

Application and Practice of VR Digital Exhibition Halls in the Dissemination of Red Culture in Hainan

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Abstract: With the widespread application of artificial intelligence technology, relevant sectors must fully leverage the empowering role of AI in the dissemination of Hainan's red culture. They should deeply explore the advantages of VR digital exhibition halls, highlighting their interactive, immersive, and cross-temporal-spatial application values. This will significantly enhance the efficiency and influence of Hainan's red culture dissemination, providing essential pathways for its dynamic promotion. Based on this, this paper combines the characteristics of Hainan's red cultural resources to conduct in-depth analysis from aspects such as experiential empowerment, dissemination expansion, and narrative innovation. It investigates the application advantages of VR digital exhibition halls and proposes corresponding practical strategies across four dimensions—resource integration, content construction, interactive design, and cultural-tourism integration—aiming to offer valuable insights for achieving remarkable results in the dissemination of Hainan's red culture.

Keywords: VR Digital Exhibition Hall; Hainan Red Culture; Communication Advantages; Application Practice

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Introduction

Within the Chinese red culture system, Hainan's red culture holds a pivotal position and embodies the unique characteristics of an island. Hainan's red culture itself carries the spiritual essence of the 23-year unyielding revolutionary spirit of Qiongya, while also providing essential resources to foster cultural confidence among the people during the construction of the free trade port. Under the new circumstances, VR digital exhibition halls and similar models can be fully utilized to transform and migrate its application advantages, enabling more effective dissemination of Hainan's red culture. This approach can drive the transition of Hainan's folk culture from static display to dynamic experience, thereby promoting the innovative development and precise transformation of Qiongya's revolutionary spirit in the era of the free trade port.

1. The Application Advantages of VR Digital Exhibitions in the Dissemination of Red Culture in Hainan

1.1 Achieve immersive experience empowerment and overcome the insufficient emotional resonance in traditional exhibition displays

Hainan's red culture is rooted in the revolutionary struggle practices of the island, encompassing resources such as the former sites of the Qiongya Column, Mount Murui, revolutionary base areas, and the Memorial to Overseas Chinese Mechanics in the Nanyang. These all possess abundant educational resources and experiential opportunities. However, in traditional museum cultural dissemination, physical displays and text-image panels dominate, often presenting issues like linear narrative styles and static formats, which fail to enhance audience engagement, provide immersive experiences of revolutionary scenes and authentic atmospheres, or foster a deep understanding of their spiritual essence. Through the VR digital museum model, technologies such as multi-sensory panoramic replication and 3D modeling can be employed to fully restore Qiongya's revolutionary historical scenes, enabling audiences to experience immersion and evoke emotional resonance.

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1.2 Facilitates cross-temporal and cross-spatial dissemination, breaking down the spatiotemporal barriers of regional resource distribution

The distribution of red cultural resources in Hainan is relatively scattered, with certain revolutionary sites located on islands or remote mountainous areas, lacking sufficient accessibility. Physical exhibition halls have relatively limited dissemination and reception capabilities, as well as coverage, failing to fully achieve normalized and comprehensive communication. By adopting the VR digital exhibition hall model, online virtual galleries can be constructed using cloud technology, enabling the organic integration and cohesive presentation of relatively dispersed red cultural resources such as Wanquan River, Wuzhishan, and Murui Mountain. This creates an integrated digital space, breaking through the dual constraints of time and physical space, allowing audiences to access exhibits without leaving their homes and achieving more significant dissemination effects in Hainan's red cultural heritage. This approach is particularly effective for corporate Party-building activities, campus ideological and political education, audiences both within and outside the province, and overseas Chinese, who can utilize VR devices or access virtual exhibitions via computers and mobile phones during fragmented time, thereby overcoming geographical and temporal barriers. Additionally, the VR digital exhibition hall format enables dynamic content updates and iterations, enriching exhibits based on the development of the free trade port and innovations in red cultural research. This effectively addresses the high costs and lengthy cycles of traditional exhibition hall updates, facilitating the propagation and radiation of the Qiongya revolutionary spirit from Hainan's regional culture to the national and international levels ^[1].

1.3 Youth oriented narrative innovation, adapting to the communication and acceptance habits of Generation Z audience

In the process of spreading red culture, its core audience is the youth group, but there are related problems such as preachy or serious narrative in the process of spreading red culture, which cannot fully adapt to the media usage habits and cognitive needs of Generation Z, and even create communication barriers. Through the form of VR digital exhibition halls, personalized, entertaining, and interactive features can be utilized to effectively innovate the narrative style of red culture, ensuring that the Qiongya Revolution story is transformed into an interactive immersive task or plot, or through puzzle solving and other related forms, meeting the content acquisition needs and participatory communication needs of young audiences. In interactive design such as role-playing, virtual check-in, and multi person assistance, young audiences can actively participate in the construction and popularization of the red culture communication system. By using such exhibition halls, the passive acceptance mode can be transformed into active exploration actions. At the same time, by utilizing narrative innovation mode and combining it with the youth development theme of Hainan Free Trade Port, the red spirit and contemporary youth mission can be organically combined, making the red culture itself have lasting dissemination vitality.

