategies to promote the integration of global cultural tourism and two-way value empowerment.

1. Introduction

With the acceleration of globalization and the rapid development of information technology, the promotion of tourism and culture is facing unprecedented opportunities and challenges. Traditional tourism promotion methods, such as brochures and advertisements, have been difficult to meet the needs of modern consumers for immersive experience. At the same time, the rise of virtual reality (VR) technology has brought new possibilities for tourism culture promotion. VR video can break through the limitation of time and space, allow users to experience the distant scenery and culture personally, and greatly enhance the attraction and interactivity of communication. This technology can not only help potential tourists to "experience" the destination in advance, but also enhance the depth and breadth of cultural communication through vivid visual presentation. In particular, peoples demand for contactless travel experience is increasing, and the application of VR video is particularly important. Through VR technology, tourist destinations can more efficiently show their unique charm to the global audience, and promote the dual development of cultural communication and tourism economy[1]. Therefore, integrating VR video into tourism culture promotion is not only an inevitable trend of technological progress, but also a key measure to meet the market demand and improve the communication effect.

2. The advantages of VR video in tourism and culture promotion

2.1 Image shaping and marketing of tourist destinations

VR video reconstruct the tourism destination marketing paradigm through scene full dimensional penetration and emotional narrative. Traditional propaganda relies on one-way output of text or short video, and information transmission is flat and lacks interactivity. VR video uses 360°

panoramic perspective and high-precision modeling technology (such as millimeter level reconstruction of street texture of ancient town and natural landscape micro-landform) to achieve "zero-distance touch" of the destination image. For example, in the project of "Visit Jiuzhaigou", users can freely control the viewing Angle, overlooking the calcified pool group from the sky to the waterfall. Combined with real-time weather simulation (sunny and rain switching, cloud and fog flow), the visual memory points are dynamically strengthened. Technology can assign, VR marketing can capture the user behavior trajectory (such as the ancient wall carved gaze length, virtual guide interaction frequency), through the AI analysis of the preference label (history lovers, natural explorers), custom differentiation promotion strategy —— if users repeatedly explore tea garden tea picking scene, can directional push tea culture theme lines. From New Zealand "virtual skydiving" to attract extreme sports customers to Kyoto "Cherry blossom season VR Live" to activate the flowering period travel booking, VR shortens the consumption link in the mode of "experience first before decision", and provides user portraits for the scenic spot.

2.2 Immersive experience creation of tourism culture

VR video reshaped the immersion of tourism cultural experience through high-precision digital reconstruction and multi-dimensional interactive narrative. Based on 3D scanning and dynamic light and shadow technology, the details of cultural heritage (such as the texture of Dunhuang murals and the mortise and tenon structure of the Imperial Palace Museum) are reproduced, and the environmental changes such as day and night alternation and seasonal changes are simulated to build a "real and tangible" virtual scene. Users can freely switch perspectives to explore (such as a birds eye view of the ancient city, flat buildings), or through AI-driven role interaction (such as dialogue with "digital ancients", participating in the play of historical events, to give cultural experience autonomy and emotional resonance). At the same time, VR video integrates multi-sensory stimulation, panoramic sound effects restore environmental sound (such as temple bells and babbling streams), tactile gloves simulate touch the texture of cultural relics, and even combine the smell equipment to release the scene atmosphere (such as desert hot wind and ancient wood aloes) to create an immersive "five-sense surround". At the educational level, the cultural connotation is deeply embedded in the experience by switching between the virtual and real scenes (such as the restoration comparison of the Yuanmingyuan site) and interactive knowledge nodes (click on the cultural relics to trigger the craft interpretation). VR technology not only breaks through the physical restrictions, but also promotes the tourism culture from "watching" to "present" with "participatory stories", providing an innovative path for the activation and dissemination of cultural heritage.

2.3 Sustainable tourism and cultural heritage protection

VR technology injects sustainable development momentum into the promotion of tourism culture through digital archiving and virtual alternative tour. In the face of the physical damage of excessive tourism to the natural landscape (such as coral reef bleaching) and cultural heritage (such as the oxidation of cave murals), VR video can build a high-precision digital twin, permanently retain the original appearance of endangered resources, while diverting offline passenger flow [2].For example, Machu Picchu, Peru, uses VRs open "virtual mountaineering" experience to relieve the pressure of the physical footpath; the Louvre has digitized vulnerable collections such as the Mona Lisa, allowing users to observe the details of the brush strokes without damaging the reality. At the technical level, the incomplete sites (such as the relief primary color simulation) and the environmental change data (such as dynamic records of glacier ablation) are updated in the cloud, so as to make cultural protection and science popularization education in parallel. For users, VR

breaks the geographical and physical restrictions—People with disabilities can "climb" Mount Qomolangma, and the elderly people can "cross" the ancient Silk Road, promoting the universal sharing of tourism and cultural resources. From a commercial perspective, destinations can borrow VR to derive "digital souvenirs" (such as virtual cultural relics NFT and scene postcards) to expand revenue channels and feedback the protection fund. VR video constructs tourism ethics in the "zero contact" mode, balances the contradiction between development and protection, and provides green transformation for the global cultural tourism industry The new paradigm.

