

# *Research on Multimodal AI-Empowered Digital Preservation and Innovative Communication of Intangible Cultural Heritage Opera: A Case Study of Yuxi Huadeng Opera*

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**Abstract:** Intangible cultural heritage opera projects are characterized by multimodal features in which texts, vocal styles, movements, costumes, stages, rituals, and local life experiences are interwoven. Traditional approaches to intangible cultural heritage preservation have largely relied on textual documentation, video recording, repertoire organization, and the cultivation of inheritors. However, in the context of digital and intelligent communication, static archives and offline performances alone can no longer meet the needs of living transmission, youth-oriented communication, and knowledge reproduction of intangible cultural heritage opera. As a representative project included in the first batch of China's national intangible cultural heritage list, Yuxi Huadeng Opera is characterized by its origin in folk Huadeng song-and-dance, integrated singing and dancing, distinctive dialectal vocal style, prominent dance movements, and lively clown-role performance. At the same time, it faces practical difficulties such as the decline of theatrical performances, a shortage of professional talent, scattered archival resources, alienation from young audiences, and a relatively limited mode of communication. Taking Yuxi Huadeng Opera as the research object, this paper adopts literature analysis and case study methods based on theories of intangible cultural heritage preservation, digital heritage, and multimodal artificial intelligence, and explores the functional mechanism of multimodal AI in the digital preservation and innovative communication of intangible cultural heritage opera. The study argues that multimodal AI can empower Yuxi Huadeng Opera through five stages: resource collection, knowledge modeling, intelligent analysis, assisted creation, and communication feedback. It can promote the transformation of Yuxi Huadeng Opera from static preservation to intelligent protection, from one-way display to interactive communication, and from experience-based transmission to data-supported living inheritance. Nevertheless, technological intervention must adhere to the principles of authenticity, integrity, and locality, avoiding the risks of algorithmically generated content obscuring the essence of opera, digital spectacles replacing artistic core, and traffic-oriented logic weakening cultural depth. This paper proposes practical paths such as building a multimodal database for Yuxi Huadeng Opera, constructing vocal and dialectal acoustic models, establishing movement and posture archives, developing an AI-assisted script adaptation platform, and forming a youth-oriented communication matrix. The study

aims to provide reference for the digital preservation and innovative communication of local opera-type intangible cultural heritage projects.

## 1. Introduction

Intangible cultural heritage refers to cultural forms created, transmitted, and continuously reproduced by specific communities, groups, and individuals through long-term historical practice. Compared with tangible cultural heritage, intangible cultural heritage depends more heavily on embodied practice, oral transmission, local experience, and social context. Opera-type intangible cultural heritage, in particular, is a comprehensive art form. Its cultural value is reflected not only in written scripts, but also in vocal melodies, dialectal recitation, performance movements, role conventions, stage arrangements, costumes, props, and the relationship between performers and audiences. Therefore, the preservation of opera-type intangible cultural heritage should not remain at the level of “text preservation” or “performance recording”; rather, it should develop toward a holistic preservation system that is multimodal, structured, sustainable, and reusable.

Yuxi Huadeng Opera is an important representative of local opera in Yunnan Province. On May 20, 2006, Huadeng Opera, namely Yuxi Huadeng Opera, submitted by Yuxi City, Yunnan Province, was approved by the State Council and included in the first batch of the National List of Intangible Cultural Heritage, with the project number IV-78 and the category of traditional drama [1]. Yuxi Huadeng Opera originated from folk Huadeng song-and-dance. It took shape in the late Qing Dynasty and early Republic of China period and became popular in Yunnan. Because of its relatively early reform, it was also known as “New Huadeng.” In artistic form, Yuxi Huadeng Opera mainly features song-and-dance performances by two performers and group dances by more than two performers. It combines singing and dancing, allows flexible subject matter, and was also influenced by Dian Opera, gradually developing into a local opera form capable of presenting large-scale historical plays, modern dramas, and local life themes.

The UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage emphasizes that the purpose of safeguarding intangible cultural heritage is to ensure its viability and to value the central role of related communities, groups, and individuals in the safeguarding process [2]. In the Chinese context, the 14th Five-Year Plan for the Protection of Intangible Cultural Heritage issued by the Ministry of Culture and Tourism also proposes improving the level of intangible cultural heritage protection and inheritance, promoting the integration of intangible cultural heritage and tourism, and encouraging intangible cultural heritage to enter modern life [3]. Therefore, the preservation of Yuxi Huadeng Opera should not be limited to static conservation; it should also attach importance to communication, learning, experience, and recreation in contemporary society.

In the contemporary media environment, the inheritance and communication of Yuxi Huadeng Opera are facing new challenges. On the one hand, traditional theatrical performances are decreasing, professional troupes and young creative talents are insufficient, and some repertoires, vocal styles, performance conventions, and orally transmitted experience are at risk of being lost. On the other hand, technologies such as short video, livestreaming, virtual reality, AI-generated content, and multimodal large models are developing rapidly, providing new tools and communication spaces for the digital preservation of local opera-type intangible cultural heritage. How to achieve the unity of “upholding tradition” and “innovation” under AI empowerment has become a core issue that must be addressed in the digital preservation and innovative communication of Yuxi Huadeng Opera.

This paper focuses on three questions. First, as a local opera-type intangible cultural heritage project, what artistic characteristics of Yuxi Huadeng Opera are suitable for multimodal digital preservation? Second, in which stages can multimodal AI empower the preservation, inheritance, and communication of Yuxi Huadeng Opera? Third, when AI intervenes in the innovative communication of intangible cultural heritage opera, how can risks such as cultural distortion, technological dominance, and superficial communication be avoided?

## 2. Literature Review and Theoretical Foundation

### 2.1 Research on Intangible Cultural Heritage Preservation and Living Transmission

The core issue in intangible cultural heritage preservation research is how to enable traditional culture to continue being practiced, understood, and disseminated in contemporary society while respecting the subjectivity of traditional cultural communities. The preservation of intangible cultural heritage is not equivalent to fixing traditional culture as a static specimen; rather, it aims to maintain its capacity for living transmission. The living transmission of opera-type intangible cultural heritage especially depends on the joint participation of performers, inheritors, troupes, audiences, and local society.

Hu Rongmei discusses the preservation and transmission of Yunnan Huadeng Opera from the perspective of intangible cultural heritage protection. She points out that Yunnan Huadeng Opera faces problems such as the sharp decline of professional troupes, a lack of successors, and a shrinking market. She also proposes strengthening its preservation and transmission through local legislation, database construction, talent cultivation, high-quality repertoire creation, and the establishment of exhibition and publicity platforms [4]. This study indicates that the preservation of Huadeng Opera cannot rely solely on scattered performances and individual inheritors; instead, it should establish institutionalized, systematic, and socially supported protection mechanisms.

### 2.2 Research on Yunnan Huadeng Opera

Existing studies generally hold that Yunnan Huadeng Opera is a local opera form developed through the long-term integration of Central Plains shehuo culture, Lantern Festival activities, Yunnan ethnic song-and-dance, dialects, and folk customs. Figure 1 shows the performance photos of *The Maiden Mo-chou*.



Figure 1: The Performance photos of *The Maiden Mo-chou*

Zhang Xinyuan, Liu Wei, and Wang Miaoze point out in their study on the archival protection of Yunnan Huadeng Opera that all sixteen prefectures and cities in Yunnan have their own forms of Huadeng Opera, with diverse styles and forms that have gradually developed distinctive local artistic characteristics. Among them, Yuxi Huadeng Opera is characterized by its reform-oriented and innovative spirit. At the same time, “wai bu” is regarded as the soul of Huadeng performance, while “fan patterns” are also important expressive forms distinguishing Yunnan Huadeng Opera from ordinary folk opera [5].

Wang Hong, from the perspective of artistic characteristics, argues that Yunnan Huadeng Opera combines Central Plains culture with the unique cultural and artistic features of Yunnan. It is characterized by numerous branches, lyrics and spoken lines containing regional features, singing accompanied by dancing, and rich musical tunes [6]. This shows that the digital preservation of Yuxi Huadeng Opera should not focus only on scripts, but should also pay attention to vocal style, dialect, dance, body movements, props, and regional aesthetics.

