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Theoretical Deconstruction and Innovation of Digital Immersion in Traditional Chinese Opera under Media Contexts

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Abstract. With the rapid development of digital technology, the digital immersion exhibition of traditional opera, as a new form of exhibition that integrates traditional opera with modern technology, uses VR, AR, holographic projection and other technologies to construct immersive scenes, breaking the limitations of traditional opera time and space, and opening up new paths for cultural inheritance. Research has found that there are problems with the current digital immersion exhibition of traditional Chinese opera in terms of technology, cultural dissemination, and setting. This study focuses on the theoretical logic and practical challenges of digital immersion exhibitions in traditional Chinese opera in terms of technological application, cultural dissemination, and scene construction, using the framework of media context and immersive communication theory. The research adopts a literature analysis method to sort out theoretical achievements, analyze relevant materials and literature. The results indicate that there are problems with the current digital immersion exhibition of traditional Chinese opera, such as insufficient technological adaptability, superficial cultural dissemination, and lack of coherence in scene ecology. From this, it can be concluded that it is necessary to establish a "technology art" collaborative mechanism, innovate cultural narrative strategies, improve scene interaction ecology, and explore practical directions such as intelligent navigation and metaverse communities to promote their transformation towards "cultural empowerment" and achieve sustainable development.

Keywords: Digital Immersion Exhibition of Traditional Chinese Opera, Technology integration, Cultural dissemination, Scene construction.

1. Introduction

This study focuses on the innovative exhibition form of digital immersion in traditional Chinese opera, which integrates virtual reality (VR), augmented reality (AR), and other digital technologies. This form breaks through the temporal and spatial limitations of traditional Chinese opera performance, providing a new path for the inheritance and dissemination of excellent traditional Chinese culture. However, there are still significant shortcomings in the deep integration of technology and art, as well as the effectiveness of cultural dissemination. Although the annual growth rate of digital immersion exhibitions on traditional Chinese opera themes has reached 32%

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nationwide in recent years, this field still faces many development challenges and urgently needs systematic research and practical exploration. This study is of great significance in promoting the development and innovation of digital immersion exhibitions in traditional Chinese opera and facilitating the better inheritance and development of traditional culture under modern technology. This study mainly focuses on three dimensions: technology, cultural dissemination, and scenario. Based on the theories of media context and immersive communication, it analyzes the development bottlenecks of digital immersion exhibitions in traditional Chinese opera and explores innovative breakthrough paths at both the theoretical and practical levels. The literature analysis method was used to search for and read relevant materials and literature. The advantage of this method is that it can comprehensively sort out the theoretical achievements and practical cases related to the digital immersion exhibition of traditional Chinese opera, accurately grasp the current development status and trends of the industry, analyze the problems in technology, cultural dissemination, and other aspects, which is conducive to the research. The ultimate research objective of this study is to construct a theoretical structure for the digital immersion exhibition of traditional Chinese opera and explore its innovative development path. In order to achieve the goal, a deep analysis based on media context and immersive communication theory was conducted from three dimensions: technology, cultural communication, and scenario, revealing existing problems and seeking innovative breakthroughs.

2. Literature review

From the perspective of media context and immersive communication theory, research on digital immersion exhibitions in traditional Chinese opera has made certain progress, and multiple scholars have explored it from different angles.

Peng Lan explored the core characteristics of future communication from a macro perspective in her book "Media, Immersion, and Intelligence: Three Important Dimensions of Future Communication", emphasizing "immersion" as a key dimension [1]. The author analyzed the underlying logic of immersive communication and pointed out its enormous potential in the field of cultural dissemination. This study provides important theoretical support and elucidates the core connotation of immersive communication and the inevitability of its application in the cultural field. It helps people to immerse themselves in the digital exhibition of traditional Chinese opera and understand it in the context of future communication trends. This article mainly focuses on macro trends and theoretical frameworks, without a specific and in-depth analysis of the unique needs, practical forms, and effectiveness mechanisms of this particular art form, opera, in immersive communication. In particular, there is a lack of detailed exploration on how the "media context" is reconstructed by specific technologies and its impact on opera narrative, performance procedures, and viewing relationships. This article will focus on the intrinsic characteristics of traditional Chinese opera art, deeply analyze how different digital technologies construct unique "opera media contexts," and explore the specific impacts and challenges that this contextual reconstruction brings to the generation of immersive experiences, the inheritance and transformation of the core aesthetics of opera.

