

Applying Digital Media in Cultural Heritage: Meet King Zhuang of Chu and Front-projected Holographic Display Technology and Nonlinear Narratives

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Abstract. The development of modern technology leads to the inevitable dismission of traditional techniques. However, this does not mean that tradition and traditional culture give way completely to trends. Innovating media applications like augmented reality (AR) and virtual reality (VR) offer a new way of displaying antiquities, especially when travelling was restricted during the pandemic (Theodoropoulos & Antoniou 2022)[1]. For example, 3D modelling can help to reconstruct broken relics and interactive installation build a multi-dimensional view of history. Improving technologies provide a way of understanding history and thus inheriting traditional culture in more depth. While the digital age is having profound effects on how we imagine the future, it is proving equally significant in shaping how we recollect and confront the traces of our past (Burkey 2021)[2]. This article aims to outline and analyse the current dilemmas of applying digital media in the cultural heritage field from the perspectives of designers and audiences. It then introduces the dance drama Meet King Zhuang of Chu to critically examine the practical accomplishments of front-projected holographic display technology and non-linear narratives in.

Keywords: Digital media; cultural heritage; AR and VR technology.

1 Introduction

Early in 2004, the Louvre Museum became the first build an online virtual museum, bringing cultural relics to the digital world[3]. This was followed by the Petrie Museum of Egyptian Archaeology in London, who built a relic model with 3D shooting and WebGL visualising interactive technology[4]. There have also been other attempts, such as the Van Gogh Alive exhibition held by Massimiliano Siccardi and Luca Longobardi[5], in which the artists recreated Van Gogh's work with the interactive projections, allowing audiences to experience the classical paintings in a multi-sensory way. The term "digital media" entered the historical field in 1991 when 3D models were applied in the historical reconstruction project of Roman Bath (Woodwark 1991,18-20)[6]. Since then, digital media has played an increasingly significant role in dealing with complex and interactively-driven historical projects (Forte & Siliotti 1996)[7].

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However, the predecessors are still at a stage of replication or an early stage of recreation according to the cases above. Designers should consider helping audiences to explore culture in more depth instead of only visualising relics digitally.

2 Literature Review

Authenticity of Heritage

Cultural inheritance consists of two parts: the origins of history and relics and the understanding of traditions and culture. The International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter 1964)[8], stated that "It is our duty to hand them (ancient monuments) on in the full richness of their authenticity". The authenticity of historical monuments consist of two parts: the tangible and intangible (Throsby 2010).[9] Hence, the integrity of authenticity can be drawn into a debate bound by the insufficient physical evidence and illusion of the immaterial. Cameron (2010)[10] discussed both sides of authenticity, suggesting that the digital reproduction of historical objects is a terrorist to the "real", as the digital version of the objects may be publicised as the substitute of the "real", gradually blurring and replacing the "real" in meaning (Baudrillard 2000).[11] The destabilisation of the real in physical aspect deconstructed historical objects to a semiotically self-referring existence on the other hand. Therefore, the importance of the semiotic value and authenticity of the immaterial should be further addressed in digitisation project for historic objects.

In terms of material authenticity, most cases apply digital media to reconstruct broken antiques. For example, in the 1950s, X-ray photography was used to detect the inner space of bronze wares. In 2023, at the Shanghai Museum, Zhang combined X-ray with computed tomography (CT) and AR technologies to provide more accurate 3D data of relics covered in dust.[12] Other examples include the Rome Reborn Project lead by Bernard Frischer and the digital unwrapping of Amenhotep I's mummy at the University of Cairo in Egypt[13]. In all the cases above, digital techniques are used to provide a more detailed and comprehensive database for the recovery of cultural relics. Therefore, the importance of ensuring the accuracy of the data collected and therefore guaranteeing the authenticity of the relics need to be taken into consideration. Comprehensive research on the relics' data would be required. In relic digitisation, the production team should record the information of the relics completely and lossless (Wan 2013 p29)[14].

Physical authenticity can be proven by sufficient database information, but the authenticity of the intangible aspects is hard to define. The Ethical Principles for Safeguarding Intangible Cultural Heritage (2003)[15] clearly stated that "The dynamic and living nature of intangible cultural heritage should be continuously respected. Authenticity and exclusivity should not constitute concerns and obstacles in the safeguarding of intangible cultural heritage... The intangible heritage is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history." It is clear that the authenticity of intangible heritage is orientated by a community within its environment, instead of outward appearances. Therefore, comprehensive community-based research is essential for conserving the authenticity of the

intangible aspect of cultural relics. This research can include human activities and the environment of the community. Moreover, the research should not focus solely on the history and the past, but also the current situation of the culture and place. To preserve authenticity while keeping culture alive in the contemporary world, it is necessary to consider culture heritage in a contemporary content, digitising and introducing the culture in relation to the background of the modern community.