### **2.3 Research on Archival Protection of Intangible Cultural Heritage and Digital Heritage**

The preservation of intangible cultural heritage cannot be separated from archival construction. Zhang Xinyuan and others point out that the archival protection of Yunnan Huadeng Opera still faces problems such as incomplete archive collection, scattered and lost archival materials, an underdeveloped classification system, and insufficient development and utilization of archival resources [5]. Opera archives are characterized by diverse carriers, complex content, and strong contextual dependence. They include not only static materials such as scripts, musical scores, photographs, and costumes, but also dynamic materials such as performance videos, oral accounts of inheritors, stage practice, and audience memories. Therefore, the archival construction of intangible cultural heritage opera should not merely establish textual catalogues; rather, it should preserve artistic information through text, images, audio, video, and structured metadata.

The UNESCO Charter on the Preservation of the Digital Heritage emphasizes that digital heritage is an important resource of human knowledge and expression, and that its preservation aims to ensure the long-term accessibility of digital resources [7]. From this perspective, the digital preservation of Yuxi Huadeng Opera does not simply mean converting traditional materials into electronic documents. Instead, it requires transforming texts, sounds, images, movements, and contextual information into a digital resource system that can be searched, understood, taught, and disseminated.

### **2.4 Research on Multimodal AI and Cultural Heritage Communication**

Multimodal artificial intelligence refers to an intelligent technological system capable of processing and integrating multiple forms of information, including text, images, speech, video, and movement. Baltrušaitis, Ahuja, and Morency summarize multimodal machine learning into key tasks such as representation, translation, alignment, fusion, and co-learning [8]. The Transformer architecture proposed by Vaswani and others laid the foundation for the development of large-scale models in text, speech, image, and video processing [9]. The vision-language model proposed by Radford and others realizes cross-modal semantic understanding through contrastive learning between images and texts [10]. The text-to-image generation study by Ramesh and others demonstrates that natural language can participate in the generation of visual content [11].

Intangible cultural heritage opera is inherently multimodal. Taking Yuxi Huadeng Opera as an example, scripts correspond to the linguistic modality; vocal styles and accompaniment correspond to the audio modality; movements, wai bu, fan patterns, and clown-role performance correspond to the motion and video modalities; costumes, props, and stage design correspond to the visual

modality; and audience comments, communication data, and interactive behavior correspond to the social feedback modality. Therefore, multimodal AI is highly compatible with intangible cultural heritage opera. AI technology can be used not only for resource collection, annotation, and retrieval, but also for vocal analysis, movement recognition, script-assisted generation, communication content recommendation, and audience feedback analysis.

### **3. Research Design**

This paper adopts literature analysis, case study, and pathway construction methods. First, it reviews research on intangible cultural heritage preservation, digital heritage, multimodal AI, and Yunnan Huadeng Opera to establish a theoretical foundation. Second, it takes Yuxi Huadeng Opera as a case to analyze its historical origin, artistic characteristics, transmission difficulties, and digital preservation needs. Third, based on the characteristics of multimodal AI technology, it proposes an application framework for the digital preservation and innovative communication of Yuxi Huadeng Opera.

This paper does not conduct fabricated questionnaire statistics or experimental modeling. Instead, it develops theoretical construction based on existing literature, project materials, and case materials. Its research focus is not to prove the quantitative performance of a specific AI system, but to explain how multimodal AI can reasonably intervene in the preservation of intangible cultural heritage opera and what cultural principles and governance mechanisms should be upheld during this process.

## **4. Multimodal Artistic Characteristics and Preservation Difficulties of Yuxi Huadeng Opera**

### **4.1 Multimodal Artistic Characteristics of Yuxi Huadeng Opera**

First, in the textual modality, Yuxi Huadeng Opera is characterized by folk life and local narrative. Its subject matter includes traditional stories, historical figures, folk legends, modern life, and revolutionary themes. During its long development, Yuxi Huadeng Opera continuously absorbed elements from Dian Opera and other genres, transforming from small song-and-dance plays into an opera form capable of presenting complex plots and character portrayals.

