

A Study on Pathways for the Digital and Intelligent Dissemination of Yellow River Cultural Heritage from the Perspective of AIGC Multimodal Technology

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Abstract:

With the advancement of digital technology, the revitalisation and dissemination of Yellow River cultural heritage are gradually becoming digitalised and interactive. This paper examines issues such as visual expression, content narration, interactive experiences and the integration of culture and tourism in the digital dissemination of Yellow River cultural heritage. It analyses the practical challenges currently faced in this process, including homogenisation and a lack of interaction and depth, and proposes pathways such as the construction of digital visual symbols, multi-platform dissemination, optimised interaction, and the integrated innovation of enhanced cultural scenarios. The aim is to use digital technology to make the dissemination of Yellow River culture more vivid and appealing, thereby injecting new vitality into the innovative dissemination and revitalisation of traditional culture.

Keywords:

Yellow River Cultural Belt, Cultural Heritage, Digital and Intelligent Dissemination, Multimodal Narrative, Integration of Culture and Tourism

1. Introduction

The proposals for the 15th Five-Year Plan explicitly state: “We will advance the integration of culture and technology, and promote the digital and intelligent empowerment of cultural development as well as its transformation towards informatisation. Breakthroughs in artificial intelligence technologies, represented by deep learning, large language models and computer vision, will provide fresh impetus for the protection and transmission of China’s cultural heritage, facilitating a shift from passive rescue to active safeguarding, from static preservation to dynamic transmission, and from isolated operations to systematic and collaborative transformation.”

Currently, the dissemination of cultural heritage is characterised by overly uniform visual expressions, a lack of diversity in content and format, and a dearth of user engagement, making it difficult to meet the ever-growing and varied demands of contemporary audiences. With the advent of the digital age, the combined application

of images, sound and contextual content has facilitated the visual presentation and immersive expression of China's traditional culture, whilst also transforming cultural dissemination from static displays towards contextualised and experiential approaches.

2. Practical Challenges in the Digital Dissemination of Yellow River Cultural Heritage

2.1. Homogenisation of Dissemination Formats

Whilst the digital dissemination of Yellow River cultural heritage is gradually evolving towards visualisation and digital intelligence, the overall forms of dissemination still suffer from a rather pronounced lack of diversity. A portion of cultural dissemination content relies primarily on conventional methods such as text-and-image displays, promotional posters and short videos, lacking in-depth exploration of the regional characteristics and cultural symbols of Yellow River culture. Consequently, different cultural projects tend to be visually similar, making it difficult to establish a distinct cultural identity [4]. Another portion of Yellow River cultural dissemination projects overly pursues online-oriented and entertainment-focused visual effects, whilst neglecting the spiritual essence and regional characteristics of traditional culture itself.

2.2. Monotonous digital content

The Yellow River boasts a wealth of cultural heritage, including the National Cultural Park, ancient architectural complexes and archaeological sites; however, current digital dissemination content still lacks holistic and systematic design. Some digital dissemination projects remain confined to the presentation of individual pieces of content, lacking a comprehensive cultural narrative framework [1], resulting in a fragmented state of cultural resources. At present, the digital dissemination of Yellow River culture still lacks consideration for cross-media integration. The design of some content fails to take into account the dissemination characteristics of different media platforms and lacks targeted optimisation, thereby affecting the effectiveness of cultural dissemination.

2.3. Insufficient Interactive Experiences and User Engagement Mechanisms

As digital cultural consumption patterns continue to evolve, user demands regarding cultural dissemination have gradually shifted from mere viewing towards participation and experience. At present, the design of interactive mechanisms in the digital dissemination of Yellow River cultural heritage remains relatively weak, making it difficult to effectively attract young users to participate on an ongoing basis. Young users place greater emphasis on personalised, socialised and entertaining experiences [1], hoping to gain emotional expression and interactive participation during the process of cultural consumption. Some digital dissemination projects for Yellow River culture lack gamification mechanisms, virtual character interactions and social sharing functions; users remain largely in a passive receptive state and find it difficult to truly participate in cultural dissemination and content co-creation.

2.4. Lack of Depth in Dissemination and Emotional Connection

The development of digital media has continuously broadened the channels for disseminating Yellow River culture; however, certain cultural dissemination content still faces challenges regarding depth of communication and emotional expression.

