数字环境下
保护与促进文化多样性

示范案例 Ⅰ

unesco
Centre
Under the auspices
of UNESCO

ICCSD
International Centre for Creativity
and Sustainable Development
under the auspices of UNESCO
联合国教科文组织
国际创意与可持续发展中心

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contents

Digital transformation of cultural institutions and industries

Creation and display of digital cultural content

Media-based dissemination of cultural digitization

Foreword

The year 2025 marks the 20th anniversary of the UNESCO 2005 Convention on the Protection and Promotion of the Diversity of Cultural Expressions ("the Convention"). Since the launch of the Convention, UNESCO has continuously focused on the systemic challenges posed by the ever-evolving digital environment in protecting cultural resources and enhancing cultural interaction. In recent years, cutting-edge digital technologies, such as artificial intelligence, virtual reality, 5G, and big data, have been widely applied to cultural activities, products, and services, leading to the fusion of science and technology with culture, the digitization of cultural heritage, the culture and technology industry, and the science fiction industry, all of which have become important issues in the current work on the protection and promotion of cultural diversity.

In order to respond positively to the relevant initiatives of UNESCO and to strengthen international cooperation and exchanges in the field of science, technology, and culture, the UNESCO International Center for Creativity and Sustainable Development (ICCSD), in collaboration with the Beijing Center for Science and Technology Innovation, CRI Online, Beijing Radio and Television Station (BRTV), Tingting FM, Culture and Technology Innovation Service Alliance, and Btime.com, has launched a call for cases collection of "Protecting and Promoting Cultural Diversity in the Digital Environment."

Focusing on enterprises and organizations committed to promoting cultural development through scientific and technological innovation on a global scale, the call has collected a total of 40 innovative cases of cultural and technological integration. These cases involve a number of cutting-edge technological innovations, such as artificial intelligence, digital twins, blockchain, and big data, as well as the upgrading of the cultural industry in a number of directions, such as the digitization of cultural resources, cultural heritage preservation, immersive performances, and digital cultural tours, and showcase the latest application results of digital technology in protecting and promoting cultural diversity and promoting the integration and innovative development of science and technology and culture.

The case collection team adhered to the following principles to select 20 exemplary cases from the submissions, compiling them into this casebook:

Demonstration: The driving effect of technological innovation on related industries, the impact of case promotion on associated projects, and the public's participation and reputation.

Innovativeness: The originality, cutting-edge nature, and leading role of digital technology, as well as innovative practices in interpreting traditional culture in a modern context and its social dissemination.

Applicability: The performance data of cutting-edge technology empowering cultural protection, inheritance, and development, or specific cases applied to solving real-life problems.

Completeness: Whether the case's application form, the body of the case description, and the supporting materials support the description and argumentation of the case.

Sustainability: Sustainable use of cultural resources, scalability of technology, and replicability of projects. The sustainability of cases focuses not only on current results but also considers future development and impact.

In our view, these cases vividly demonstrate the deepening and comprehensive impact of digital technology development on promoting cultural diversity. The application of emerging technologies is no longer limited to the scenario-based enhancement of cultural presentations and displays but has entered all aspects of cultural creativity, production, dissemination, application, trading, and protection, forming a systematic effect on the protection of cultural resources, the production of cultural creativity, the upgrading of the cultural industry, and the enhancement of new-quality productivity.

The protection and promotion of cultural diversity have fully entered the digital environment and have become increasingly responsive to emerging technologies. Cutting-edge technological innovations, such as meta-universes and generative artificial intelligence, are being rapidly applied to work related to various fields of culture, transforming them into new forms and scenarios, and generating profound impacts.

We hope that sharing these cases can provide cutting-edge, concrete, practical experience for protecting and promoting cultural diversity in the digital environment. And we hope these cases will promote the exchange and mutual understanding of the achievements of scientific, technological, and cultural integration and innovation among countries, so that we can face new challenges with development, openness, and inclusiveness, and jointly welcome the 20th anniversary of the publication of the Convention on the Protection and Promotion of the Diversity of Cultural Expressions.

Beijing Workers' Stadium Metaverse (GongtiMetaverse) Construction

Case sources

GTverse (Beijing) Digital Technology Co.Ltd.

Keywords

Metaverse

Mixed Reality

Internet 3.0

Beijing Workers' Stadium, built in 1958, is one of China's first ten major buildings. Over the years, it has hosted thousands of sports and cultural events, becoming a key center for entertainment and sports activities in Beijing. The stadium enjoys high international recognition and stands as an important witness to the development of China's sports culture. In 2023, the Workers' Stadium underwent protective reconstruction, transforming into a new vitality hub for the city. This redevelopment aligns with the new demands of Beijing's cultural and sports industries, providing fresh momentum for integrating sports, culture, commerce, and consumption in Beijing's core areas.

In the process of reconstructing the Workers' Stadium, the introduction of digital technology became a key highlight. By integrating online and offline services, the project aimed to create a globally leading smart complex for "culture, sports, tourism, and commerce."

Utilizing big data, smart culture and tourism, smart sports, and smart commerce as platforms, the project established an innovative operational model. This approach is widely recognized as a bold attempt at the forefront of cultural and technological integration in the stadium's reconstruction.

The Gongtiverse is dedicated to creating the world's first mega sports, commerce, and culture complex. It integrates top sports IP into a Metaverse-as-a-Service (MaaS) platform and aims to become a globally leading smart scene service platform in the metaverse.

The project is the world's first new type of B2C mixed reality Internet 3.0 social platform developed and constructed based on a large-scale sports, culture, and commercial entity. It employs a globally pioneering integrated architecture of cloud-network-computation-industry, creating the world's first integrated network industry metaverse application based on the super 5G network deployment of Beijing Workers' Stadium. This project has established multiple new metaverse business scenarios, including "GongtiMetaverse Live Streaming," "GongtiMetaverse Super Cultural Tourism," "GongtiMetaverse Digital Football," and "Gongtiverse King of the Ball Competition."

It seamlessly connects all screens, including TV, mobile phones, and XR headsets, launching various metaverse products that offer immersive viewing, experiences, and interactions. The project has achieved multiple key technological breakthroughs based on domestically developed machine learning frameworks, models, self-developed algorithms, private engines, and intelligent hardware devices. These advancements help the new Workers' Stadium continue to lead consumer trends in culture, sports, and technology. Additionally, it provides a template for the digital upgrade of global sports cultural venues and urban renewal.

Expert Review

Beijing Workers' Stadium is one of the first ten major buildings of the new China and an important center for entertainment and sports activities in Beijing. This case adopts the world's first integrated cloud-network-computation-industry deployment architecture, relying on a super 5G network deployment. It has launched the world's first integrated metaverse application, expanding beyond the conventional single-perspective, single-mode offline viewing experience. It meets the new needs of football fans for multi-perspective, multi-modal, online and offline full-field interaction during matches.

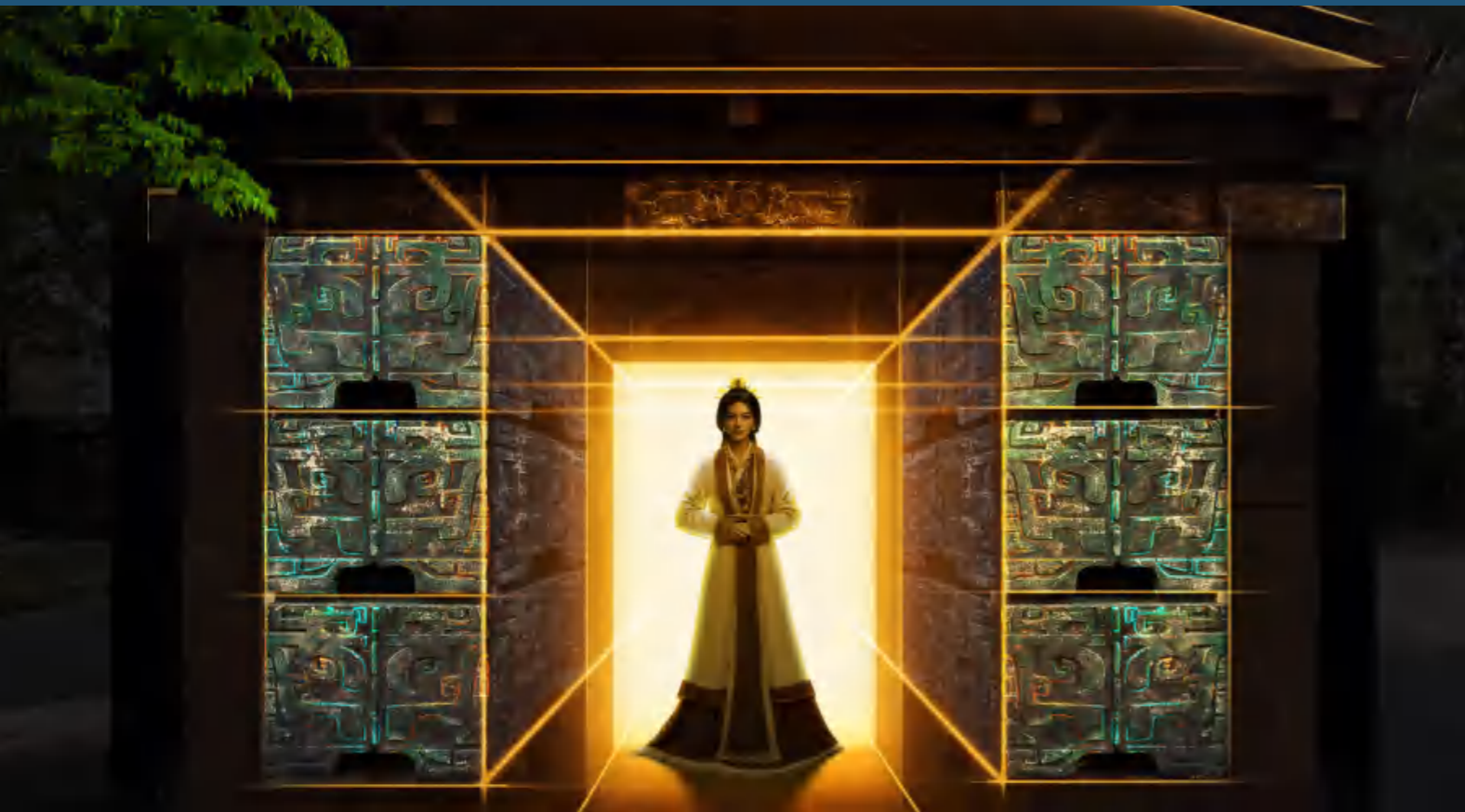# Reenvision the Majestic Shang Capital: Yinxu Revival and Digital Immersion Project

Case sources

Shandong Jindong Digital Creative Co.,Ltd.