In his article "Immersive Art in the Digital Age: Experience, Narrative, and Spatial Reconstruction," Wang Keyue focuses on the shaping of immersive art experiences through digital technology, analyzes the narrative strategies and spatial reconstruction of immersive art, and uses some new media art cases to illustrate [2]. The core value of this study lies in its analytical framework for the elements of immersive experience construction, which provides a useful reference for understanding how digital immersive exhibitions in traditional Chinese opera break the

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traditional frame style stage, reshape the viewing space, and narrative logic. The participatory and non-linear characteristics mentioned in the article inspire innovation in traditional Chinese opera. It mainly discusses the generalized "immersive art", with many cases being contemporary art or new media art exhibitions, lacking targeted research on the special contradictions and opportunities faced by traditional opera art in the digital immersion transformation. For example, how to effectively preserve or transform highly formulaic elements such as body movements, singing, recitation, acting, and percussion in non-linear narrative structures and immersive interactive spaces in traditional Chinese opera performances is a matter of concern. However, existing research on this topic is still insufficient. Based on this issue, this article will delve into the adaptability and transformation strategies of the unique programmatic and comprehensive aspects of traditional Chinese opera art in the context of digital immersion. The study will analyze how digital technology reinterprets the "virtuality" of traditional Chinese opera in immersive environments, and how this transformation affects the audience's aesthetic experience and understanding of the essence of opera.

Sun Zhenhu and Zhang Zixuan applied Merowitz's media situational theory to analyze the "situations" created by different media for drama in their article "Innovation of Communication Paths of Dramatic Art from the Perspective of Media Situational Theory", and how these situations change the dissemination methods, performance styles, and viewing relationships of drama [3]. Emphasis was placed on the reconstruction of the boundary between the "backstage" and "front-end" of drama through media technology. This article directly applies the theory of media context to analyze drama communication, providing an important theoretical lens and analytical path for this study. It inspires us to think about how digital immersion technology can create unprecedented "situations" for opera, and how this situation can break the traditional boundaries between the "front" and "back" of opera, reshaping the roles of actors and audiences. The main research object of this article is drama, and there is insufficient attention paid to the particularity of traditional Chinese opera in the context of digital media. There is a lack of in-depth discussion on the tension or integration between the "ultra real" situation created by digital immersion technology and the "freehand brushwork" aesthetics of drama. However, there is insufficient discussion on how the deep "involvement" brought about by immersive communication affects situational perception. This article will combine media situational theory and immersive communication theory to specifically focus on the art of traditional Chinese opera. This paper focuses on how digital immersion technology can build an "opera super situation" that integrates physics and virtualization and dispels the boundary of watching and acting, and analyzes how the "freehand brushwork" aesthetics of opera in this situation interacts with the "virtual/super real" characteristics of technology. At the same time, we will delve into how the "borderless" feature of immersive communication can enhance or change the audience's perception and understanding of the context of traditional Chinese opera.