For instance, some digital dissemination projects prioritise visual stimulation and traffic metrics to such an extent that they overlook the transmission of traditional cultural values and emotional significance. Consequently, whilst users can rapidly access cultural information, this fails to foster a deep sense of cultural identity [3]. As a key cultural symbol of Chinese civilisation, Yellow River culture embodies rich historical memories, regional sentiments and the national spirit. How to enhance the narrative depth and emotional resonance in the dissemination of Yellow River culture is a critical issue that current digital communication must address.

2.5. Insufficient Integration of AIGC Technology

The development of AI-generated content (AIGC) technology also offers new possibilities for the digital dissemination of Yellow River cultural heritage. However, current applications reveal that the integration between technology and cultural dissemination remains weak; in terms of multimodal coordination, the interaction between different media elements is still not sufficiently natural. Yellow River cultural heritage encompasses a wide range of cultural content, including text, images, music, folk rituals and spatial settings. Some digital dissemination content lacks a unified narrative logic across different media, which can easily lead to issues such as inconsistent styles and disjointed expression. How to integrate digital technology, cultural content and communication design to construct a more systematic, immersive and intelligent model for the digital dissemination of Yellow River culture remains a key area for future research and exploration.

3. The Value of AIGC in Empowering the Digital and Intelligent Dissemination of Yellow River Cultural Heritage

3.1. Enhancing the Visual Communication Efficiency of Yellow River Cultural Heritage

Traditional dissemination of Yellow River cultural heritage has primarily relied on textual descriptions, image displays and physical exhibitions; these formats are relatively static and struggle to meet contemporary users' demands for intuitive and diverse visual experiences. With the development of digital media and the widespread adoption of short videos and mobile internet, people are increasingly inclined to learn about traditional culture through vivid, tangible images, immersive scenes and visualised content. AIGC multimodal technology has introduced new modes of expression for the visual dissemination of Yellow River cultural heritage [1], utilising image generation, digital modelling and dynamic visual reconstruction to present traditional patterns, historical architecture, folk scenes and mythological tales from Yellow River culture in a more vivid manner. (i.e., Figure 1)

3.2. Enhancing Intelligent Interactive Experiences in Cultural Communication

With the development of digital media, cultural dissemination has gradually shifted from one-way presentation towards interactive experiences [4]. Previously, the dissemination of traditional cultural content was largely limited to viewing and display, with limited user engagement; however, advancements in interactive technology now allow people to enjoy the pleasures of culture through immersive experiences. When disseminating Yellow River culture, users can not only browse relevant cultural content but also participate in the process through virtual tours, scene interactions and dialogues with digital characters. This interactivity is more likely to

evoke emotional resonance among a wide audience, thereby increasing public attention and a sense of identification with Yellow River culture.

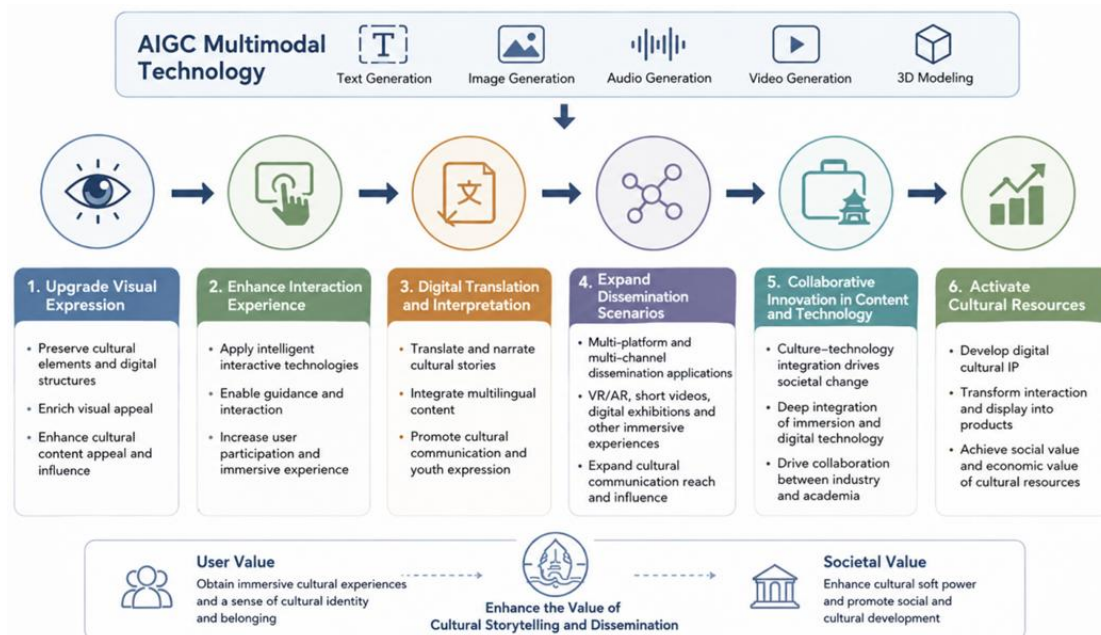


Figure 1. Value Pathways for Digital Dissemination of Yellow River Culture Empowered by AIGC Multimodal Technology.