Second, in the audio modality, Yuxi Huadeng Opera possesses dialectal vocal style and diverse musical tunes. Its singing must convey local dialectal flavor while also serving the emotional expression of characters and the development of dramatic plots. Therefore, sound is not an auxiliary element, but an important carrier of the cultural identity of Yuxi Huadeng Opera.

Third, in the movement modality, Yuxi Huadeng Opera emphasizes integrated singing and dancing, wai bu, and fan patterns. In Yunnan Huadeng dance, there is a saying that “without wai bu, there is no Huadeng,” which shows that bodily movement is an important feature distinguishing Huadeng Opera from ordinary opera forms. The use of fans, handkerchiefs, and other props also gives Yuxi Huadeng Opera a distinctive visual rhythm and bodily beauty.

Fourth, in the visual modality, Yuxi Huadeng Opera includes costumes, makeup, stage design, props, and spatial arrangement. With the development of modern stage technology, projection, lighting, and multimedia devices have gradually entered Huadeng Opera performances. However, these technologies should serve the original freehand, folk, and local qualities of Huadeng Opera rather than replace its artistic essence.

Fifth, in the social modality, Yuxi Huadeng Opera is closely related to local festivals, rural life, and the relationship between performers and audiences. It is not a pure theater art detached from local society, but a cultural phenomenon formed within folk life, festival rituals, and local identity. Therefore, the preservation of Yuxi Huadeng Opera needs to preserve artistic texts, performance

skills, and social context at the same time.

## 4.2 Preservation Difficulties of Yuxi Huadeng Opera

At present, the difficulties faced by Yuxi Huadeng Opera are mainly reflected in four aspects.

First, resource preservation is scattered. Traditional scripts, musical scores, oral histories, performance videos of senior artists, and local performance materials may be scattered among troupes, cultural centers, individual inheritors, and local archival institutions. A unified, structured, and continuously updated digital resource system has not yet been formed.

Second, inheritance subjects are insufficient. Local opera generally faces a shortage of young performers and creative talents. Some vocal styles, movements, and performance experiences rely on oral instruction and personal transmission, creating the risk of rupture.

Third, communication methods are limited. Traditional stage performances are restricted by time, space, and audience size, making it difficult to continuously reach young audiences.

Fourth, the boundary of innovation is unclear. Modern stage design, popular music, short videos, and AIGC can expand communication effects, but they may also result in “technological excitement” replacing the original “Huadeng flavor.” Therefore, the innovative communication of Yuxi Huadeng Opera must properly handle the relationship between “attracting audiences” and “preserving the artistic essence.”

## 5. A Mechanism Model for Multimodal AI-Empowered Yuxi Huadeng Opera

Multimodal AI empowerment of Yuxi Huadeng Opera does not mean using AI to replace performers, playwrights, or inheritors. Rather, AI should function as a collaborative system for resource organization, skill learning, creative assistance, and communication optimization. This paper proposes a five-layer model: the resource layer, analysis layer, generation layer, communication layer, and governance layer. Figure 2 shows the detail of the mechanism model.