In their article "Research on the Application of Immersive Technology in Digital Protection and Communication of Cultural Heritage", Liu Yan and Li Huailiang outlined the current status, advantages, and trends of immersive technology in digital protection and communication of cultural heritage, and mentioned some case studies in museums, site exhibitions, and other fields [4]. This article provides a macro overview of the application of immersive technology in the field of cultural heritage, affirming its value in enhancing communication effectiveness and providing support for confirming the background of technology application in this study. The article's discussion is relatively macro and generalized, without specifically focusing on the art of traditional Chinese opera. It also lacks an analysis of the uniqueness of traditional Chinese opera as a performing art and its digital immersive dissemination, which distinguishes it from static cultural heritage. There is no

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mention of the applicability and specificity of media situational theory and immersive communication theory in the specific object of opera. Stay at the surface level of technical application description. This article will deeply focus on the core characteristics of traditional Chinese opera as a "living performing art", emphasizing that the core of its digital immersive dissemination lies in reconstructing the real-time and synchronic context of "performance" and "viewing". The study will delve into how immersive technology not only "showcases" traditional Chinese opera, but also "reconstructs" a new type of viewing "situation" that integrates digital and physical elements, and explore the significance of this reconstruction for the continuation of the vitality of traditional Chinese opera art.

3. Interpretation of the core theoretical framework

3.1. Deconstruction of media situation theory

The media situational theory was systematically proposed by American communication scholar Joshua Meyerowitz in 1985 in "The Disappearing Territory: The Impact of Electronic Media on Social Behavior". This theory breaks through McLuhan's macro perspective of "media as information" and emphasizes that media technology is not only a means of communication, but also reshapes social behavior and interaction patterns by changing the scene structure of information dissemination. In the context of the digital immersion exhibition of traditional Chinese opera, digital technology has completely broken the fixed spatial relationship between the stage and the audience, and reconstructed the context of interactive viewing and performance. For example, with the help of VR devices, viewers can "immerse themselves" in the center of opera scenes, trigger plot branches through body movements, and transform from passive bystanders to narrative participants.AR technology combines virtual characters with physical exhibition halls, blurring the boundaries between reality and virtuality. The transformation of this situation not only innovates the temporal and spatial dimensions of traditional Chinese opera dissemination, but also profoundly affects the effectiveness of cultural dissemination and the emotional resonance intensity of the audience by changing the cognitive participation mode of the audience, providing a new path for the modern transformation of traditional Chinese opera art.

3.2. Application of immersive communication theory

The theory of immersive communication was proposed by Professor Yu Guoming, which focuses on the audience's wholehearted involvement and deep participation in the communication process. It emphasizes that communication should break through the traditional one-way information transmission mode and achieve the audience's all-round involvement in cognition, emotion, and behavior by constructing a highly simulated media environment. In the practice of digital immersion exhibition in traditional Chinese opera, the comprehensive application of multimodal technology has become a key path for theoretical implementation: spatial audio technology simulates the sound level of the opera stage through 3D sound field, making the audience feel as if they are in the theater scene; The motion sensing interactive device captures the audience's movements and converts them into instructions that affect the direction of the plot; Real time rendering technology generates personalized opera scenes in real-time based on dynamic feedback from the audience. These technologies collectively construct a multidimensional sensory stimulation network, allowing the audience to experience a strong sense of presence in a virtual or blended virtual environment. This dissemination model not only breaks the one-way communication limitations of traditional opera's

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"performance on stage and viewing off stage", but also promotes the upgrading of cultural dissemination from simple "information transmission" to the deep construction of "emotional resonance" and "cultural identity", opening up new possibilities for the dissemination and inheritance of opera art in contemporary times.

4. Case analysis from the perspective of media situational theory

The dissemination of traditional Chinese opera heavily relies on the physical space of the theater, where the audience passively receives performances in a fixed "front desk" viewing area, and the actors' singing, speaking, acting, and acting are framed within the temporal and spatial boundaries of the stage. The "Dreaming into the Pear Garden" digital experience exhibition at the 2020 Chinese Opera Culture Week utilizes digital technology to integrate traditional culture with modern technology, creating a new information system for a comprehensive and immersive experience of opera. This allows audiences to no longer be limited to traditional stage viewing situations, but to be immersed in novel situations that integrate multiple digital technologies. Media technology creates new social contexts by reshaping the flow of information, while digital technology not only changes the physical carrier of opera dissemination, but also reconstructs the rules of cultural experience.