3.3. Promoting the Digital and Intelligent Transformation of Yellow River Culture

The Yellow River culture boasts a long history and encompasses a wealth of resources, including national cultural parks, ancient architectural complexes and archaeological sites. However, some traditional cultural content is difficult to comprehend within a modern communication context, and issues such as outdated modes of expression are common, making it unable to capture the attention of younger audiences.

3.4. Expanding Digital Communication Channels for Cultural Heritage

The development of digital technology has broken down the temporal and spatial constraints of traditional cultural dissemination, enabling Yellow River cultural heritage to gradually expand from offline exhibitions to multi-platform, multi-scenario dissemination [3]. By utilising multimodal technologies to integrate traditional textual narratives, visual elements, audio content and folk cultural scenes, these can be presented in a more youthful and visually engaging manner. With the support of digital technology, Yellow River cultural heritage can reach a wider range of platforms, such as digital exhibition halls, virtual reality, interactive HTML5 applications, short-video platforms and mobile devices.

3.5. Promoting the Revitalisation and Utilisation of Yellow River Cultural Resources

Yellow River cultural heritage possesses not only significant cultural value [2] but also rich social and industrial value. Traditional cultural resources, if merely preserved, are prone to issues such as marginalised dissemination and weak public engagement from a public perception perspective. Through digital technology, traditional symbols, folk tales and historical scenes within Yellow River culture can

be redeveloped and utilised, transforming them into digital cultural and creative products, cultural IP and interactive entertainment content. The integration of Yellow River culture with the cultural tourism industry enables cultural resources to be utilised more effectively. Through digital performances, immersive guided tours and virtual experiences, visitors can witness the charm of Yellow River culture more intuitively, enhancing their sense of participation and interactivity, and driving the innovative transformation and sustainable development of Yellow River cultural resources.

4. An Analysis of Design Approaches for the Digital and Intelligent Dissemination of Yellow River Cultural Heritage

4.1. Establishing a Digital Visual Symbol System for Yellow River Culture

To achieve the digital and intelligent dissemination of Yellow River cultural heritage, it is first necessary to establish a digital visual symbol system that embodies regional characteristics and cultural distinctiveness [4]. Visual expression in the dissemination of traditional culture is often fragmented, lacking unity and systematic coherence; therefore, digital and intelligent design methods must be employed to extract, organise and reconstruct typical visual elements from Yellow River culture. Whilst preserving traditional cultural characteristics, appropriate innovations should be made to colour schemes, forms and visual styles, ensuring they better align with the contemporary digital media communication context and the aesthetic preferences of younger audiences.

4.2. Strengthening Narrative Design in Digital Media within a Multimodal Context

Multimodal storytelling emphasises the collaborative construction of text, images, sound, animation and interactive content, with different media working together to advance the expression of cultural narratives. In the digital dissemination of Yellow River culture, a comprehensive narrative system integrating text, images, sound and interaction can be established [1]. In the ‘Centre of Heaven and Earth’ architectural AR interactive design project, augmented reality technology is used to integrate traditional architectural culture, historical narratives and spatial settings. Users can access architectural history, cultural significance and interactive information within a real-world environment, thereby achieving a cultural experience that blends the virtual and the real. This multimodal narrative approach enhances the sense of space and immersion in the dissemination of traditional architectural culture, whilst simultaneously deepening users’ understanding of and identification with the spiritual essence of Confucian, Buddhist and Taoist cultures. (i.e., Figure 2)

In the process of digital communication, we utilise virtual reality, digital characters, interactive scenarios and real-time feedback to provide users with a more immersive cultural experience. In terms of interactive design, the emphasis is on emotional expression and social dissemination. Gamified interactions, virtual character development, digital collectibles and social sharing are utilised to enhance user engagement and foster a sense of identification with cultural content within the context of Yellow River cultural dissemination.