Anyang Cultural Tourism Development Group

Keywords

Digital Human

Extended Reality

Cultural Data Visualization

As an important symbol of Chinese civilization, the Yinxu (Ruins of Yin) holds unparalleled historical and cultural value. In order to advance Henan Province's strategy of integrating culture, tourism, and cultural innovation, as well as developing Anyang into an international tourist destination, Reenvision the Majestic Shang Capital: Yinxu Revival and Digital Immersion Project aims to provide more vivid and dynamic historical and cultural experiences through advanced digital and immersive technologies. These efforts seek to attract deeper engagement from modern young tourists and stimulate their interest in exploring Shang culture, thereby opening a new chapter in preserving and promoting cultural heritage.

Through projects like Digital Fu Hao, Fu Hao's Tomb XR, and digital immersive art spaces, we are creating a bridge between the past and the present, tradition and the future, offering an experience to explore Shang culture.

This case utilizes deep learning and data analysis in archaeology and Shang culture to form a unique AI model that continuously updates cultural content. This ensures that the content remains fresh and stands at the academic forefront, with cultural data visualization presenting the research findings on Shang culture in a multidimensional way.

Leveraging advanced AI digital technology, a digital representation of the Shang Dynasty queen has been created to interact with visitors. This initiative aims to introduce and promote the image and stories of ancient female leaders to the public.

Employing the latest XR display technology, this case sets a benchmark in the protection, utilization, presentation, and dissemination of large archaeological sites. It offers a more immersive digital experience and a lighter digital upgrade of the site, making archaeological research findings accessible to the general public.

Reenvision the Majestic Shang Capital: Yinxu Revival and Digital Immersion Project is a cross-temporal dialogue between Chinese people and cultural heritage. It bridges ancient civilization and the present, centered on oracle bone inscriptions that document 3,000 years of Chinese history. Through digital revitalization, it recreates China's earliest ambush battle, transforming historical events into vivid, tangible, and thought-provoking stories.

The overall digital revitalization of the Yinxu (Ruins of Yin) site is not merely a technological upgrade; it represents a comprehensive enhancement across multiple dimensions, including cultural heritage preservation, education, international exchange, economic development, and cultural transmission. By vividly presenting the social life, cultural arts, and divination rituals of the Shang Dynasty through digital means, we enhance the engagement and interactivity of historical education, inspiring scholars and students to explore ancient cultures with greater enthusiasm.

Under the influence of digital revitalization, the Yinxu site has attracted a significant following. During the 2024 Chinese New Year, the site welcomed over 150,000 visitors, a 650% increase compared to 2019. Tourism revenue reached 2.54 million yuan, a 182% increase from 2019.

Construction of the Kulangsu Metaverse

Keywords

Metaverse

World Cultural Heritage

Digital Lifestyle

As a highly acclaimed city of high-quality innovation and entrepreneurship, a beautiful ecological garden city, and a modern, international city with a booming economy, Xiamen officially launched a three-year action plan for the metaverse industry in 2022. The plan aims to develop Xiamen into a "model city for the metaverse ecosystem."

To achieve this goal, Xiamen established a metaverse industry alliance to continuously strengthen its network and improve the ecosystem. In the same year, the Xiamen Municipal Government and China Mobile Migu formed a strategic partnership, launching the "Kulangsu
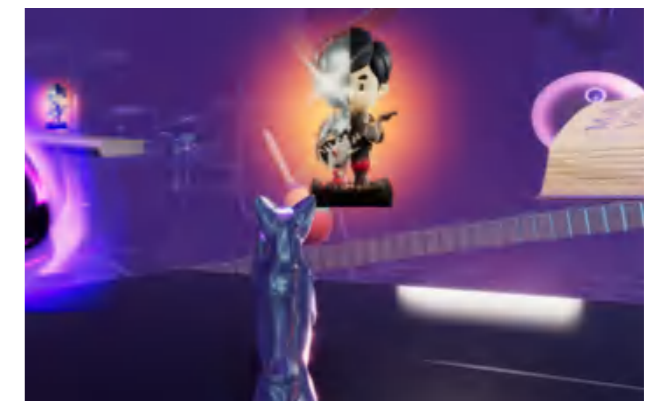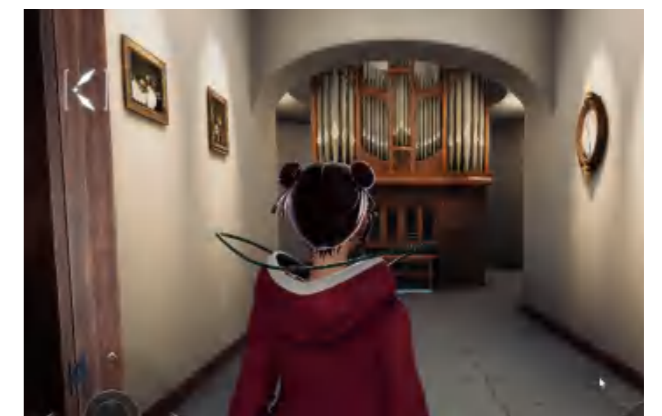
Metaverse" as the first initiative. This project aims to create a benchmark demonstration project for cultural tourism in the metaverse in China.

The Kulangsu Metaverse, positioned as the first physical-digital community in China based on a World Intangible Cultural Heritage site, brings new possibilities for creating a metaverse cultural tourism landmark in Xiamen. It offers island visitors digital-intelligent life experiences such as cultural tourism, interactive entertainment, and shopping. This project is dedicated to establishing Kulangsu as the "First Metaverse Island" in China.

Leveraging 5G, ITU T.621, and AR technological innovations, the project is built upon the real-life scenery and historical culture of Kulangsu. This project is a pioneering initiative in China, creating a multidimensional space that merges mountains, sea, islands, and cityscapes across a vast area and a 6.5-kilometer span. The high-definition, real-time rendered virtual landscapes meet users' immersive cultural tourism metaverse experience needs and can serve as digital film production scenes.

Functionally, it achieves autonomous control, free exploration, instant interaction, and real-time online capabilities. This provides a robust information infrastructure for creating new immersive experiences and cultural tourism consumption models within the metaverse. Utilizing high-precision modeling, phygital rendering, positioning and tracking, and intelligent interaction technologies, the Kulangsu Metaverse achieves centimeter-level accuracy and millisecond-level latency for an augmented reality experience. In the virtual space of the Kulangsu Metaverse, Stunning lighting designs are implemented, reflecting real-world weather and time on users' mobile phones, enabling seamless transitions between day and night and weather changes. This integrates the digital-intelligent space perfectly with real-time changes in the physical world.

Expert Review

In 2017, Kulangsu Island was listed as a World Heritage site for its "international community featuring cultural diversity and modern quality of life since the mid-19th century." This case is driven by a cloud rendering fusion innovation engine, based on the real scenes and local historical and cultural resources of Kulangsu Island. It achieves immersive MR (mixed reality) virtual-real scene interaction, creating a multi-layered mixed reality metaverse open world. This provides tourists with a more dynamic digital cultural experience characterized by free exploration and real-time interaction.

Taihu Lake Stage Design Art Digital Resource Sharing and Design Service Platform

Case sources

National Centre for the Performing Arts

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Keywords

Digitization of Stage Design Resources Database

The theatre, a platform for humans to express emotions and realize dreams, serves as an indispensable carrier of performing arts and an important space for people to enjoy development achievements. Chinese theatre culture has evolved significantly since China's earliest framed-stage theatre was constructed in 1909. From the rapid development of theatre construction in the 1980s to the official operation of the National Centre for the Performing Arts on December 22, 2007, China's theatre industry has gradually prospered and entered its heyday in the 21st century. However, there are still some issues regarding the efficient management and utilization of stage design resources.

Firstly, the stage design industry lacks an influential professional communication and exchange platform among artistic institutions, stage designers, students from art schools, and industry experts.

Secondly, the stage design industry lacks digital communication and display methods for professional forums, academic activities, award selections, exhibitions, and trade shows.

Thirdly, despite the increasing use of digital technology in stage design, there is still a lack of standardized, systematic digital management capabilities in the industry.

Fourthly, the industrial chain of stage design production is not yet fully developed. Most stage design production remains in small workshops or small-scale enterprises, hindering the effective utilization of stage design resources and the full development of industry advantages.

This project addresses the new demands for digitization, industrialization, and management informatization of stage design resources in the Taihu Digital Performing Arts Town. It has developed the first domestic platform for digital management, display, and communication of stage design resources by integrating technologies such as VR, big data, cloud computing, and artificial intelligence. This platform resolves issues such as backward management, difficulty in revitalization, and waste of value in stage design resources. It digitises stage design resource management, artistic display, and communication, enhances management efficiency, revitalises the value of stage design resources, and promotes technical exchanges and achievements sharing in stage design.

To expand and strengthen the stage design resources of the Taihu Performing Arts Town, the National Centre for the Performing Arts leverages its advantages in location, resources, and brand influence of the Taihu Stage Art Centre. Utilizing technologies such as VR, big data, cloud computing, and artificial intelligence, they are constructing the "Taihu Stage Art Digital Resource Sharing and Design Service Platform" tailored for the digital Taihu scenario. This platform aims to establish a digital path for stage design resources, featuring "one repository, one platform, one centre," which includes repositories for stage sets, props, costumes, and crafts, a platform for stage design and production services, and Taihu stage art digital immersive experience centre.

Key Outcomes

The establishment of a stage design resource database, forms standardized specifications for stage design data, and collects over 1000 three-dimensional models of stage sets, props, and costumes.The case establish a digital stage design resource sharing and design service platform, with over 300 users registered; It creates a digital immersive stage design experience centre, utilizing the digital results of the stage design resource platform to rapidly generate digital exhibitions combining audio, video, graphics, and 3D related to performances, and implementes them in Taihu.

The Immersive Digital Experience of China Grand Canal Museum in Yangzhou

The Grand Canal serves as the continuous lifeline of the Chinese nation and is a significant symbol of Chinese civilization. Yangzhou, being both the starting point city of the Grand Canal and the leading city for its UNESCO World Heritage application, holds immense cultural significance and contemporary value. The establishment of the China Grand Canal Museum in Yangzhou carries important cultural implications and epochal significance. In June 2021, the grand opening of the China Grand Canal Museum addressed the issue of "zero collections" by adopting the concept of "technology + museum". With a focus on digital experiential exhibitions, the museum aims to create immersive exhibition spaces.