Traditional Chinese opera strictly distinguishes between the "front stage" and the "back stage", and the two maintain their boundaries through physical barriers and behavioral norms. The "Entering and Exiting" section of the digital experience exhibition deconstructs the order of the past thousand years. The audience interacts with classic opera characters in 3D animation form through character dynamic capture technology. Some actions originally prepared by actors in the background are presented to the audience through digital means, blurring the boundary between private and public situations. The audience can have a closer encounter with some "behind the scenes" elements of opera performance. This situational fusion breaks the one-way relationship of "watching being watched", where the audience is both a performer on the digital stage and a spy on backstage skills. What the audience gains here is not only an expansion of knowledge about traditional Chinese opera, but also a renewed understanding of the structure of traditional drama.

Traditional opera audiences are fixed as "aesthetic acceptance terminals", whose role functions are limited to providing limited feedback such as applause and cheers. The "Dreaming into the Pear Garden" digital experience exhibition empowers audiences through technology, transforming their identities. Viewers can imitate the movements of opera characters and be rated, transforming from mere spectators to "performers". Viewers can also focus on opera themed cultural and creative products, contemplate the development prospects of opera culture, and become cultural thinkers and disseminators. This reflects the reconstruction of roles and the democratization of cultural participation.

5. Discussion

5.1. The technical adaptation dilemma in media context reconstruction

The current digital immersion exhibition of traditional Chinese opera presents diversified technological applications. In the national cultural and technological tourism innovation research and development project, Tan Tiezhi's team has built a dynamic interactive system of "actor audience space" through VR, AR, and MR technologies, using artificial intelligence to analyze audience behavior and achieve real-time adjustment of performance content [5]. Peng Wei pointed

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out that technologies such as AI image restoration, 6DoF motion capture, and phantom imaging have significantly improved the visual effects of opera displays [6].

However, the issue of compatibility between technology and traditional Chinese opera art has become prominent. According to the 2024 White Paper on the Digital Development of Chinese Opera, 73% of projects exhibit the phenomenon of "technology driven art", and the excessive pursuit of visual wonders weakens the aesthetic characteristics of "formulaic performance" and "virtual real interaction" in opera [7]. From the perspective of media context theory, the reconstruction of traditional opera contexts by technology has not fully considered the uniqueness of the artistic essence, resulting in a "mismatch" in artistic expression under new media contexts.

5.2. Value interpretation in immersive communication

In the field of cultural dissemination, the digital immersion exhibition of traditional Chinese opera has expanded the audience boundaries through cross-border integration. Jin Yuanpu proposed that digital and scene based immersive experiences can increase the efficiency of reaching young audiences with opera culture by 40% [8]. Wang Jue emphasized that in the process of dissemination, it is necessary to adhere to the cultural core and avoid form innovation that undermines the spiritual value of traditional Chinese opera [9].

However, there is a problem of shallow cultural interpretation in the practice of immersive communication. Market research shows that 65% of young audiences only focus on the technical effects of immersive exhibitions, and their deep understanding of opera culture has not significantly improved [10]. This indicates that although the current immersive communication mode enhances the audience's sensory experience, it has not effectively guided their deep understanding of the cultural connotations of traditional Chinese opera, exposing the insufficient adaptation of cultural narrative strategies to immersive communication theory.

5.3. Value interpretation in immersive communication

Scene construction is a key link in the theoretical implementation of the digital immersion exhibition in traditional Chinese opera. Professor Wang Liming from the Central Academy of Fine Arts proposed that an open platform should be built to promote the reuse of digital content in traditional Chinese opera in cultural tourism, education, and other settings. The Zhang Jingping team from Shanghai Theatre Academy achieved a narrative innovation of "changing scenery" in the immersive exhibition of "Dream of the Red Chamber" by overlaying physical installations with virtual content [11].