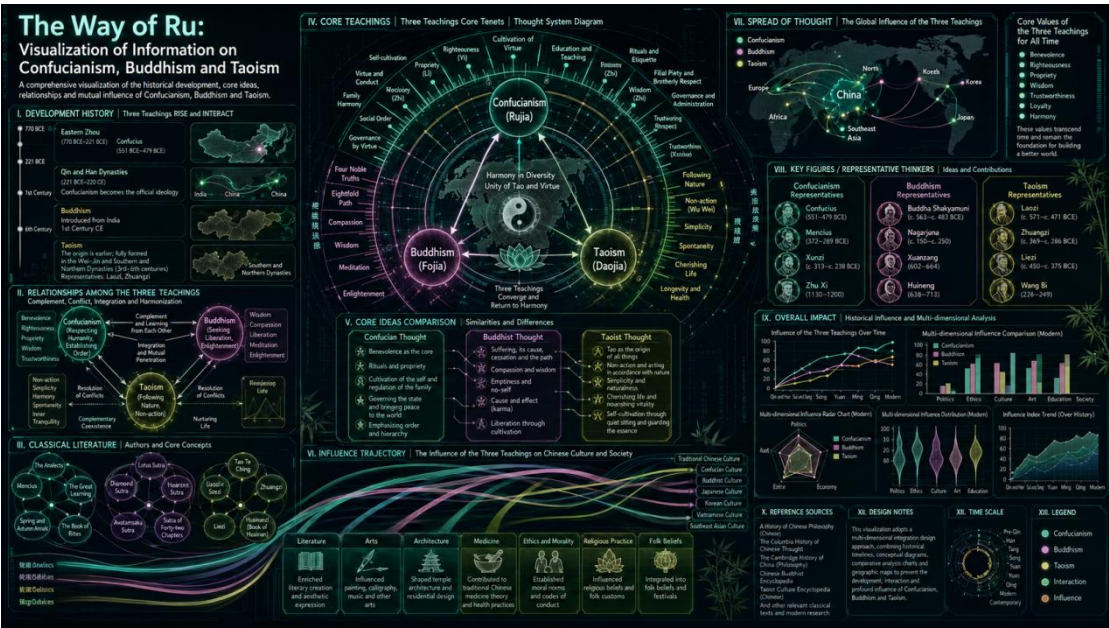


Figure 2. Visualisation design of Confucian, Buddhist and Taoist information.

In the design of interactive experiences, attention is paid to achieving harmony between technology and cultural content, thereby enhancing the enjoyment of the user experience without trivialising cultural expression, thus improving the quality of digital cultural dissemination. For example, in the Song Tombs VR Immersive Interaction Design project, virtual reality technology was used to recreate historical scenes of the Song Tombs, allowing users to enter the cultural space from a first-person perspective. Through scene exploration, voice interaction and dynamic storytelling, the project enhances users' sense of cultural immersion. Compared to static displays, this immersive interaction design effectively increases user engagement, fosters emotional resonance and spatial perception in cultural dissemination, and provides a new interactive pathway for the digital dissemination of Yellow River cultural heritage ((i.e., Figure 3).