2.Application and practical strategies of VR digital exhibition hall in the dissemination of Hainan's red culture

2.1 Integrate digital cultural resources and build a digital resource library for Hainan's red culture

In the process of spreading Hainan's red culture, in order to ensure that the application and practical effectiveness of VR digital exhibition halls are fully reflected, it is necessary to take the concept of digital humanities as a guide in application practice, effectively strengthen the collection and organization of Hainan's red cultural resources themselves, achieve integration and systematization in digitalization, and under the premise of forming a strong digital resource library, make various resources present three-dimensional panoramic and traceable characteristics. This fully demonstrates the necessary role of resource guarantee.

On the one hand, relevant parties need to collect and organize relevant resources and data in conjunction with the revolutionary base of Murui Mountain and the former headquarters of Qiongya Column. Especially for the 52 key revolutionary sites, 720 degree panoramic modeling and high-precision 3D scanning should be carried out to

fully restore the original appearance of historical space. At the same time, high-definition digital collection of literature archives and revolutionary data is also necessary to form a corresponding 3D cultural relic model library, so that the audience has the necessary resources and data support in terms of detail viewing and virtual disassembly. I also fully immerse myself in the excavation and utilization of various resources throughout the entire process, and feel the revolutionary stories behind cultural relics. On the other hand, it is necessary to fully integrate and collaborate in the excavation of historical materials on the resistance against Japanese aggression by overseas Chinese mechanics in Southeast Asia, as well as characteristic resources such as the support of the Li and Miao ethnic groups for revolution. Relevant intangible cultural resources such as red songs, old soldiers, oral history, and revolutionary images should also be collected. Furthermore, an integrated and comprehensive digital resource system will be formed to ensure the organic combination of material resources, non-material resources, historical resources, and contemporary resources^[2]. In the process of collaborative development, the fundamental application value of digital resources will be fully reflected. In addition, in the application process of VR digital exhibition halls, it is also necessary to make good use of artificial intelligence technology and blockchain technology to ensure the full guarantee of resource ownership and secure storage. Combined with the Hainan Free Trade Port big data platform, precise docking and collaborative utilization can be achieved, so that VR digital exhibition halls have necessary fresh authority and rich content support, fundamentally avoiding and solving the problems of scattered and fragmented red cultural resources, and effectively improving the influence and efficiency of red culture dissemination.

2.2 Build scenario based content and create immersive narrative scenes with Qiongya characteristics

In the application and practical aspects of VR digital exhibition halls, it is necessary to fully tap into the regional characteristics of Hainan's red culture itself, form distinctive and differentiated immersive narrative scenes, and effectively avoid the problem of homogenization among thousands of halls. In the process of constructing content, it is necessary to fully follow the authenticity of history and the uniqueness of the region, forming corresponding emotional resonance and empathy experiences, so that the audience can integrate into immersive narrative scenes. In the construction of scene content, the fundamental value of the venue is fully reflected.

Firstly, relevant scenes such as islands and beacon fires can be created to fully restore key historical events such as Mount Murui, the three anti encirclement campaigns, and the battle at Coconut Village. Based on elements such as rainforest environment, island terrain, and sound effects of waves, a realistic and three-dimensional atmosphere of island revolution can be created. Secondly, it is necessary to restore the worrying scenes of overseas Chinese, and to virtually reproduce and fully restore the historical scenes of Nanyang overseas Chinese mechanics returning to China for the War of Resistance Against Japan and overseas Chinese donating money and goods to support the Qiongya Revolution, which to a greater extent reflects the international and open nature of Hainan's red culture itself. Thirdly, restore the scene of ethnic unity. The scenes of the Li and Miao ethnic groups fighting side by side and supporting each other with the Qiongya Column are fully presented in the context of ethnic unity, fully reflecting the inclusiveness embodied by Hainan's red culture itself. For each scene, objective historical facts should be taken as the fundamental basis, combined with relevant suggestions or consulting content from regional culture and party history experts, to achieve precise review of various contents and facts, ensuring that the details and character images of each scene have historical authenticity and traceability, and integrating emotional narrative design to ensure that the audience can deeply feel the connotation and rich meaning of the revolutionary spirit of Qiongya during the experience of the scene. At the same time, it also ensures that Hainan's red culture is more recognizable, creating a VR red culture IP^[3].