3. VR video problems in the promotion of tourism culture

3.1 Technical cost and equipment popularization problems

The cost of professional VR equipment (such as high-priced camera and head display) is tens of thousands of yuan, which exceeds the budget of ordinary creators, and has complex operation and dependence on late-stage technology, resulting in high threshold of content production and long cycle. Ordinary users are more inclined to low-cost traditional devices, and VR video presents the dilemma of "high quality and low output" on the short video platform, which is difficult to form scale effect. Taking VR content creation in Dunhuang Mogao Grottoes as an example, the production cost and technical requirements of the whole process significantly expose the pain points of the industry. In order to realize the millimeter-level precision reproduction of the cave murals, a professional-level 8K 3D camera is needed to take multi-angle shooting, and record the spatial structure data with laser scanning equipment. A single shot requires a team of 5 people, and the later 3D modeler takes 2 months to repair the details of the mural, and achieve dynamic lighting rendering with the help of Unreal Engine engine.

3.2 Bottleneck and breakthrough of high-quality content creation

At present, VR video is faced with the dual dilemma of "content homogenization" and "low quality" in the promotion of tourism culture. On the one hand, a large number of creators rely on the "fixed perspective view" mode (such as mechanical translation to shoot the panoramic view of the scenic spots), and lack of narrative creativity and deep cultural exploration, leading to aesthetic fatigue of users. For example, most VR videos in ancient towns only show street scenes, without integrating characteristic elements such as dialect and handicraft, and becoming an "electronic promotional video". On the other hand, in order to meet the rapid consumption demand of short videos, some creators compress the production cycle and sacrifice the accuracy of content. For example, VR video shot with mobile phone and cheap fish-eye lens often has picture distortion and lag problems; 360-degree scene with AI automatic splicing is frequently exposed (such as sky and ground joints), which seriously affects the immersion.

3.3 Low user acceptance and awareness

An important problem faced by VR technology in tourism communication is the low user acceptance and recognition. Many users still hold a wait-and-see attitude towards VR technology, and lack a deep understanding of its application in tourism[3]. This is mainly due to the lack of popularity of VR technology and the lack of publicity of VR technology in the tourism industry. In addition, some users may be worried about the complexity and difficulty of using VR devices, thus resistance to them. Taking the VR guide project of Suzhou Garden as an example, its promotion dilemma directly reflects the shortcomings of user acceptance and awareness. According to the survey, more than 60% of tourists give up trying—equipment due to "complex operation" and need

to calibrate the handle positioning and adjust the head tightness at the same time. The average preparation time for elderly tourists is more than 8 minutes.

4. Strategy of VR video in tourism culture promotion

4.1 Technical collaboration

In order to promote the creation and dissemination of VR content, we develop lightweight creation tools, and promote mobile phone adaptation solutions combined with AI automatic editing, so that ordinary users can quickly generate high-quality VR short films. At the same time, we build a cloud material library to reduce the cost of professional shooting. The short video platform optimizes the VR content recommendation mechanism, realizes accurate touch, and develops the "VR + social" function, to expand the communication with the help of sharing fission. Cultural and tourism institutions cooperate with technology enterprises to develop standardized VR content production processes to improve efficiency. Through policy support and public service construction, the government will build the sustainable development ecology of VR tourism, promote the integration of cross-field resources, and jointly promote the popularization and development of VR culture[4].

4.2 Bottleneck breakthrough

Some reashers build immersive cultural experience, and use VR technology to deeply restore cultural scenes, such as the "Digital Dunhuang" project of Dunhuang Academy, so that users can view the cave murals at close range, cooperate with expert explanation and background sound effects, and revitalize the millennium culture. At the same time, we adopt an interactive narrative design to embed a multi-path exploration function in short videos. Users can switch perspectives through gestures to trigger hidden cultural Easter eggs and enhance the sense of participation. According to the characteristics of the short video platform, we split the long-term VR experience into a series of "cultural flash mob" content, such as several one-minute theme videos of the Great Wall VR tour, to adapt users fragmented browsing habits and make the cultural experience more convenient and vivid.

4.3 Improve cognition

In order to improve users cognition and acceptance of VR tourism, we propose the strategy of "experience-cognition-transformation". First of all, VR experience kiosks are set up in the offline crowded areas, and the naked eye 3D and gesture interaction technology are used, as well as the hybrid mode of "VR + mobile phone", so as to reduce the threshold for users to try. Secondly, it reshape users cognition of VR tourism, emphasizing its irreplaceable cultural value, such as providing scenes where exclusive experience cannot be physically reached or protective closed, and transforming cultural knowledge points into immersive tasks to deepen user cognition[5]. Finally, some researchers through the impact-free hardware iteration and social experience drainage, improve the equipment friendliness, such as the use of light head display and myopia adaptation technology, as well as the development of VR and mobile phone terminal online function, to promote user fission transmission. The cooperation case between Hangzhou Songcheng and ByteDance verifies the effectiveness of this strategy, and shows the remarkable results of low threshold experience, high value perception and forced incentive.

5. Conclusion

VR video innovates tourism culture promotion with immersive experience, and enhances users sense of participation through scene restoration and interaction design. However, its popularity is limited by the high equipment cost, content homogenization and shoddy production, so the bottleneck needs to be solved through the strategy of universal technology popularization and content stratification. In the future, AI tools and 5G technology will promote the low threshold of VR creation, make VR become the core carrier of global cultural integration, and realize the two-way empowerment of "cloud experience" and "field travel".

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