In the Gannan Hakka culture digital reshaping project, the researchers based their work on community-oriented research (2023)[16] and built digital museums and a new media social platform using VR technology. The report revealed the designers' comprehensive research on the trajectory of Hakka people's habits and habitat. The designers then applied the characteristics of Hakka culture in the digital museum and platform in terms of both aesthetics and connotations. They used the representative patterns of the culture in their design and explained the relics and the communities in relation to the developing social background timeline in the app. The project not only focused on the replication of the relics themselves but also put more effort into maintaining the vitality of the culture through social approval. Digital heritage is redesigned with a contemporary aesthetic to attract audiences. In this way, intangible culture is publicised with full authenticity and sustainably.

Heritage Education

The inheritance of culture is not only about cultivating the protection consciousness of the whole citizens, but also about spreading related knowledge. Only by allowing people to perceive culture from an early age and cultivating their sense of closeness to the culture can the inheritance of the "group" be continued (Zheng 2008)[17]. Therefore, culture heritage as an educational subject has always been crucial and is an integral means for personal education, sustainable development, and the establishment of national identity.[18]

Achille and Fiorillo (2022)[19] summarised three fundamental objectives for a successful cultural heritage education programme: accessibility, communication, and participation. They emphasised the need for multi-sensory participation in the culture, comprehensive introductions and explanations, and freedom for audiences to take part in the activities. However, Perez et al's (2010)[20] research showed an insufficient understanding of the concept of cultural heritage among educators in primary school and a lack of teaching methods in middle school. Digital media could be a solution to the calls for some kind of supplementary support.

Thereby, to apply digital media the in educational field, the digital reshaping process should not be fixed at the duplication stage. The digital Palace Museum project[21] is an example of a museum digitisation project that put more effort into accessibility and communication. The project consists of a online virtual museum, four corresponding apps, and a website. The designers combined apps with digital versions of the relics together to build an online museum, introducing further historical knowledge with the apps. However, most digital reshaping cases are still at the stage of duplicating relics digitally. For example, the 3D digital project lead by the Imperial Palace of Shenyang in 2023[22] focused on guaranteeing the accuracy of the geometrical parameters but failed to build a structural cultural acknowledgement for audiences.

User Experience

The concept of "user experience" as suggested by Norman (2013)[23] encompasses "all aspects of the end-user's interaction with the company, its services, and its products." When talking about the user experience of a digital media project, it is necessary to consider the aural, tactile, olfactory, and interactive aspects, as well as the visual aspect. The digitisation of cultural relics transforms museum collections into interactive artwork, changing the viewers' perspective from spectator to participant. [24] When the audience becomes part of the work, they share part of the authorship with the artists and are thus able to influence, modify, and even recreate the work, which brings the work to life. [25]

Therefore, the user experience in digital projects is particularly important, and audiences should not be considered as outsiders but part of the work to accomplish the whole work with the author. In most early cases, the audiences were still in a spectator position, such as the First Life virtual project lead by the Natural History Museum in London, who cooperated with director Martin Williams to make a virtual version of his documentary film First Life, putting audiences in a deep-sea environment so that they can watch the film from multiple perspectives. However, the interactivity was still limited. [26] The film was still a linear narrative and audiences were not able to move the objects or change the story through interaction.

Non- Linear Narratives

Since its inception, new media has been highly connected with non-linear narratives. The application of digital media helps traditional dramas to retrieve plots in a more moderate and comprehensible way. Holtzman discussed the relationship between digital media and non-linear narratives in 1997:

...the alphabet and written word have shaped our literary traditions into linear form...In sharp contrast to the alphabet, the nature of digital technology is random access. It's nonlinear. A computer can retrieve information from any part of its RAM (random access memory) in less than a millionth of a second. With a hard disk it may take thousandths of a second. We are blinded by digital speed. With such rapid access time, it's equally easy to jump from one page to the next and from the first page to the last. In effect, anything stored in digital form can be accessed at any time and in any order (Holtzman 1997 p167-168).[27]

The spatio-temporal nature of linear narratives is singular, while the spatio-temporal nature of non-linear narratives is multi-dimensional [28]. Non-linear narratives are often characterised by multiple perspectives, multiple clues, and the intermingling of time and space, allowing characters and culture to be described in a more comprehensive and dynamic way, making the performance more attractive and able to tell a more vivid story. The inserted knowledge points alongside with the scene play an educator role in the heritage process, evoking the audience's memory of historical knowledge.