The case utilizes modern technology to activate and fully use the resources along the Grand Canal, showcasing its historical and cultural significance comprehensively across the entire basin and throughout all time; and creating immersive experiential spaces. As

the first comprehensive canal-themed museum in China integrating cultural relic preservation, scientific research and display, and social education, the China Grand Canal Museum utilizes immersive digital experiential exhibitions to interpret the stories of the Grand Canal effectively. It aims to promote China's image to the world, showcase Chinese civilization, and demonstrate cultural confidence.

As the first museum within a national cultural park in China, the China Grand Canal Museum aims to provide high-quality public cultural services through immersive digital experiential exhibitions. Its exhibition hall design features distinct immersive digital experience areas such as the "5G Grand Canal Immersive Experience Zone," the "Sand Flying Boat Experience Area," the "River Romance" 720° panoramic space, and the "Canal Mystery" immersive interactive space for teenagers. These areas showcase the culture of the Grand Canal.

5G+VR Immersive Experience": The China Grand Canal Museum highlights the "5G Grand Canal Immersive Experience Hall," which utilizes naked-eye 3D technology along with 5G+VR 720° panoramic views and ultra-high-definition visuals with billions of pixels. Through advanced interactive technologies, visitors can "travel through" 17 canal cities in a single view, digitally and visually presenting the historical features and cultural significance of the thousand-year-old Grand Canal.

"Physical Experience + Virtual Technology": In the "Boats on the Canal" exhibition hall, the China Grand Canal Museum combines physical and virtual experiences. In the first section, featuring 78 boat models as the main display, a blend of physical and multimedia interactive experiences is employed, it is incorporating touch screens and AR interaction to emphasize both knowledge and experience, thus constructing a comprehensive knowledge system of boats. The second section consists of the Sand Flying Boat Multimedia Interactive Experience Area, which combines physical experience with digital immersive virtual experiences. It integrates advanced display methods such as real-time rendering of panoramic projection, Augmented Reality (AR), and 360° IMAX projection to create an immersive atmosphere.

Immersive Experience: To allow visitors to experience the changes in day and night, as well as weather conditions, within the exhibition hall, the China Grand Canal Museum installed a canopy in the "Canal Street Market" exhibition hall. Utilizing a large number of LED technologies, the canopy undergoes a 20-minute cycle, simulating the changes in light and shadow over 24 hours.

"Technology + Art + Culture": The "River Romance" exhibition hall interprets the culture of the Grand Canal of China through abstract and symbolic multimedia language. Employing naked-eye technology, it highlights dynamic effects in terms of sound, light, electricity, form, and color. Additionally, the 720° interactive space is a rare feature, enhancing visitor engagement and immersion.

"Immersive Ancient Style Experience": The "Canal Mystery" is the first escape room-style experiential project in China. The China Grand Canal Museum recreates the experiential space with true proportions and story backgrounds. It utilizes contemporary media technologies such as AR virtual reality technology and real-time rendering of panoramic projection to present ancient historical culture, creating a sense of spatial extension. Additionally, it integrates an H5 mobile application to guide visitors through the experience.

Located in the Sanwan Scenic Area of Yangzhou, Jiangsu Province, the museum is a landmark project in constructing the Grand Canal National Cultural Park.

The exhibition extensively utilizes the latest modern technology to showcase the rich and diverse historical culture of the Grand Canal through digital immersive interactive experiences. It offers the public a new immersive experience and high-quality cultural services. Over the nearly 3 years since its opening, it has welcomed nearly 8 million visitors and has been reported by central and provincial-level media multiple times. It has increased the tourism contribution to the local city and has achieved significant social and economic benefits.

Expert Review

In 2014, the China Grand Canal was successfully inscribed on the World Heritage List, recognized as the world's longest and oldest man-made waterway. How can one transcend the limitations of time and space to present the charm of the Grand Canal, which spans north to south and ancient to modern times, in a single venue? The China Grand Canal Museum in Yangzhou provides the answer. Through digital immersive exhibits, it skillfully blends the historical weight with the modernity of digital light and shadow, allowing visitors to virtually walk through and experience the thousand-year-old landscape of the canal and the cultural charm and aesthetic expression it embodies.

See You Again, Pingyao: an Immersive Theatre

The ancient city of Pingyao in Shanxi province is renowned as one of the "Four Best-Preserved Ancient Cities" in China and is one of only two ancient cities in China to have successfully applied for UNESCO World Cultural Heritage status as an entire city. In 1986, Pingyao Ancient City was designated as a "National Historical and Cultural City" by the State Council. In 1997, it was inscribed on the UNESCO World Heritage List. In 2015, Pingyao Ancient City was officially classified as a national 5A-level tourist attraction.

The large-scale live performance project "See You Again, Pingyao" is the first project of the Impression series in northern China. It is one of the key tourism development projects in Shanxi Province during the "12th Five-Year Plan" period, marking a significant transformation from an energy-intensive province to a culture-intensive one. Moreover, it represents Shanxi's pioneering efforts in cultural industry innovation and development nationwide following the 18th National Congress of the Communist Party of China.

Through an innovative "walking-style" viewing mode and an immersive "crossing" experiential journey, the performance allows visitors to deeply immerse themselves in the benevolence of the people of Pingyao and the integrity of the people of Shanxi, profoundly comprehending the spirit of Jin merchants. This aims to create a visual feast that integrates cultural, artistic, national, and unique characteristics. It complements other cultural and tourism projects in Pingyao Ancient City, attracting a large number of tourists to stay and spend time in the city. The production has evolved from a mere performance project into a comprehensive cultural and tourism complex that integrates culture, roaming, experiences, and conference affairs.

"See You Again, Pingyao" represents a groundbreaking original project by the Impression team, marking a breakthrough in entertainment innovation. It transitions from outdoor live performances to indoor immersive experiential modes. The project fully utilizes modern audio-visual technology, employing theatre, dance, sound, and music to create unique spaces. It integrates Shanxi's cultural roots, courtyard culture, and noodle culture throughout the production. Audiences walk through various themed spaces while performers move among them, engaging in dialogue and creating a sense of transcending time and space for the spectators.

On February 18, 2013, "See You Again, Pingyao" was officially launched, with a total of more than 7,700 performances, 5.4 million audience members, and revenue exceeding 900 million yuan. Since its debut, "See You Again, Pingyao" has received numerous accolades, including the "Top 10 Cultural Performing Arts Scenic Spots in Mypoint Brand Index 2019-2022," "2021-2022 Immersive Industry Excellence Project (Culture, Tourism, and Performing Arts)," and "2019-2022 Continuously Listed Cultural Performing Arts-based Scenic Spot Meadin Index TOP10." It has also been recognized as a "National Immersive New Industry Demonstration Case," listed in the "National Tourism Performing Arts Excellence Directory" by the Industry Department of the Ministry of Culture and Tourism, and awarded "MBI Annual Outstanding Operational Culture and Tourism Project" and "Top 100 Influential Tourist Attractions of National 4A Grade."

Development and Demonstration application of the Grand Canal Smart River Patrol System

Case sources

China Institute of Water Resources and Hydropower Research

Tongzhou District Water Affairs Bureau of Beijing

Keywords

Image Recognition

Autonomous Driving

Grand Canal Protection

Currently, the establishment of the river chief patrol mechanism at all levels in Beijing has achieved significant results in maintaining the landscape of "clear water, green banks, beautiful scenery, and smooth rivers." However, some problems have been exposed in the actual river patrol work. These mainly include difficulties for patrol personnel to conduct 24-hour on-site inspections, making it challenging to detect illegal activities effectively such as trespassing , dumping garbage along the riverbanks, illegal fishing, and crossing barriers; some sections or areas of the river are difficult for manpower to reach directly, leading to significant water environmental risks being overlooked

for extended periods; the daily inspection tasks of river patrol officers are heavy, and during major holidays, there is a need to increase the frequency and intensity of river patrols, which negatively impacts the efficiency and sustainability of the patrol work; some illegal activities pose challenges for evidence collection, making it difficult to handle such incidents. Additionally, manual methods are still used for river surface garbage cleaning, making it difficult to promptly detect and clean up the garbage.

This project aims to address the challenges and difficulties commonly encountered in the patrol and

surface cleaning work of the Grand Canal. It fully leverages technologies such as 5G communication, artificial intelligence, automatic control, and optimized scheduling to conduct research on water applications such as video integration, precise identification, and unmanned driving. The goal is to seek solutions for improving the management level of the Grand Canal using advanced technological means. The project aims to create a smart, precise, efficient, and digitalized application scenario for integrated patrol along the water's edge and cleaning of the water area. It develops a smart river patrol technology system and formulates a set of products with promotional value.

Key Outcomes

The Grand Canal Smart River Patrol System, can accurately identify activities such as fishing, swimming, crossing barriers, floating objects in the river, and encroachment on riverbanks. The accuracy of identifying 20,000 sets of images has increased from 80% to over 90%. The Grand Canal unmanned boat surface cleaning system, autonomously avoids obstacles during operation. The communication delay of the cleaning boat's self-control is less than 30ms. The cleaning rate within a 100m² area, and the completion rate of cleaning tasks within a 100m² area both reaches over 90%.

The "Plant Adventures" Immersive Exploration Exhibition at the Beijing Expo Park Botanical Pavilion

The "Plant Adventures" is a permanent immersive exploration exhibition created by the Beijing Expo Park Botanical Pavilion in collaboration with the Arts and Technology Digital Art Agency. The digital exhibition reconstructs the evolutionary history of Earth's plants hundreds of millions of years ago, allowing visitors to engage with the stories of ancient plants and ecosystems through gamified interactive experiences. This case utilizes digital technology to promote cultural preservation and inheritance, targeting families and teenagers and establishing a new model for cultural dissemination.

The case aims to enhance public awareness of Chinese natural history and traditional culture, promote the integration of technology and culture, provide enjoyable educational resources, increase public participation and interactivity, and enhance the attractiveness and impact of the exhibition. The exhibition collaborates with archaeologists and botanists to delve deep into botanical knowledge, transforming it into vivid experiences. The exhibition employs gamified role-playing and task-oriented experiences within a narrative framework, featuring 3 major missions and 8 interactive scenes. Each scene integrates projection technology and interactive devices, accompanied by two intelligent cartoon mentors who guide visitors throughout. Through interaction with sensor cards, hidden clues are activated, allowing audiences to immerse themselves in a realistic historical environment and enhancing their learning experience through visual, auditory, and tactile sensations.

Within a 1000-square-meter space, the exhibition utilizes 50 projectors to create images exceeding 14K resolution and 100 million pixels. It incorporates 6 specially composed theme music tracks and 50 sound effects. Additionally, it establishes over 900 real-time interactive responses for 58 species of animals and plants. Emphasizing the integration of virtual and real elements, the exhibition incorporates augmented reality content into its displays of fossilized specimens, creating a lifelike ecological environment that vividly recreates the habitats of ancient plants and dinosaurs. The exhibition scenes allow visitors to touch and feel the textures and forms of ancient plants, enhancing their understanding and memory of the exhibition.