2.3 Implement multimodal interaction design and build a participatory red culture dissemination system

In the application process of VR digital exhibition halls, interactive and interactive efficiency should also be reflected, breaking through the drawbacks of singularity and roaming interaction, effectively matching deep and multi-dimensional interaction systems, and presenting the expected efficiency in the continuous improvement and

optimization of the red culture dissemination system. It is also necessary to form a closed-loop communication system of experiential participation and dissemination of identity, in order to present the expected red culture dissemination effect.

Firstly, strengthen role-playing interaction to ensure that the audience can independently choose relevant roles such as overseas Chinese technicians, Qiongya warriors, and front-line masses, and participate in virtual revolutionary tasks through a first person perspective. If we can treat the wounded, convey intelligence, raise funds for support, etc., we can further deepen our understanding of the revolutionary process throughout the entire process of completing the mission. Secondly, through interactive collaboration, a multiplayer VR experience module is developed to enable teams to work together to complete tasks such as reclaiming the revolutionary path of Qiongya. At the same time, the audience's sense of unity and cooperation, as well as their understanding of red culture, are significantly improved, and are matched with relevant scenarios such as party building activities and campus research. Thirdly, implement knowledge-based interaction. It can effectively set up interactive activities such as historical detail decryption, red knowledge Q&A, and spiritual connotation interpretation, ensuring that the historical knowledge and spiritual essence of the Qiongya Revolution are integrated into the entire process of the activity, and reflecting the expected interactive effectiveness in strengthening the process of combining education with entertainment. Fourthly, we need to achieve communicative interaction. We can develop functions such as experience sharing, digital collection generation, virtual check-in, etc., so that the audience can generate corresponding digital commemorative badges and VR exclusive experience posters after completing the relevant task experience, and share them on social platforms with one click, thus forming a corresponding fission effect, fully integrating and integrating offline experience and online dissemination. At the same time, it is necessary to adapt to different terminal needs, develop lightweight mobile terminal VR and PC virtual exhibition halls, and form corresponding high-quality products in immersive VR experience halls, so as to fully meet the diverse broadcasting needs of campuses, communities, enterprises, online and other scenarios to a greater extent.

2.4 Building a cultural tourism integrated ecosystem to promote the coordinated development of red culture and free trade ports

In the construction process of Hainan Free Trade Port, there can be new opportunities for the dissemination of red culture. By utilizing VR digital exhibition halls and combining them with the development trend of cultural and tourism integration, an integrated ecological system can be formed. Effective connections can be achieved in VR digital exhibition halls, red tourism, cultural and creative development, ideological and political education, etc., strengthening the joint force and ensuring that the dissemination of red culture can present the synergistic development efficiency of economic and social benefits.

On the one hand, the construction of the Hainan Red Culture Scenic Area requires the effective formation of a virtual real integration tourism model. Both offline real-life tours and online VR pre experiences need to be fully coordinated and developed. By utilizing VR digital exhibition halls, the historical background and core attractions of the scenic area can be displayed in a panoramic manner, and matched with offline VR guidance and immersive real-life experiences, the attractiveness and experience of red tourism can be significantly enhanced. On the other hand, in order to meet the needs of campus ideological and political education, enterprise party building training, and cadre research, customized VR red education courses should be developed to ensure that VR digital exhibition halls are integrated into the ideological and political education practice bases of primary and secondary schools, as well as the education and training bases of party members and cadres, so that red culture itself can be integrated into the entire process of education, teaching, and party building work, forming institutionalization and normalization. By utilizing the resource advantages of VR digital exhibition halls, further matching red cultural and creative products, digital collections, or VR experience peripherals, etc., the development effect can be further enhanced in various derivative products. And according to the cultural industry policies and relevant requirements of Hainan Free Trade Port, a red cultural and creative industry chain will be formed, using VR technology to achieve cross regional

dissemination, targeting overseas Chinese, international friends, etc., forming a multilingual VR digital exhibition hall, thereby promoting the cultural construction of Hainan Free Trade Port and the revolutionary spirit of Qiongya, which can have a wider international dissemination.

3.Conclusion

In summary, in the process of spreading Hainan's red culture, relevant parties need to fully utilize the paradigm innovation and technological empowerment advantages of VR digital exhibition halls, create immersive experiential scenes and cross temporal communication, and demonstrate good performance in youth oriented narrative. At the same time, taking the construction of Hainan Free Trade Port as an opportunity, we should further utilize VR digital exhibition halls, take resource integration, scene content construction, multimodal interaction design, and cultural tourism integration to build an ecosystem as entry points, and ensure that the application value of VR digital exhibition halls is fully reflected, laying a digital foundation for achieving more significant results in the dissemination of Hainan's red culture.

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