The birth of digital media in the late 20th centuries brought non-linear narratives to interactive images (Li 2023, p134).[29] In 1979, Lynn Hershman Leeson created the installation artwork Lorna, which was the first non-linear narrative artwork using media. This was followed by films like Room of One's Own (Leeson 1993) and The Erl King (Weinbren 1983), in which the artists started to explore non-linear narratives with

the support of digital media. However, this storytelling method is not that popular in the historical field. To maintain the integrity and rigorism of history, historical records tend to use an annalistic style, i.e., a typical linear narrative (Luan & Shi 2017).[30]

"Digitization capabilities provide cultural heritage institutions with a method for recording, management, and dissemination, whereas the process of collecting, recording, interpreting and disseminating "digital heritage" promotes the active participation of the audience" (Psomadaki et al. 2019)[31] As a means for recording, both physical and intangible authenticity should be taken into consideration. Today, the recording process largely focuses on physical aspects and fails to consider intangible aspects. Simple replication is not enough to fit the requirements. When it comes to dissemination, the process of transforming the information in recent projects lacks constructed acknowledgement and interest guidance for different age groups. In terms of audience involvement, digital designers tend to consider the audience as an outsider instead of a participant in the work.

In response to this gap, this article introduces the dance drama Meet King Zhuang of Chu to analyse the potential for the application of digital media like front-projected holographs and 3D modelling combining with non-linear narratives in the cultural heritage field. The article critically evaluates the effectiveness of digital media in response to gaps in the research, thereby developing a comprehensive hierarchy for designers working in this field.

3 Case Study

The Cultural Value of Meet King Zhuang of Chu

King Zhuang was the King of the Chu dynasty during 613-591 BC and was hailed as one of the Five Hegemonies during the Spring and Autumn Period (770-476BC) by Chinese historians.[32] He won the war against the Jin state and embodied the surrounded countries like Lu, Song, Zheng, and Chen. The state of Chu reached 1.5 million km2 and the population reached 5 million. Chu became the biggest country in the Central Plains during the reign of King Zhuang. His story reflects the golden age of Chu dynasty. There are several Chinese idioms derived from his story, such as Yi Ming Jing Ren (一鸣惊人) and Tao Guang Yang Hui (韬光养晦).

Meet King Zhuang of Chu is a dance drama concentrating on several important nodes in the life of King Zhuang. It narrates how King Zhuang pretended to fall into a torpor before fighting against the Jin state. The King of Jin underestimated him and lost the war. The performance is acclaimed as "a concrete implementation of the creative transformation and innovative development of outstanding traditional culture, and a useful exploration of telling a good Chinese story in museum science field" (Liu 2023).[33].

Effectiveness of Presentation Form

Front-projected holographic technology uses the principles of interference and diffraction to record and reproduce a realistic 3D image of an object (p694).[34] It has

advantages in terms of convincingness and audience experience. As a naked-eye technology, audiences are able to enjoy the show without equipment, and this lower threshold can attract museum visitors to watch the show without extra effort. The director projects dynamic historical scenes on the curtain at the back (Figure 1), integrating it with the actors' performances and corresponding sound effects. This generates a multisensory experience for audiences. 3D technology also plays an important role in the audience experience. The digital artists recreate cultural antiques (Figure 2) using 3D technology and apply it in the stage design. The 3D rebuilt antiques are integrated in structure and vivid in appearance. Through the rendering process, the Drum with Phoenix Rack on Tiger-shaped Pedestal fits into the midnight scene and becomes a burning stage under the moon. The combination of the created burning stage and the realistic night view attracted audiences to be more involved in the performance.



Fig. 1. Soldiers dancing in front of the curtain





Fig. 2. the Drum with Phoenix Rack on Tiger-shaped Pedestal and its digital version

The goal of digital media is to record all the information about an object (Huang 2009 p273)[35] and thus preserve the authenticity of the culture value. All the scenes projected are designed on a foundation of comprehensive historical research. In terms

of the visual effects, the producers combined computer-generated holography and digital holography to guarantee the brilliance and 3D effect of the scenes. As shown in Figure 3, with the support of 3D technology, the producers digitally rebuilt the chimebells from the Tomb of Marquis Yi of Zeng State, restored the broken parts, and amplified it on screen. Based on data supported by Hubei Provincial Museum, the chimebells are presented in their maximum original state. Moreover, digital chimebells are used to build an illusionary background for the performance. The digitally produced ribbons spread out from the dancers through the bells, generating a mysterious atmosphere with the symbolic cultural relics of Chu. In this way, the multi-sensory effect allows audiences experience the cultural atmosphere, and the authenticity of the intangible culture is conveyed.