Since its operation in 2021, the exhibition has attracted nearly 100,000 visitors, including numerous schools and educational institutions conducting study tours. The exhibition provides educational materials to support in-depth study activities. Through hands-on participation, visitors gain vivid and profound insights into the fauna and flora, as well as the ecological environment of the significant Chinese archaeological discovery, the "Liaoning Jehol Biota." They also experience immersive encounters with traditional Chinese art.

Relying on iterative upgrades of content and technology, the exhibition can maintain long-term vitality and appeal. By modifying the software, adding new scenes or species of plants and animals, and switching to other cultural themes, the exhibition content can be continuously updated. The digital exhibition supports replication in other locations, and a nationwide touring exhibition is also being planned.

The case has successfully pioneered a viable model combining culture and technology, innovating cultural display and educational approaches. Through innovative immersive and interactive experiences, the case effectively addresses pain points in preserving and inheriting culture and improving the dissemination of traditional culture and natural knowledge. Operational data demonstrates widespread public and educational institution appreciation for the case, enhancing public awareness and interest in preserving botanical cultural heritage and advancing the deep integration of culture and technology.

Development and Application of Smart Media Interactive Communication System for Classic Literature

At present, cultural and museum institutions and offline cultural spaces have placed higher demands on technological innovation and the application of cultural resources. They emphasize on presenting the historical and artistic value of Chinese cultural heritage more multi-dimensionally through technologies such as imagery, AR, VR, holographic projection, etc. They continuously expand the boundaries of digital technology application in key scenarios such as cultural tourism and public cultural services, constantly enlarge the supply of high-quality cultural products, bring new immersive experience scenes to the public, and promote the innovation and inheritance of traditional culture.

Expert Review

Traditional libraries focus on accumulation and research, but in the digital age, modern libraries emphasize their role in public cultural services. This case applies intelligent interactive technology to the library's public interface, enhancing the public's experience and significantly bridging the gap between the library and the public. It has greatly revitalized the vast cultural resources accumulated by the library and strengthened its function as a provider of public cultural services.

While classical literature contains profound historical and cultural thoughts of the Chinese Nation, the majority of it is only suitable for niche or segmented dissemination. There are few successful examples of mass dissemination, making it a challenge to make classical literature "alive" as part of cultural heritage. This project aims to establish an intelligent media interactive interface for classical literature, leveraging the vast resources of the National Library and even the entire library community.

Through digital imaging, interactive games, experiential activities, and AI-powered Q&A sessions, it will provide avenues for disseminating knowledge of classical literature. By creating standardized visual interactive interfaces, it will serve as the gateway to a digitalized metaverse of classical literature. Through technological innovation, the public will have close access to classical literature, experiencing its profound content and enduring charm, thereby promoting the creative transformation and innovative development of

excellent traditional Chinese culture. This initiative will allow the rich cultural knowledge of classic literature to enter the public's field of vision and daily life in new forms.This project effectively complements the current online development trends of digital libraries and intelligent libraries in the library community. It addresses the shortcomings of online digital libraries, such as data standardization and weak interactivity, by deploying various offline spaces. Leveraging the rich collection resources of the National Library, it delves deep into the essence and connotation of classical literature. Combining these with technological creativity and other industries, it approaches the public through technological experiences and cultural products, fully showcasing the digital construction and innovative activation results of valuable classical literature. Moreover, it expands the social service functions of libraries and provides resource support for various cultural and museum institutions and cultural spaces nationwide.

The case has developed an intelligent interactive communication system based on promoting classical literature resources. It utilizes multiple interactive scene container construction technologies, low-coupling IO management methods, intelligent sensing technology, holographic display technology, and UHD-simulated digital human technology. By leveraging the abundant classical literature resources of the National Library, it creates an integrated platform based on authoritative classical literature IP resources, forming a standardized and replicable interactive learning window for classical literature. The system aims to empower cultural spaces in the book industry, adopting a productized operating model. By showcasing the important role of classical literature resources in inheriting excellent traditional Chinese culture, it enhances the publicity

and popularization of classical literature, improves the cultural literacy of the general public, and meets the growing spiritual and cultural needs of society.

The case uses the "*Yongle Encyclopedia*", the largest encyclopedic work of ancient China, as a starting point to allow the public to experience the charm of classical literature culture and understand the arduous journey of Chinese cultural continuity to the present day. It Explores and refines scene scripts to achieve learning through tactile interaction and intelligent questioning, thereby stimulating interest in protecting ancient Chinese books and learning from excellent traditional culture. It establishes an integrated software and hardware classical literature dissemination system to promote high-quality cultural content.

Development of the "East of the Forbidden City" Urban Culture IP and Interactive Platform

"East of the Forbidden City" is a cultural, commercial, and tourism integration brand in Dongcheng District, Beijing. To support the brand's development and growth, creating new consumption spaces and products that combine the culture of Dongcheng District with the "East of the Forbidden City" brand is a crucial part of cultural construction in Dongcheng. A project for "East of the Forbidden City," developing an urban cultural interactive platform, aims to utilize artificial intelligence technology to create highly intelligent,intelligence technology to create highly intelligent, interactive, and experiential cultural IPs for Dongcheng District. By introducing AR real-time control solutions, it aims to provide highly customized spaces for future development and use.

Based on this foundation, the project extracts and refines cultural elements and tags from Dongcheng to create an online interactive platform using interactive engine technology and offline immersive experience spaces using holographic projection technology. This forms the "Urban Cultural Living Room" product for Dongcheng District, combining city culture with technological displays, promoting tourism consumption, and driving the integration of culture, commerce, and tourism, ultimately boosting the cultural industry development in Dongcheng. In 2022, the "East of the Forbidden City" city cultural interactive platform was showcased at the World VR Industry and Metaverse Expo, where leaders and guests experienced the platform's new features, and won accolades in the cultural and creative project track of the 6th Beijing Cultural and Creative Competition.

"Qidongdong" is the animated image of the "East of the Forbidden City." In the design and intelligent development of the "Qidongdong" image, a facial recognition control algorithm based on key points was researched and developed. This algorithm enables real-time capture of facial feature points and motion trajectories using a standard RGB camera, achieving real-time facial motion effects for the virtual image. The design method of the YOLO-CNN network significantly improves detection speed, with a facial recognition accuracy rate exceeding 95%. By using computational geometry algorithms, it predicts and maps 2D coordinates to 3D coordinates, and with the self-developed MAGICS lightweight engine, it renders models, actions, and special effects in real-time, ultimately achieving the effect of driving the virtual model's real-time interaction.

The 50-episode short video series titled "Qidongdong Cultural Journey" was released on social media platforms
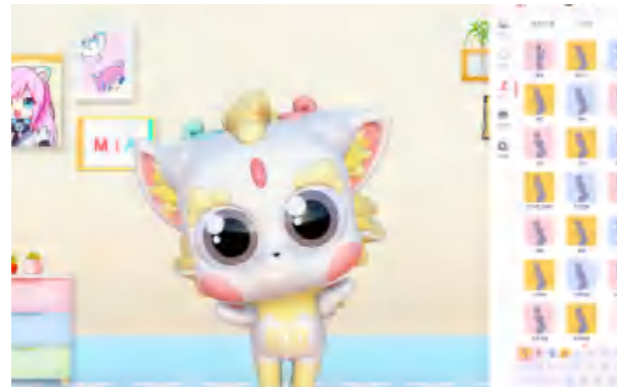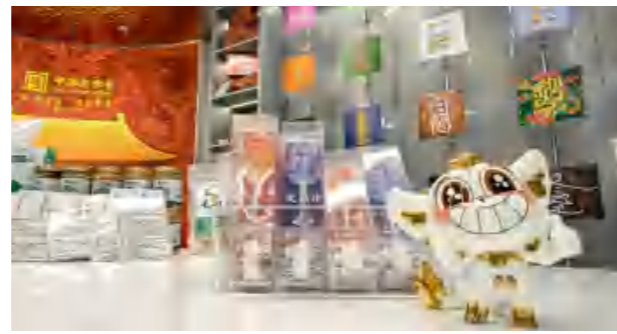
such as Tiktok. These videos by highlighting the cultural features of Dongcheng District, create cultural tourism experience IPs. attract young users and showcase the tourism value of Dongcheng.

In the development of the interactive platform, an integrated online and offline full-scenario interactive experience space was achieved. This involved the digital development of 50 cultural heritage sites, landscapes, and character from Dongcheng District, Beijing, creating a diverse array of digital models. By applying LBS (Location-Based Services) technology, users can explore Dongcheng locations on the map, issue and solve tasks, summon Dongcheng characters, reconstruct attractions, and engage in territorial battles.

Using virtual reality and holographic projection technologies, the "East of the Forbidden City" digital immersive experience space was created. It integrates

products related to intangible cultural heritage, cultural creativity, trendy toys, technology, and contemporary culture, combining technological methods to create an offline digital entertainment space.

The completion of the "East of the Forbidden City" city culture interactive Platform has created a synergy and multiplier effect for Dongcheng District's cultural resources, rapidly transforming these cultural advantages into development strengths. This represents the best strategy and model for leveraging the cultural resources. By utilizing novel content forms and technological applications that are not yet available on the market, a new cultural IP brand has been established.

The development of cultural products that blend culture and technology enhances the audience's perception. The implementation of immersive experience scenarios
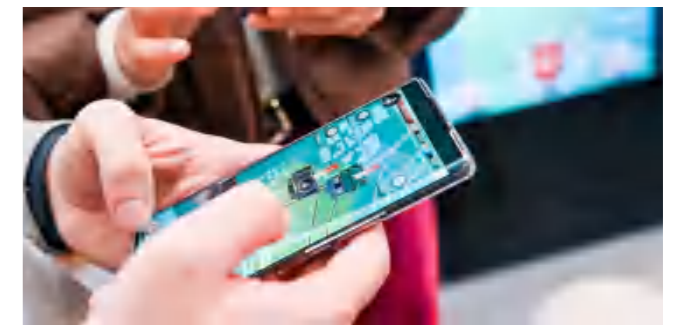
elevates the digital cultural sophistication. Creating a digital platform featuring Culture plus science and technology, the past plus the present, the project breaks down the boundaries between public, artistic, and commercial sectors.