However, there is still an issue of ecological fragmentation in practical scenarios. Although the Guangmei student team's "Impression of Peking Opera" achieves real-time interaction of audience movements, the lack of data exchange and collaboration mechanisms between different scenes results in insufficient continuity of immersive experience [12]. From a theoretical perspective, existing scene designs have not fully integrated the "environmental reconstruction" of media context theory and the "deep participation" of immersive communication theory, and there is an urgent need to build a systematic scene interaction ecosystem.

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6. Exploration of the possibility of theoretical and practical innovation

6.1. Theoretical innovation path

Based on the theory of media context, a "technology art" adaptability evaluation model is established to dynamically match the programmatic performance, vocal rhythm, and other artistic parameters of traditional Chinese opera with digital technical parameters, achieving the transformation of technology application from "functional orientation" to "artistic adaptability".

Combining immersive communication theory, innovate the "layered narrative" strategy: taking the core of opera culture as the main line, guiding the audience to gradually understand the cultural connotation through interactive side tasks, and construct a progressive communication system of "sensory immersion, cognitive immersion, emotional immersion".

Integrating media context and immersive communication theory, the concept of "scene ecosystem" is proposed, and cross scene data standards and interaction protocols are established to achieve seamless connection and collaborative innovation of digital content in traditional Chinese opera in different scenarios.

6.2. Practice innovation direction

Develop a personalized intelligent navigation system using artificial intelligence technology based on audience age, cultural background, interest preferences, and other data. The system can automatically push suitable exhibition routes, key content explanations, and interactive tasks when the audience enters the immersive exhibition, enhancing the accuracy and depth of cultural dissemination.

Building a metaverse opera community platform, where audiences can not only visit digital immersive exhibitions in virtual spaces, but also interact in real-time with other enthusiasts, participate in opera creation and performance. Through functions such as virtual character creation, script co creation, and online performances, a new ecology for the dissemination and inheritance of traditional Chinese opera culture is formed.

Explore the "offline immersive experience+online content extension" model, for example, the audience can obtain a unique digital identity in physical immersive exhibitions, which can be extended to online platforms to achieve functions such as watching live opera broadcasts, participating in cultural lectures, and purchasing digital cultural and creative products online, expanding the temporal and spatial boundaries of opera culture dissemination.

7. Conclusion

The research results of this study indicate that there are surface level innovation problems in the current digital immersion exhibition of traditional Chinese opera in terms of technological applications, which are mostly limited to device stacking and visual impact, and lack deep integration with the core of traditional Chinese opera art. At the level of cultural dissemination, the advantage of immersive communication has not been fully utilized to explore the essence of opera culture, and the dissemination effect is superficial. The lack of systematic planning in scene interaction design results in stiff connections between various stages, which affects the coherence of the audience experience. At the same time, it is proposed to deepen the research on technology adaptation theory guided by the theory of media context and immersive communication, and organically combine digital technology with opera performance programs and aesthetic features.

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Innovate cultural dissemination strategies and construct a multi-level and multi-dimensional narrative system for traditional Chinese opera culture. A series of solutions including improving the scene interaction ecology and creating a natural, smooth, and emotionally resonant viewing environment. Furthermore, the research conclusion is that the development of digital immersion exhibitions in traditional Chinese opera needs to be guided by theory, promoting collaborative innovation of technology, culture, and scenes, and achieving a transformation from relying solely on technological innovation to a deep integration of technology and culture. Only then can the creative transformation and innovative development goals of traditional opera in the digital age be truly achieved.

This study provides valuable reference significance for future research in this direction, mainly influencing the theoretical framework construction and practical path exploration in the field of digital immersion exhibition of traditional Chinese opera. At the theoretical level, it provides a dual perspective analytical paradigm for subsequent research, guiding researchers to enter from the combination of media technology and communication theory, and deeply explore the internal logic of digital immersion exhibitions in traditional Chinese opera. At the practical level, it provides actionable strategic guidelines for industry development, encouraging practitioners to pay attention to the integration of technology and culture, and optimize scenario design.

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