Fig. 3. the chime-bells from the Tomb of Marquis Yi of Zeng State applied on the performance

The characteristics of interactivity and fluidity intrinsic to digital media[36] in the educational field are built on in this show. Positive, concrete, and multi-sensory experiences can stimulate thinking (van et al. 2016).[37] At the beginning of the performance, a projected phoenix - a common symbol of Chu - flies out of the stage and moves around the audiences (Figure 4). The out-framed object quickly draws people's attention. Then, a cartoon character called Little Vulcan appears. It introduces the story background with a childish tone, playing the role of interest guidance. The character improves the interactivity with the audiences by using communicative phrases to conduct dialogues, which makes the audience interested in the cultural knowledge narrated by the character. Alongside the show there are digitally-rebuilt relics appearing on the background. Because the show is performed at Hubei Provincial Museum, the digital antiques model immediately reminds audiences about the antiques they have just seen. This helps audiences to understand the practical value of the antiques in the historical context. In this way, a concrete historical educational framework is constructed that provides acknowledgement in content and arouses the interest of the audience in terms of aesthetic and form.



Fig. 4. phoenix flies around the stage

Non-Linear Narratives in Storytelling

The content of the performance can be roughly divided into two parts. In the introduction, the director draws the audience into the cultural background using the cultural relics of Chu. Then, a cartoon character is shown on the screen, introducing the biography of King Zhuang and the Chinese idioms about him. The story of the idioms is briefly narrated at the introduction and then adapted into a dance drama and performed in the following part. In the second part, the main thread of the show is the life of King Zhuang. The director has picked several important nodes of his life story and narrated the stories in the form of montage clips. It is important to note that the idiom stories are integrated into the plot and called back by the captions.

The above paragraph describes parallel stories in the drama and the inserted knowledge points, making it a typical non-linear narrative performance. A non-linear narrative can be realised with the support of digital media. This article will analyse how the narratives of Meet King Zhuang of Chu support cultural heritage in the following paragraphs.

In Meet King Zhuang of Chu, the director does not just present a simple dance performance. With the help of the projected background, the audience is able to understand the change of place and time. The third essential of the story – character – is brought to life by the dancing actors. Therefore, the performance narrates the story in a simple way. The show also introduces the captions on the screen to explain the classical Chinese phrases and help audience understand the unfamiliar scenes. In that way, the audience is able to follow the story when the view shifts from one place to another. With the support of the digital facilities, the scenes are flexible enough to follow the multiple parallel storylines.

4 Conclusion

The digitisation of cultural heritage has become an inevitable trend. Creators have been trying to make the most of the effectiveness of digital technologies, promoting the value of traditional Chinese culture heritage preservation and the sustainable development of the culture and drawing the public's attention to the conservation and development of cultural heritage.

The Meet King Zhuang of Chu project is a well-developed example of applying digital media in the heritage protection field. The production team cleverly integrates digital technologies with performance, effectively transforming historical stories into a vivid dance performance. They balance authenticity and creative aspect, stimulating the audiences' interest in exploring and inheriting the culture. It is a comprehensive example with reference for both the design and audience sides. It is a case study that show-cases the potential of digital media. It preserves culture authenticity from tangible and intangible aspects, enhances the efficiency of cultural heritage education, and improves the audiences experience from multiple aspects. With the development of technology, in the future, creators can not only use digital media to generate attractive scenes for performances but also build a multi-sensory imaginary world.

Figures

Figure 1 Liu,Y (2023) Chu Yun Holographic Theater: Naked Eye 3D Creates Dreamland. *Hubei Provincial Museum, Hubei*. Available at: https://mp.weixin.qq.com/s/1jR-53l00p7NlT1W71dnrw.

Figure 2 Liu,Y (2023) Chu Yun Holographic Theater: Naked Eye 3D Creates Dreamland. *Hubei* Provincial *Museum*, *Hubei*. Available at: https://mp. weixin. qq. com/s/1jR-53l00p7NlT1W7ldnrw.

Figure 3 Ming,M (2023) A Great Effort in Culture Heritage: A Review of Holographic Drama "Meeting King Zhuang of Chu". *Sohu*, Beijing. Available at: https://roll.sohu.com/a/675946203 121358028.

Figure 4 Ming,M (2023) A Great Effort in Culture Heritage: A Review of Holographic Drama "Meeting King Zhuang of Chu". *Sohu*, Beijing. Available at: https://roll.sohu.com/a/675946203 121358028.

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