Expert Review

Digital platforms are highly "accessible" technological tools, particularly beneficial in urban areas with densely concentrated cultural resources, making it easier for consumers to find their preferred products and services. This case applies digital technology to create virtual IP images and build online interactive platforms, providing new impetus for the development of the cultural industry in Dongcheng District.
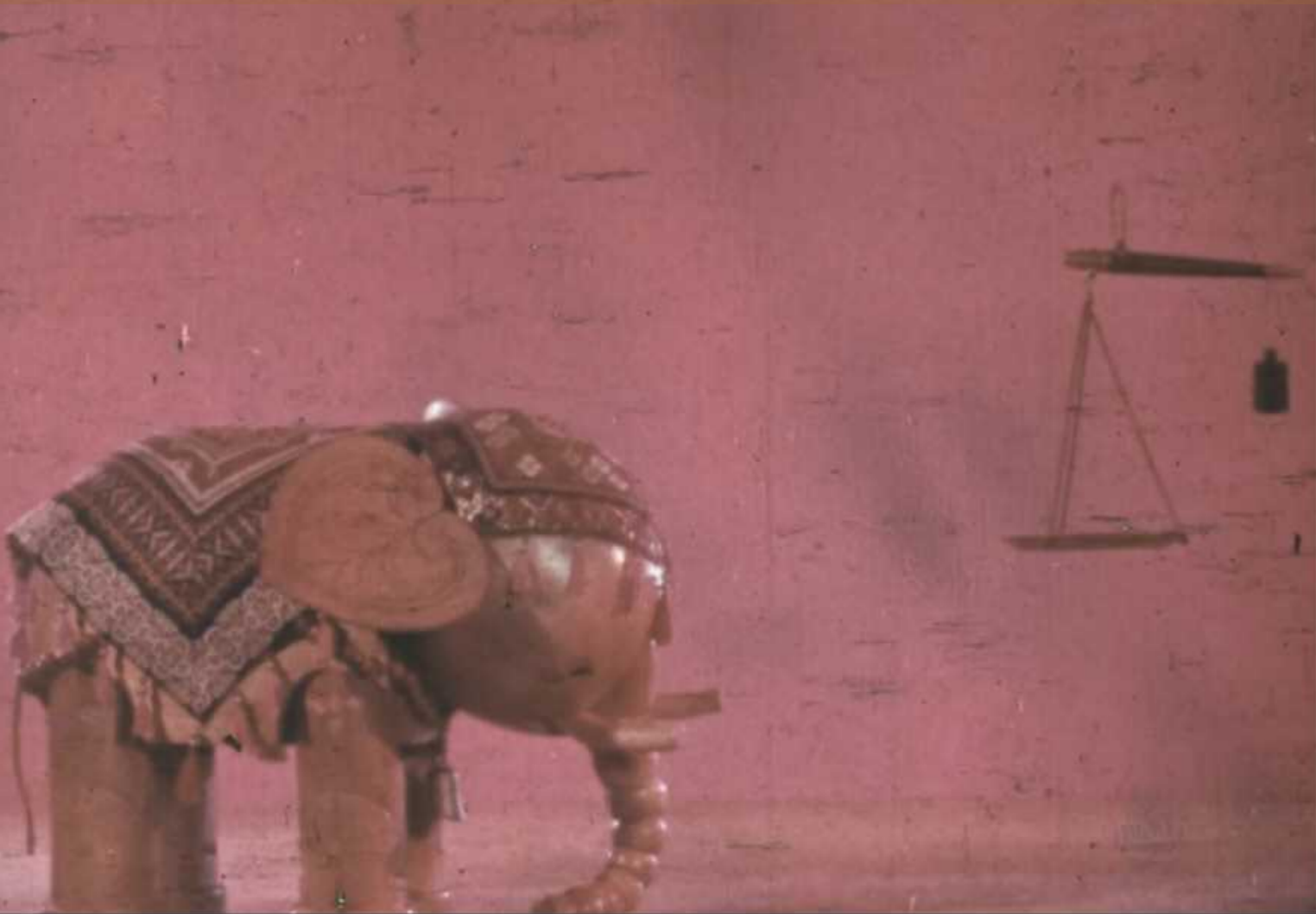
Development and Application of AI-based 5G+4K/8K Intelligent

Restoration System for Celluloid

Film Digital Imaging

Case sources

Sanweiliudu (Beijing) Culture Co.,Ltd.

Keywords

Artificial Intelligence

Digital Image Restoration

Since the debut of China's first celluloid film, "Battle of Dingjunshan" (filmed in 1905), Chinese cinema has traversed a century of history. As a cultural carrier that records important information such as the history, culture, society, politics, military, and diplomacy of various periods in the country, films are an essential component and precious heritage of national culture, possessing significant historical and contemporary economic value in the film industry.

The old film footage is generally restored using manual Photoshop (PS) techniques or conventional restoration software that requires a significant amount of manual labor. A professional team typically takes one year to complete the restoration work, with a minimum direct cost of 600,000 yuan. When using conventional film restoration software for 4K restoration (resolution 4096*3112), the workload is four times that of 2K restoration, and it takes approximately six months for a professional team to complete the restoration of one old film. The annual national allocation for emergency restoration of old films is only 35 million yuan, which can barely cover the 2K restoration of a few dozen precious films each year that urgently need rescue, are relatively classic and are of high artistic value. Only a tiny number of classic films undergo 4K UHD restoration.

This project aims to develop an AI-based 5G+4K/8K Intelligent Restoration System for Celluloid Film Digital Imaging. The platform utilizes the Huawei 5G Video Cloud, which is capable of handling large data capacities, as a testing and experimentation environment for intelligent AI-based restoration of large-capacity celluloid film digital images. It is primarily intended to restore early celluloid films, including old documentaries, archival films, and historical footage, aiming to achieve a high level of restoration from damaged, blurry images to clear, complete ones with restored color and sound. This project seeks to break free from the current industry practices of manual 2K image restoration using Photoshop and the labor-intensive process of 4K restoration using conventional film restoration software. The system uses AI technology to intelligently refine and restore damaged or blurry frames of celluloid film digital images to 4K ultra-high-definition quality, with compatibility for 8K restoration technology. This endeavor aims to revitalize historical films, including documentaries, educational films, and archival footage, contributing significantly to the preservation and cultural inheritance of China's cinematic heritage.

This technology represents a pioneering effort in China and holds significant importance for the preservation and cultural continuity of historical films and imagery. This project focuses on developing AI intelligent restoration technology for celluloid film digital imaging, resulting in a set of intelligent 4K restoration systems for celluloid film digital imaging based on Huawei's 5G Video Cloud (with the capability for 8K restoration). It is primarily applied to the refined restoration of important visual materials such as early celluloid films (old documentaries, archival films, historical footage) in 4K resolution. The AI technology aims to intelligently identify defects such as dirt, scratches, mold, color shifts, blurriness, flickering, curling, and missing frames in celluloid digital images, enabling AI-driven restoration while ensuring stable and efficient output at 4K/8K levels.

This project has developed a globally leading celluloid film digital imaging 5G+AI 4K/8K intelligent restoration system, achieving restoration quality that meets the standards of 4K films. The restoration period has been reduced from the industry standard of 6-12 months to 45-60 days, with over 100 pilot film restoration projects completed. It is capable of typical applications in scenarios such as old celluloid films, documentaries, educational films, and archival footage.

Expert Review

This case utilizes AI technology to achieve intelligent and precise restoration of old film digital images, enhancing them from blurry to clear and restoring color and audio to ultra-high-definition 4K quality. It can also achieve 8K-level restoration, significantly reducing restoration time and costs. This approach has broad application prospects and promotional value. It holds significant importance for the preservation, cultural promotion, and reutilization of old films and historical images.
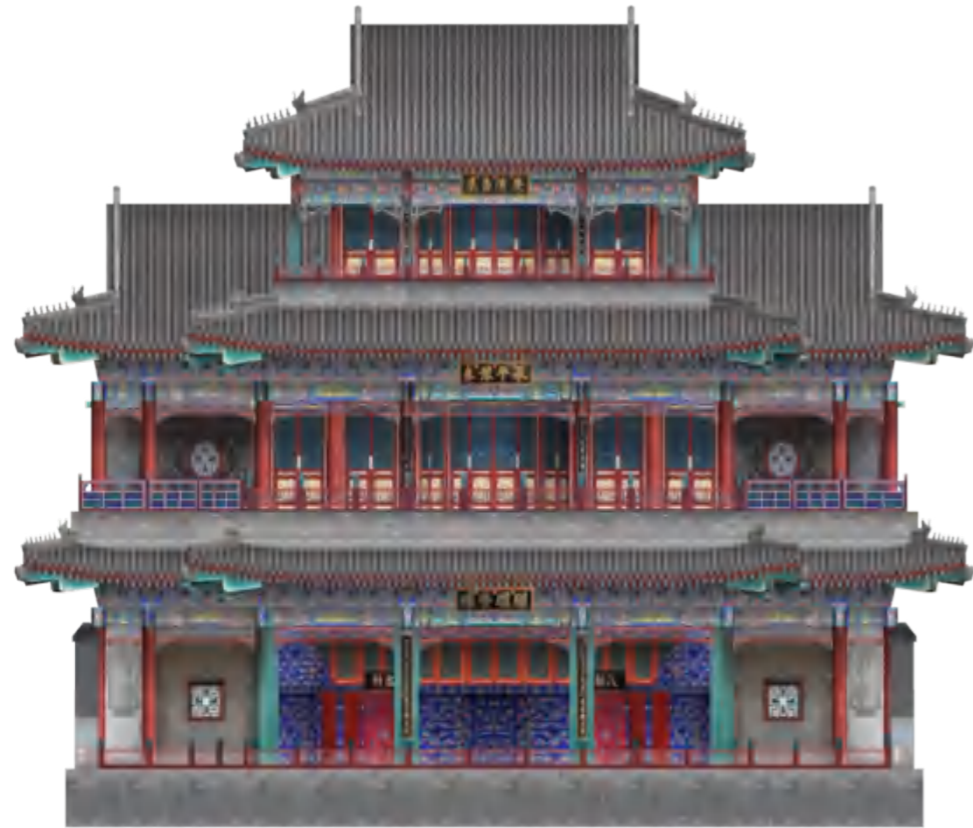
Research and Application of Knowledge Graph Construction and Service Technology for Classical Garden Based on Multi-source Data Fusion