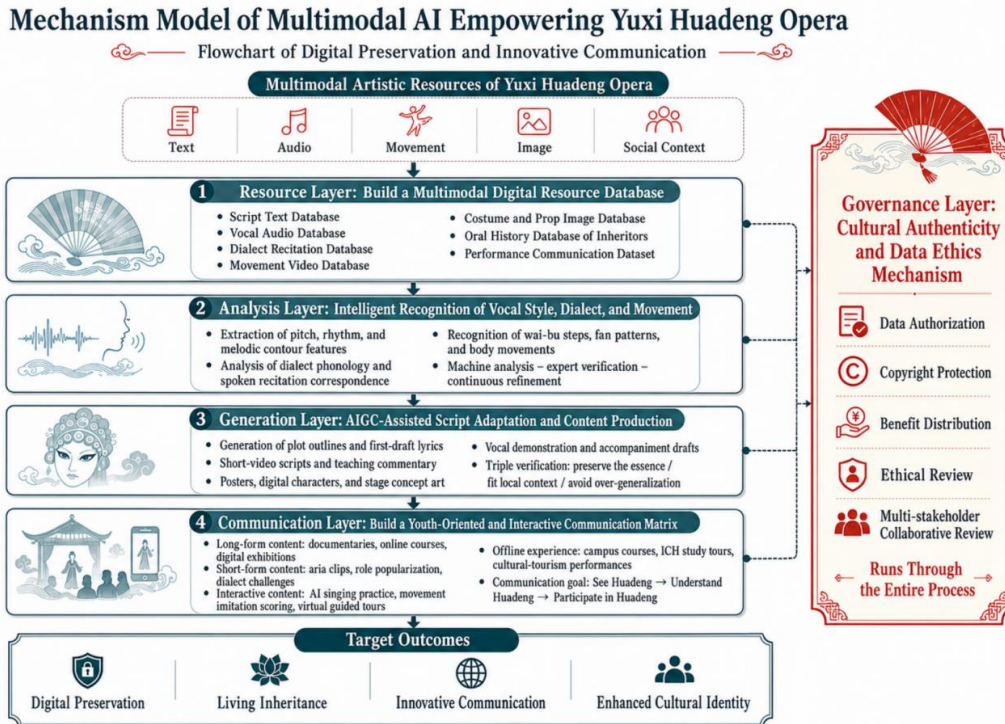


Figure 2: The detail of the mechanism model

## 5.1 Resource Layer: Building a Multimodal Digital Resource Database

The resource layer is the foundation of AI empowerment. A digital resource database for Yuxi Huadeng Opera should include a script text database, vocal audio database, dialectal recitation database, movement video database, costume and prop image database, inheritor oral history database, and performance communication dataset. Each type of resource needs unified metadata, including repertoire title, role type, tune name, performer, collection time, location, authorization method, version description, and related transmission lineage. Only in this way can digital preservation avoid remaining at the level of “data accumulation” and truly form searchable, traceable, and usable knowledge resources.

## 5.2 Analysis Layer: Intelligent Recognition of Vocal Style, Dialect, and Movement

The analysis layer mainly uses audio processing, speech recognition, video pose estimation, and image recognition technologies to conduct intelligent analysis of the artistic characteristics of Yuxi Huadeng Opera. Vocal analysis can extract features such as pitch, rhythm, melodic contour, prolonged singing, and ornamental tones. Dialect analysis can establish phonological correspondences between local recitation and Mandarin. Movement recognition can record wai bu, fan patterns, hand positions, body movements, and stage arrangements. These technologies can provide visualized references for teaching, transmission, and research.

However, AI analysis cannot replace the aesthetic judgment of inheritors. Machines can judge pitch similarity, rhythmic deviation, and movement trajectories, but whether a performance has “Huadeng flavor,” whether it conforms to a character’s temperament, and whether it reflects the local interest of everyday life still require joint evaluation by inheritors, performers, and researchers. Therefore, intelligent recognition should be combined with expert annotation to form a mechanism of “machine analysis—expert verification—continuous correction.”

## 5.3 Generation Layer: AIGC-Assisted Script Adaptation and Communication Content Production

The generation layer mainly serves creative assistance. Large language models can generate plot outlines, short video scripts, teaching explanations, communication copywriting, and interactive Q&A based on traditional repertoires, local stories, and poetic texts. Image generation models can assist in designing posters, digital characters, stage concept images, and cultural-creative visual elements. Speech synthesis and music generation technologies can be used for vocal teaching demonstrations and accompaniment drafts.

However, AIGC must follow the principle of authenticity in intangible cultural heritage. For Yuxi Huadeng Opera, AI-generated content should undergo at least three levels of verification. First, it should preserve core identifying elements such as dialectal vocal style, wai bu, fan patterns, and clown-role performance. Second, it should conform to the folk aesthetics and local life logic of Yuxi Huadeng Opera. Third, it should avoid turning Huadeng Opera into a generalized form of “ancient-style opera,” “popular song-and-dance,” or “visual spectacle.” AI can only provide auxiliary proposals and cannot replace the final judgment of inheritors and opera practitioners.