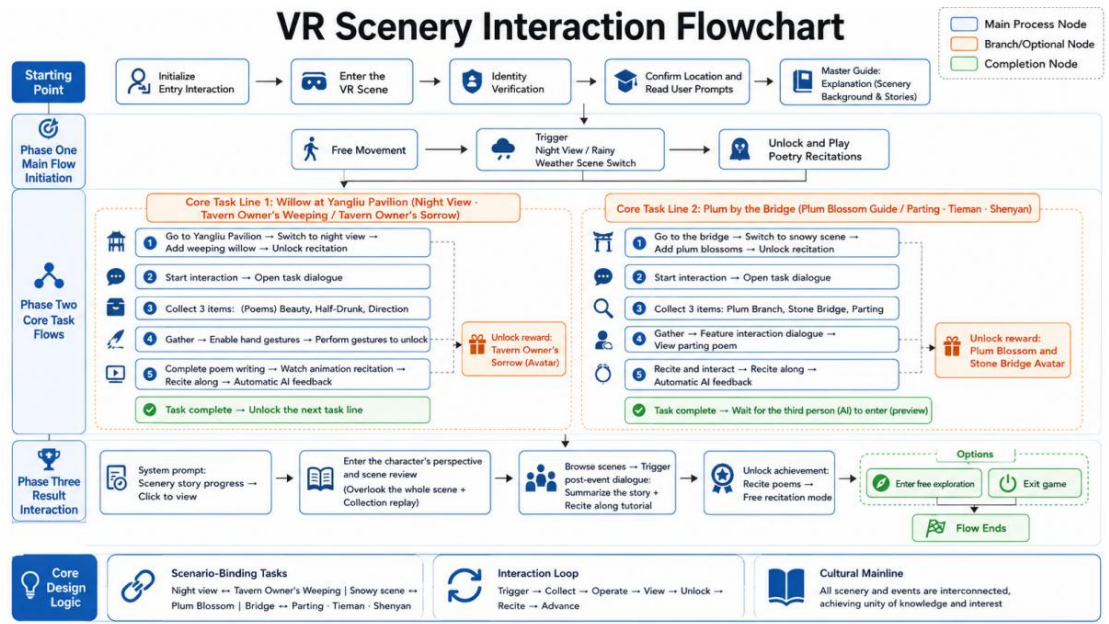


Figure 3. Interaction flowchart for the VR Yongchang Mausoleum Scenes.

4.3. Establishing a Multi-platform Collaborative Digital Dissemination Mechanism

With the development of the digital media environment, the dissemination of Yellow River cultural heritage is increasingly exhibiting a trend towards cross-media convergence across different platforms [1]. It is necessary to establish a collaborative digital dissemination mechanism across various platforms to achieve the coordinated dissemination of cultural content across different media environments. For example, on short-video platforms, dynamic visual storytelling can be employed to enhance the appeal of dissemination; on social media platforms, digital emojis, virtual IPs and interactive topics related to Yellow River culture can be developed; whilst digital exhibition halls and cultural tourism platforms can combine virtual reality and interactive scenarios to create immersive cultural experience spaces. Furthermore, collaborative dissemination between different platforms should be promoted, and a unified content mechanism established.

4.4. Promoting Innovative Integration of Digital Technology and Cultural Tourism Scenarios

Against the current backdrop of the integrated development of the digital economy and cultural tourism [2], the digital dissemination of Yellow River cultural heritage must not be confined to online dissemination alone; rather, digital technology must be deeply integrated with cultural tourism scenarios to drive the innovative transformation and revitalised utilisation of cultural resources. Through virtual reality, immersive interaction and scenario-based experiences, digital cultural tourism spaces with a sense of cultural immersion can be created. Taking Zhengzhou's 'Only Henan: Theatre Fantasy City' as an example, the project centres on the cultural essence of the Yellow River and the Central Plains, utilising technologies such as immersive theatre, live light and sound performances, and digital scene reconstruction to create a panoramic cultural and tourism experience space. It enables audiences to experience Yellow River civilisation through walk-through, scenario-based interactions, serving as a prime example of how digital technology empowers innovation in Yellow River cultural and tourism scenarios, thereby achieving the revitalised dissemination of Yellow River cultural resources.

5. Conclusions

Against the backdrop of rapid advancements in digital technology, the dissemination of Yellow River cultural heritage has evolved from static displays to digital, intelligent, immersive and interactive formats. Consequently, this paper analyses the subject against the backdrop of AIGC multimodal perspectives, focusing primarily on the digital and intelligent dissemination of Yellow River cultural heritage. It elaborates on the design value and practical challenges of Yellow River cultural heritage in areas such as visual communication, digital storytelling, interactive experiences, multi-platform dissemination, and the integration of culture and tourism, whilst proposing a roadmap for optimisation.

By leveraging digital technology, we can enhance the efficiency of Yellow River cultural heritage dissemination whilst broadening the forms of cultural expression and dissemination scenarios. This involves constructing a digital visual symbol system, strengthening multimodal narrative design, improving interactive experiences, and promoting the integration of culture and tourism. Such efforts will enhance cultural distinctiveness, user engagement and emotional resonance in the dissemination of

Yellow River culture, thereby facilitating the creative transformation and innovative development of traditional culture.

Furthermore, the integration of digital technology with traditional culture should be further strengthened, the multimodal dissemination system refined, and emotional expression and user experience within cultural narratives enhanced. Concurrently, efforts should be made to develop digital cultural tourism scenarios and cultivate interdisciplinary talent, thereby promoting the development of digital dissemination of Yellow River cultural heritage towards greater intelligence, systematisation and immersion.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author Contributions

Conceptualisation: Chen Jiaoyan and Chu Xiaohui; Methodology: Chu Xiaohui; Formal analysis: Chen Jiaoyan; Investigation: Chen Jiaoyan; Resources: Chen Jiaoyan; Data curation: Chen Jiaoyan; Writing – original draft preparation: Chen Jiaoyan; Writing – review and editing: Chu Xiaohui; Visualisation: Chen Jiaoyan; Supervision: Chu Xiaohui; Project administration: Chu Xiaohui. All authors have read and agreed to the published version of the manuscript.

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