With the continuous acceleration of urbanization, rich and diverse historical and cultural heritage is facing an increasingly severe crisis. Protecting and salvaging these heritage sites has become a primary and arduous task today. Although significant progress has been made in the conservation of existing classical gardens as important cultural heritage, there is generally a need for targeted and authentic electronic data collection technology. Poor management and uncontrollable factors have led to the significant loss of historical information in classical gardens. This has had adverse effects on the protection and restoration of garden sites. While some surviving drawings of disappeared gardens can partially reconstruct them, they
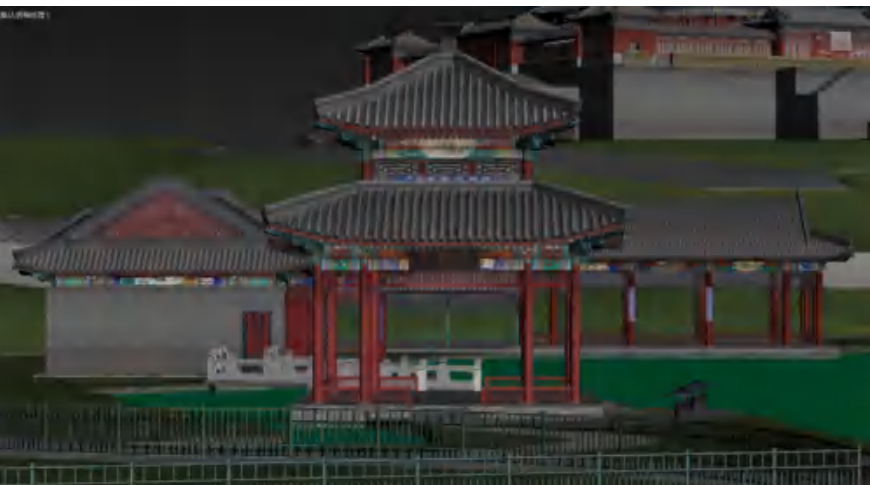
cannot guarantee complete consistency in all details. Therefore, it is necessary to explore modern high-tech methods to strengthen the protection of classical garden cultural heritage.

The Knowledge Graph construction and service technology for the Classical Garden, based on multi-source data fusion, applies "AI+VR" to the exhibition and dissemination of classical gardens. This approach addresses the challenge of how to centrally display and aggregate data resources for classical gardens, which have immovable and spatial attributes, within museums. It innovates the exhibition and dissemination model for classical gardens, integrating on-site, museum, and internet-based displays.

This case achieves a comprehensive, multi-perspective presentation of the cultural essence, garden artistry, unique charm, and scientific value of the "Mother of World Gardens." It realizes the vision of establishing a "garden field exhibition, communication, and data center," highlighting the advantages of national-level museums.

The case establishes a garden data resource repository and knowledge graph, with garden historical, cultural, and artistic data resources exceeding 2 terabytes; It designs classical garden cultural and creative product conceptual materials and construction materials based on the knowledge graph and conducts research on data knowledge resource and material copyright protection technology; to develop a platform for innovative design services for classical garden cultural and creative products.Integrating new technological means and diversificed, multi-dimensional knowledge transmission, it demonstrate the scientific and entertaining aspects that exhibition design should follow, which is more beneficial for viewers' acceptance, truly achieving the goal of

education through entertainment, systematization, and uniqueness, forming a systematic knowledge system.

This case innovatively creates a classical garden exhibition model based on "AI+VR". It establishes a display service platform built on multi-source data resources and knowledge graphs, achieving the visual representation of classical garden knowledge and information. The case constructs a classical garden knowledge graph based on multi-source data fusion and establishes a crowdsourcing model for building this knowledge graph.

Supported by modern information technology, the case aims to benefit the public through the digital cultural dissemination of gardens. With a focus on resource development and exhibition, the research investigates methods and techniques for constructing knowledge graphs of classical gardens based on multi-source data

fusion. The goal is to establish a digital exhibition system for Chinese classical gardens, innovating the digital display and dissemination modes of classical gardens. This involves creating a comprehensive digital display system for classical gardens that integrates historical, educational, and aesthetic aspects, accessible through various platforms. Utilizing audiovisuals, images, texts, virtual reality simulations, and interactive features, users will be immersed in the precious exhibits of Chinese classical gardens, experiencing the profound historical and cultural heritage and the artistic charm of Chinese garden culture. The case aims to comprehensively present the essential characteristics, development history, cultural inheritance, and diverse functions of classical gardens, serving the public and, promoting the art of garden design and disseminating historical culture.

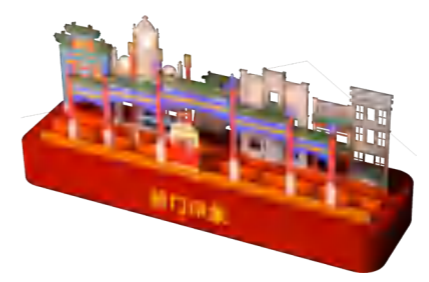# Qianmen Cultural Elements Library System Construction, Branding System Design and Underground Immersive Experience Scene Landing

The Qianmen area is an important historical and cultural district in Beijing. Located on the traditional central axis of Beijing, it plays a crucial role in the city's historical and cultural continuity. The cultural development of this area is fundamental to promoting the inheritance of Beijing's traditional culture and the city's cultural promotion. This case helps to preserve Beijing's historical legacy and

supports the development of a national cultural center. By creating a cultural brand for the old city area that highlights the features of the central axis, the case aims to gradually infuse the image of ancient Beijing through infrastructure, daily promotion, and cultural shaping.

This case aims to create a cultural elements library for the Qianmen area, which will serve as the foundation for a systematic design of the cultural image of Qianmen. This includes the brand system design of the Qianmen area, the "Qianmen Gifts" logo design, a series of cultural and creative product designs, urban furniture and signage designs within the hutongs, and digital collectible designs. Additionally, it incorporates Beijing's underground world as an essential component, using the element database to refine design forms. By employing interactive new media technology and augmented

reality technology, it aids in designing props, exhibition halls, and the software and hardware equipments for key interactive scenes, creating a new tourist landmark in the Qianmen area, promoting historical heritage and cultural exchange.

The innovation point of this case lies in the scientific and technological innovation applied to transforming the cultural and design symbols of Qianmen. It innovatively reconstructs design elements through technological methods, employs systematic design thinking, and integrates multiple design disciplines with technology. The case emphasizes the application of industrial design to facilitate the transformation of technological achievements. Additionally, it combines traditional and contemporary culture using an intersection of technology and humanities.

This case is grounded in the preservation of the old city and establishes a design sharing platform for the Qianmen area. It extracts and parametrically reconstructs traditional cultural elements to form a supportive design element library for the old city's culture. Based on this foundation, the case integrates VR, augmented reality, and interactive new media technologies, applying design systematically and comprehensively from both virtual and real perspectives in the Qianmen area. This effort aims to create a representative brand for Dongcheng District, contributing significantly to the academic research and practical implementation of historical and cultural heritage preservation and promotional design in the Qianmen area.

Supporting the application for World Heritage status for the central axis of Beijing, the case tells the story of Beijing and aligns with the "emphasis on innovative development" mentioned in the 14th Five-Year Plan. It leverages modern technological means to promote cultural and tourism innovation on a broader scale, at deeper levels, and higher standards. The case aims to enhance the living environment in the core areas, protect history while improving residents' lives, and preserve nostalgic memories. It paves a new path for cultural development, construction, and promotion in the Beijing region, providing a model for future cultural construction.

Case sources

Beijing Radio and Television Station

Southwestern University of Finance and Economics

Keywords

AIGC

LoRA Fine-tuning

Semantic Fusion in Chinese and English

Preservation and Integration of the Uniqueness of Ancient Chinese Architecture in the AI Era
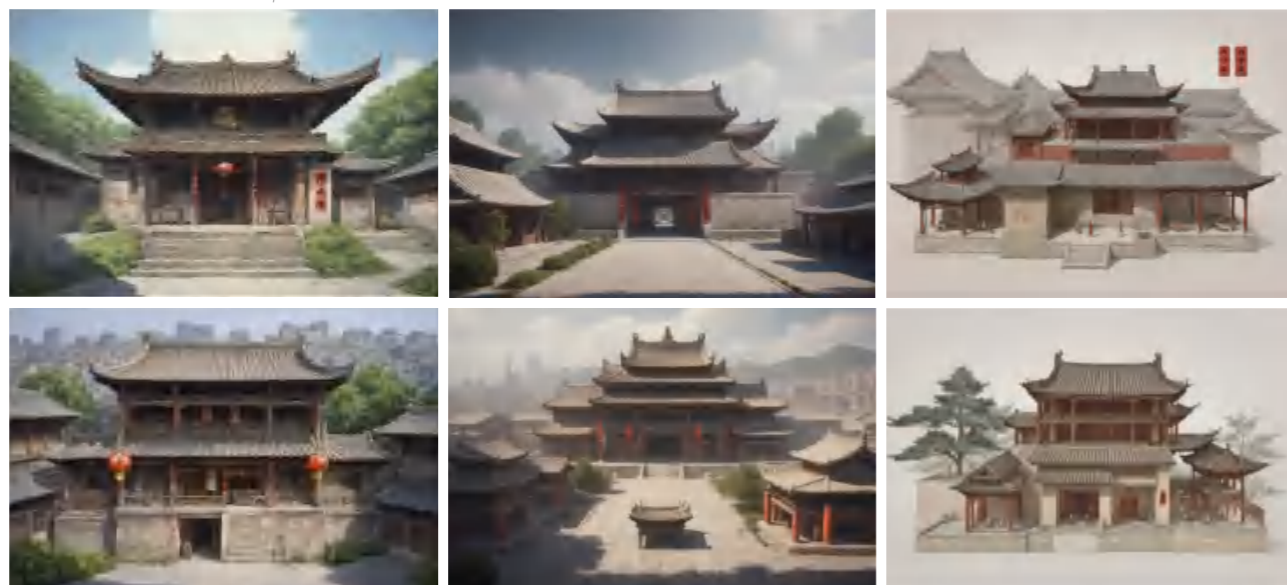
Comparing the results obtained through the combination of SDXL + Style LoRA + Architecture Content LoRA with those from OpenAI's DALL-E3.

Comparing the results obtained through the combination of SDXL + Style LoRA + Architecture Content LoRA with those from OpenAI's DALL-E3.

Results generated based on seven Style LoRA and Architecture LoRA styles derived from knowledge in the field of fine arts.

Results obtained through SDXL + our project's landscape-style LoRA.
("A solitary boatman in his straw raincoat, fishing alone in the cold river snow.")