## 5.4 Communication Layer: Constructing a Youth-Oriented and Interactive Communication Matrix

The communication layer is the key to transforming digital preservation into social influence. Yuxi Huadeng Opera can build a communication matrix combining long-form content, short-form

content, interactive content, and offline experience. Long-form content includes documentaries, online courses, and digital exhibition halls. Short-form content includes clips of classic arias, role introductions, dialectal recitation challenges, and wai bu teaching videos. Interactive content includes AI-assisted singing practice, movement imitation scoring, role-based Q&A, and virtual tours. Offline experience includes campus courses, intangible cultural heritage study tours, cultural-tourism performances, and immersive experience spaces.

The goal of this communication matrix is not simply to pursue traffic, but to enable audiences to acquire clear knowledge points about Huadeng Opera within short periods of contact and then move toward deeper learning and offline experience. In other words, digital communication should move from “seeing Huadeng” to “understanding Huadeng,” and further to “participating in Huadeng.”

### **5.5 Governance Layer: Establishing Mechanisms for Cultural Authenticity and Data Ethics**

The governance layer runs through the entire process of AI empowerment. The digitalization of intangible cultural heritage opera involves the voices, portraits, movements, scripts, musical scores, and local knowledge of inheritors. Therefore, mechanisms for data authorization, copyright protection, benefit sharing, and ethical review must be established. Especially in AI training and content generation, unauthorized use of inheritors’ audio and video data should be avoided, and local knowledge should not be transformed into algorithmic materials with no source, no subject, and no responsibility. At the same time, an auditing mechanism jointly participated in by inheritors, troupes, cultural centers, universities, and technical teams should be established to ensure that technological innovation serves rather than dissolves the essence of intangible cultural heritage.

## **6. Practical Paths for the Digital Preservation and Innovative Communication of Yuxi Huadeng Opera**

### **6.1 Building a Multimodal Database for Yuxi Huadeng Opera**

First, a small-scale and expandable multimodal database for Yuxi Huadeng Opera should be built around representative repertoires, representative inheritors, and representative vocal excerpts. The database can be divided into five modules: text, audio, video, image, and oral history. The text module includes scripts, lyrics, spoken lines, musical score descriptions, and research literature. The audio module includes vocal excerpts, dialectal recitation, instrumental accompaniment, and live recordings. The video module includes complete performances, movement decomposition, and teaching demonstrations. The image module includes costumes, fans and handkerchiefs, makeup, posters, and stage photographs. The oral history module records inheritors’ artistic experiences, transmission relationships, and creative experiences.

### **6.2 Constructing an Intelligent Learning System for Vocal Style and Dialect**

Second, an AI speech evaluation system for learners should be developed. This system can compare learners’ singing with demonstration recordings by inheritors and provide feedback on pitch, rhythm, articulation, prolonged singing, and pauses. Unlike Mandarin speech evaluation, speech evaluation for Yuxi Huadeng Opera must respect local dialect and opera singing style. It cannot simply replace Huadeng vocal standards with Mandarin pronunciation standards. Therefore, the system should be continuously optimized through a combination of standard sample databases, expert annotation, and learner feedback.

### **6.3 Establishing Archives of Movement Posture and Dance Gestures**

Third, video pose estimation and motion capture technologies should be used to record movement elements such as wai bu, fan patterns, hand positions, turns, and circular stage walking. Movement archives can be used not only for preservation, but also for teaching. Learners can master basic body movements through video comparison, movement trajectory visualization, and step-by-step practice. For prop movements such as fan patterns, it is also possible to establish associations among movement names, movement meanings, usage scenarios, and corresponding vocal excerpts, thereby forming a movement knowledge base.

### **6.4 Carrying Out AI-Assisted Script Adaptation and Poetic Intertextual Experiments**

The digital innovative communication of Yuxi Huadeng Opera can also integrate poetic texts, local legends, and red cultural resources to conduct AI-assisted script adaptation experiments. The basic procedure is as follows: collect traditional scripts and local stories to build a material database; use large language models to generate plot drafts and preliminary lyrics; invite playwrights, directors, and inheritors to revise them; collect feedback through small-scale performances or online releases; and then conduct secondary optimization. This process can give full play to the efficiency advantages of AI in material combination, text generation, and communication copywriting, while also using expert review to preserve the essence of opera.