With the rapid development of artificial intelligence technology, AIGC technology is playing an increasingly important role in cultural heritage preservation and promotion. In the new era, to leverage AI technology for better protection of Chinese civilization and cultural heritage, Beijing Radio and Television Station, in collaboration with the Big Data Research Institute of the Southwestern University of Finance and Economics, launched the project "Preservation and Integration of the Uniqueness of Ancient Chinese Architecture in the AI Era." This case aims to utilize AIGC technology, combining the characteristics of ancient Chinese architecture with Chinese Pinyin, to optimize the open-source Stable Diffusion's SDXL model through LoRA fine-tuning technology. The goal is to generate images of ancient Chinese architecture, thereby addressing the technical challenge of integrating Chinese and English semantics. At the same time, it explores new possibilities for applications in cultural heritage protection, education, tourism, and artistic creation.

This case uses AIGC technology to deeply explore the field of image generation for China's outstanding traditional culture, especially ancient Chinese architecture. Based on the characteristics of ancient Chinese architecture, this case undertakes work from three aspects: data, model, and application. Specifically, through on-site photography, a dataset of ancient Chinese architecture has been compiled and constructed; a method combining Chinese Pinyin and AIGC fine-tuning technology was developed independently, using Pinyin to redefine descriptions in ancient architecture, thereby enhancing the uniqueness of semantic integration and reducing repetition and conflict between Chinese and English semantics; by integrating elements of Chinese culture such as landscape painting, entirely new creative scenes have been developed.

On the technical level, this case successfully incorporated Chinese Pinyin into the expression of unique elements of Chinese civilization, achieving the embedding of unique characteristics into the AI model. This enhanced the model's ability to understand and generate details of Chinese culture. By adopting LORA and prompt-based fine-tuning strategies, the case improved the model's applicability and generation efficiency in specialized fields. Additionally, by integrating scenes from traditional Chinese landscape painting, the case realized the generation of applications fusing two distinctive Chinese civilization elements.

Expert Review

This case applies AIGC technology to the digital display of ancient Chinese architecture. By using a data model represented by Chinese pinyin, it delves into model and application exploration, creating a Chinese-English semantically integrated dataset of ancient Chinese architecture. This enriches the expression of Chinese architectural culture, promotes innovative applications of AI technology in the cultural industry, enhances cultural influence, and showcases the immense potential of AIGC technology in cultural heritage preservation.

Beijing International Light and Shadow Art Season "All Creatures Coexist"

Case sources

Beijing Gehua Large Cultural Activity Center Co., Ltd.

Keywords

Cultural and Tourism Equipment

Light and Shadow Art

Nighttime Economy

To implement the directives of the Beijing Municipal Party Committee and Municipal Government to promote the prosperous development of the nighttime economy and advance its growth, meeting the high-quality, diversified, and convenient consumption demands of the people, the project has built upon the successful experience gained from the light and shadow art performances during the opening ceremony of the 2019 Beijing International Horticultural Exhibition. It has collaborated with the Yuyuantan Park, a 4A-level scenic spot in Beijing, to launch the Beijing International Light and Shadow Art Season – "All Creatures Coexist" outdoor immersive light and shadow art exhibition. Since 2020, it has been successfully held for three sessions.

The 2023 Beijing International Light and Shadow Art Season (Yuyuantan Station) was held at the Yuyuantan Park Sakura Blossom Valley area from May 15th to October 31st. With the theme of "Harmonious Coexistence between Humans and Nature," the project centered around the element of "light". It explored a beam of light symbolizing eternal vitality and depicted a symbiotic world of different life forms, aiming to construct a new digital mirror art space.
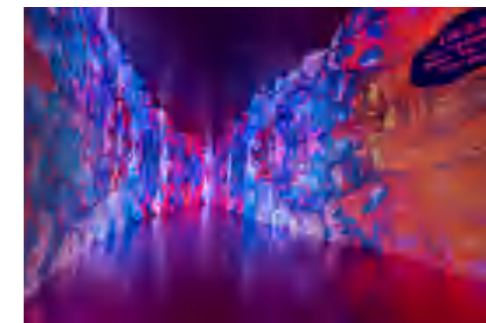
To promote the nighttime economy and meet diverse consumer needs, the creative team, drawing on the success of the 2019 World Horticultural Exposition, partnered with Yuyuantan Park to launch the Beijing International Light and Shadow Art Season—an immersive outdoor exhibition titled "Symbiosis." First debuting in 2020, the project has been successfully held three times by 2023.

The Beijing International Light and Shadow Art Season, which is themed "All Creatures Coexist", is located in the Sakura Valley of YuYuanTan Park in Beijing, covering an area of 19,000 square meters. It is based on the concept that "humans and nature are a community of life" and incorporates various elements such as the ocean, forest, floral world, earth, and myriad others. It features 15 significant landscapes, including the Wormhole, Cloudscape, Mysterious Mist, Star Flame, Wonder Light Tower, Tree of Life, Sky Loom, etc. Each creation retains the original appearance of the site, aiming for a perfect integration of natural forms and digital technology. By combining cutting-edge technologies such as the metaverse and artificial intelligence, it explores the philosophical implications of life, energy, and digital twins, creating a brand-new digital eco-art park.

The project has upgraded five digital interactive scenes and created over a thousand seconds of original audiovisual content. Utilizing the national-level intangible cultural heritage of glassblowing techniques, over a hundred pieces of "glass fairy grass" have been crafted, forming a "glass forest".

Curved laser technology has been applied in the scenes for the first time, transforming single-point laser light sources into full-angle laser displays. Based on multi-view naked-eye 3D stereoscopic video technology, complex multi-layered and multi-angle naked-eye 3D visual effects have been created and specific stage art installations to create a visual fantasy feast. New technologies such as interactive totem installations, digital array imaging, multi-channel projection, and large-scale projection interaction have been incorporated into the works, providing audiences with a unique immersive interactive experience in light and shadow art.

The success of the Beijing International Light and Shadow Art Season, which is themed "All Creatures Coexist", contributes to the creation of a prominent "Night Beijing" landmark that has influence both domestically and internationally. It endeavors to fully establish a "Cultural Tourism + Technology" branded event, optimize market supply, innovate consumption patterns, revitalize cultural consumption, and boost Beijing's development as a national cultural center and international consumption hub. Through diverse cultural activities, people's aspirations for a better life are further satisfied.

Expert Review

The nighttime economy has become a crucial pillar of urban vitality and appeal worldwide. This case leverages the unique cultural and natural landscapes of Yuyuantan Park, combining digital imagery, bionic installations, motion capture, and body sensing interaction technologies to create a distinctive outdoor immersive light and shadow art experience. It achieves a seamless blend of light and shadow, gardens and technology, reality and fantasy.

Teamlab Borderless Shanghai

As one of the world's top ten must-see art exhibitions, the teamLab exhibitions have sparked a frenzy among art enthusiasts since their debut in Tokyo. On November 5, 2019, the grand art museum "teamLab Borderless Shanghai", created by Guangyulai (ALight) in collaboration with the globally renowned digital artist teamLab, officially opened its doors along the Huangpu River waterfront in Shanghai.

TeamLab Borderless Shanghai is an art museum without maps or boundaries, where artworks are not confined by exhibition hall spaces. They interact, influence, and merge with each other. Visitors immerse their bodies in this boundless art, wandering through intricate 3D spaces, using their conscious senses to explore artworks, and collectively creating and discovering a new world with others.

As the first flagship store in China, teamLab Borderless Shanghai represents a new commercial immersive art exhibition type. It is currently the largest venue in China dedicated to immersive new media art, boasting the highest number of exhibited artworks and the largest exhibition area. With its boundaryless exhibits, the museum showcases the fusion of new media art and technology, offering a comprehensive display of exploration in the field of new media art. Curating new media art as a permanent exhibition and transforming it into a destination for cultural tourism experiences is a significant innovation of the project.
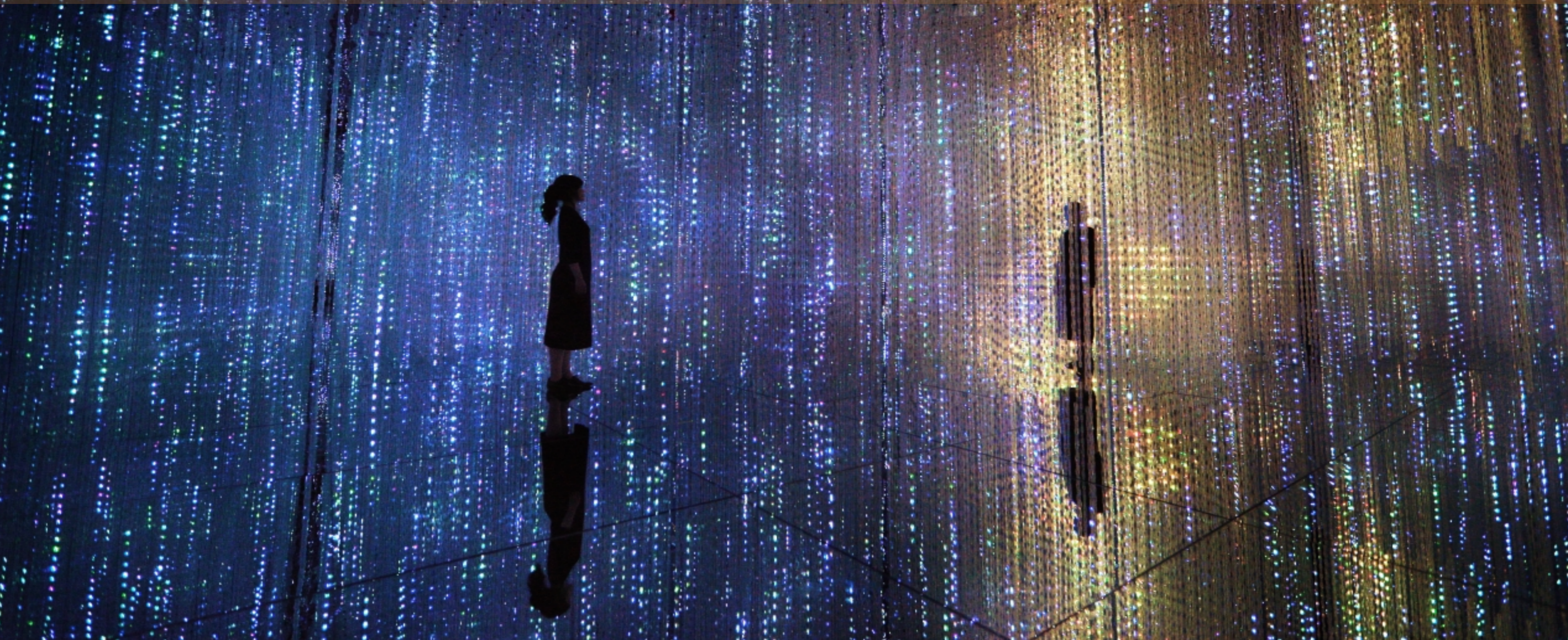
It opens up possibilities for more direct interaction and engagement between cultural and artistic projects and the general public.