### **6.5 Forming New Media Communication and Cultural-Tourism Integration Scenarios**

Finally, the digital achievements of Yuxi Huadeng Opera should be transformed into communication scenarios. Online communication can be carried out through short video platforms, Bilibili, WeChat official accounts, mini-programs, and digital exhibition halls. Offline communication can be combined with campus aesthetic education, intangible cultural heritage study tours, local cultural tourism, immersive performances, and community cultural activities. Communication content may be designed as a series of columns such as “One Minute of a Classic Aria,” “A Small Classroom on Huadeng Dialect,” “A Breakdown of Fan Patterns,” “Why the Clown Role Is the Soul,” and “The Aesthetics of Everyday Life in Yuxi Huadeng Opera.” Through continuous, thematic, and interactive communication, young audiences can be attracted more effectively.

## **7. Risk Reflection and Governance Suggestions**

### **7.1 Preventing Cultural Distortion**

AI-generated content may easily mix elements from different local opera forms and generate “pseudo-intangible cultural heritage” content that appears traditional but is actually inaccurate. Therefore, AI generation for Yuxi Huadeng Opera must establish an ontology knowledge base and expert review mechanism, clarifying which elements can be innovated and which must be preserved. Dialectal vocal style, wai bu, fan patterns, clown-role performance, and life-oriented song-and-dance should be regarded as the core boundaries of the digital translation of Yuxi Huadeng Opera.

### **7.2 Preventing Technology from Overwhelming Art**

Digital technology can enhance stage expression and communication appeal, but it should not

cause audiences to remember only projection, lighting, and AI special effects while forgetting vocal style, spoken lines, and body movements. Technology should serve opera aesthetics rather than replace them. For Yuxi Huadeng Opera, the ideal form of digital innovation is not to turn Huadeng Opera into a technological show, but to help audiences better understand why Huadeng is beautiful.

### **7.3 Preventing Superficial Communication**

Short video communication can easily lead to the fragmentation of intangible cultural heritage symbols. If communication content only pursues humor, novelty, or topical popularity, it may weaken the cultural depth of Huadeng Opera. Therefore, knowledge explanation and aesthetic guidance should be embedded in short videos, so that each communication unit corresponds to a clear cultural knowledge point.

### **7.4 Strengthening Data Ethics and Copyright Protection**

The voices, performance movements, portraits, and oral histories of inheritors all possess cultural and personal attributes. Digital collection and AI training should adhere to the principles of informed consent, authorized use, limited purposes, and benefit sharing. AI-generated works should also clearly indicate the generation process, material sources, and responsibility for human modification, so as to avoid infringing upon the rights and interests of inheritors and troupes.

## **8. Conclusion**

As a national intangible cultural heritage project, Yuxi Huadeng Opera has distinctive local, song-and-dance, dialectal, and folk characteristics. Its digital preservation should not remain at the level of preserving scripts or performance videos, but should construct a multimodal resource system covering texts, sounds, movements, images, stages, and social contexts. Multimodal AI provides new tools for the preservation and communication of Yuxi Huadeng Opera. At the resource level, it can promote systematic archiving of scripts, vocal styles, movements, and visual materials. At the analysis level, it can support the recognition of vocal, dialectal, and movement features. At the generation level, it can assist script adaptation, teaching content production, and communication copywriting. At the communication level, it can promote short video dissemination, interactive learning, and immersive experience. At the governance level, it also requires mechanisms of authenticity, copyright protection, and ethical regulation.

This paper argues that the key to multimodal AI empowerment of Yuxi Huadeng Opera does not lie in “using technology to replace tradition,” but in “using technology to help tradition be understood, learned, and disseminated.” The future innovative communication of Yuxi Huadeng Opera should adhere to the principles of protection first, preservation of artistic essence, and appropriate use of technology. It should lower the threshold of understanding for young audiences while maintaining artistic richness, and expand communication reach while preserving local cultural identity. Only in this way can multimodal AI truly become a driving force for the living transmission of intangible cultural heritage opera, rather than a tool of superficialization, spectacle, and traffic-oriented communication.

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