TeamLab Borderless is an art collective created by the teamLab artistic group, known as the "museum without maps." It's an art experience where boundaries between rooms dissolve, and artworks interact with each other. There are no delineations between the artworks; they blend and influence one another. These seamlessly integrated artworks form a continuous world without boundaries. Immersing themselves in this borderless art, visitors wander and use their conscious bodies to explore, collectively creating and continually discovering new worlds.

TeamLab Borderless is a large-scale immersive art exhibition project utilizing high-definition projection, digital interaction, sensor technology, and more. It commenced operations in 2019. In terms of software art design, to achieve the theme of "borderless" for the art museum, the artist team employs projection blending technology and interactive techniques, allowing the visual works to transcend the concept of physical space and freely flow throughout the entire venue, seamlessly integrating as one.

In terms of interactive experience design, there is not only fusion and influence between visitors and artworks, but also interaction among the artworks themselves. All scenes may contain non-human-induced interactions and influences, allowing visitors to generate unlimited imagination and thoughts. With a display area of 6,600 square meters, the project showcases approximately 50 boundaryless art pieces, demonstrating the integration of new media art and technology. It serves as an integrated exhibition exploring the field of new media art, becoming a new cultural and tourist destination in Shanghai.

Expert Review

Globally, TeamLab has almost become synonymous with the new digital cultural spaces that explore the fusion of technology and art. This case uses technology as a tool and art as a medium to engage participants in immersive contemplation of the relationship between individual life and the dimensions of time and space. The TeamLab Borderless Museum, established in China, quickly became a trendy hotspot. Its greatest allure might lie in the exploration and perception within the digital interactive light and shadow.

Intelligent Extraction and Processing of Cultural Pattern Elements Used in the 2022 Beijing Winter Olympics

Case sources

Beijing University of Posts and Telecommunications

Keywords

Cultural Computing

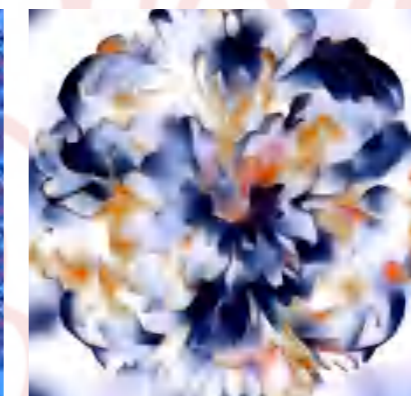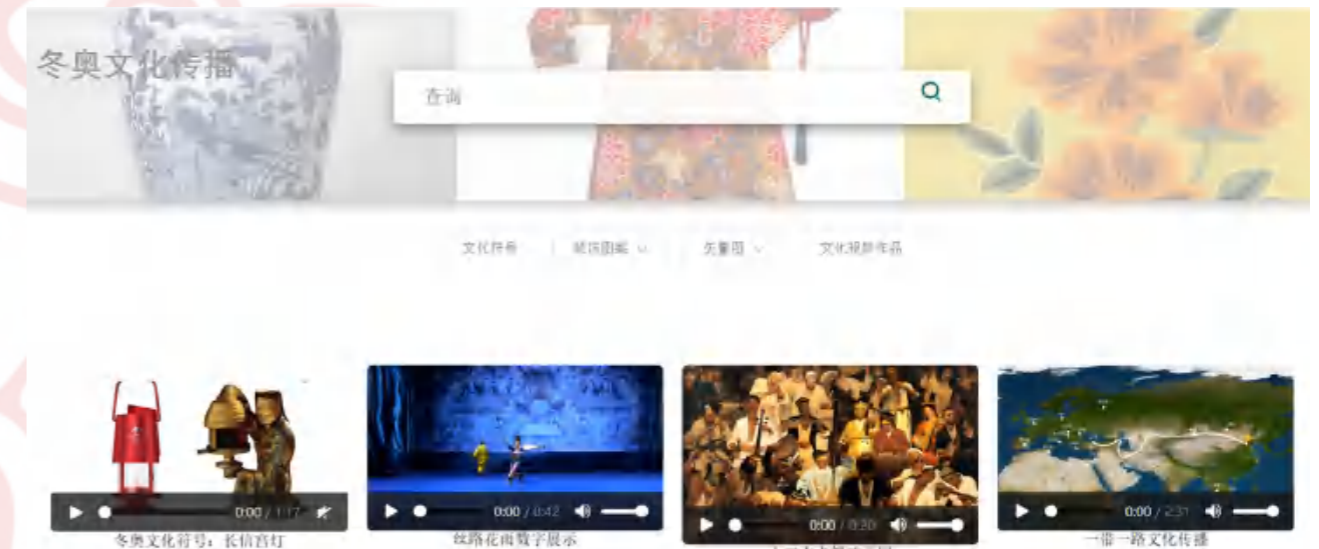Digitization of Cultural Symbols

Beijing Winter Olympics

As a globally influential sporting event that attracts worldwide attention, the Winter Olympics has always been a crucial platform for the host country to shape its international image and promote cultural exchange. The successful hosting of the 2022 Beijing Winter Olympics provided China with an important platform to disseminate its excellent culture and enhance its global cultural influence.

The image design and media communication efforts for the Beijing Winter Olympics posed high demands on refining and transforming symbols of outstanding traditional Chinese culture. The challenge was to retain the aesthetic appeal and cultural essence of Chinese culture while adhering to the communication norms of the international community and the new media era. Additionally, it was essential to showcase the cutting-edge achievements of cultural and technological integration. This needed to align with the hosting principles of the

2022 Beijing Winter Olympics, effectively utilizing the international communication platform provided by the Winter Olympics to achieve better cultural dissemination outcomes.

Traditional cultural patterns, as the essence of traditional culture, hold immense research value. They reflect the diversity of human spirit and culture and embody the legacy of the aesthetic beauty of Chinese traditional culture. By reconstructing and innovating these traditional cultural symbols through digital technology, the Beijing Winter Olympics were infused with the aesthetic essence of China's outstanding traditional culture. Additionally, the symbolic meanings conveyed the good wishes of the Chinese people to the world.

The project systematically categorized and aggregated resources from China's outstanding traditional culture, utilizing cultural computing for deconstruction,

annotation, and reconstruction. This process recombined various cultural elements and components to generate new cultural resource data or digital content, encompassing three main categories: cultural symbols, decorative patterns, and vector graphics, totaling over 50,000 items. Cultural Symbols were centered around cultural heritage resources. Decorative Patterns were organized into subcategories such as carpets, clothing, artistic creations, and decorative elements, reconstructed using elements like patterns, colors, configurations, and styles. Vector Graphics included scalable vector graphics of patterns and symbols, with 10,000 characters vectorized in 3D.

These resources provide valuable patterns for preserving and understanding Chinese traditional culture. Leveraging the global platform of the Winter Olympics, the project aimed to foster a favorable environment for the entire society to engage in protecting, disseminating, and promoting excellent traditional culture.

To enhance the usability of the Winter Olympics global communication service platform, the project developed a distributed real-time data synchronization and processing framework and a distributed computing engine resource management system based on Yarn.

Expert Review

Under the overall context of digitalizing cultural resources, this case focuses on the "cultural gene" as its core. Through a series of technologies such as collection, extraction, annotation, and reconstruction, a comprehensive Chinese image resource database has been established. This database has been utilized in the design of cultural symbols for the 2022 Beijing Winter Olympics and in various science and technology cultural touring exhibitions, demonstrating the potential of traditional cultural resources in innovative applications.

Case sources

StarTimes

Keywords

Ultra HD Video

Cloud Services

China-Africa Cooperation and Development

Development and Application of Ultra HD Video Smart Convergence Media Service Cloud Platform for African Countries

According to Digital TV Research, the Sub-Saharan Africa market in 2018 was dominated by three media groups - MultiChoice (South Africa), Vivendi (France) and StarTimes/StarSta (China) - which accounted for 93% of the region's pay-TV market share. The number of pay-TV subscribers in Sub-Saharan Africa is expected to reach 45.63 million by 2024. During the 2018 FIFA World Cup, DSTV broadcasted the matches via satellite in 4K-UHD, the first 4K-UHD live video streaming in Africa.

In the context of the "Belt and Road" initiative and China-Africa cooperation, StarTimes utilized its technology research and development capabilities and influence in the field of digital television, and led the completion of this case by combining its own technology accumulation and advantages, as well as its research results and technical advantages in ultra-high-definition (UHD) video technology, cloud computing, artificial intelligence, and big data.

The UHD video intelligent integrated media service cloud platform for African countries mainly focuses on UHD video management, UHD video processing, UHD video distribution and UHD video convergence business operation support. The development and application of this platform can promote UHD video-related business applications in Africa, enhance the company's overall competitive strength in the African market, especially in the technological competition in new business areas such as UHD video and provide a demonstration role for domestic enterprises to go out. At the same time, it can also realize a good linkage effect of the industry chain, drive the domestic UHD digital content, UHD equipment, and intelligent terminal equipment sales in Africa; promote high-quality cultural and scientific and technological products to go out, and further promote in-depth exchanges of Chinese and African cultures, and advance the integration of science and technology and culture.

This project applies cloud computing, artificial intelligence, big data and other technologies to the field of UHD video broadcasting, develops four core software function subsystems of UHD video management, UHD video processing, UHD video distribution, and UHD video convergence service support, and builds a UHD-supporting intelligent media integration service cloud platform. The platform can provide operators with a complete private cloud deployment solution for UHD video intelligent media integration and UHD video integration SaaS cloud services based on StarTime Hybrid Cloud. Relying on the technical products of the project, it provides customers with UHD video fusion media server leasing and UHD video fusion media business operation support services. After the completion of the project, customers purchasing these services can focus on providing their own UHD video content and business operations

without the need to invest heavily in hardware infrastructure construction. This allows them to quickly establish their own independently operated UHD video fusion media business platform.

The case establishes a multi-lingual UHD video content management system tailored for Africa. Including the management of content metadata for minority languages, implementing low-bit-rate UHD encoding technology for African networks, and developing an intelligent distribution engine for UHD videos across heterogeneous networks in Africa. This engine involves the collection, predictive analysis, and intelligent scheduling of UHD video playback quality on various African networks and the enhancement of support for the

operation of UHD video fusion business based on the existing African BOSS system. This support encompasses functions such as defining UHD products, facilitating ordering and service delivery, and providing SaaS services to operate UHD fusion media business.

The "Science Popularization Duck" (Ke Pu Ya) APP, Using Data to Drive the Dissemination of Scientific Knowledge and Traditional Culture

Case sources

Beijing Haige Excellent Media Technology Co., Ltd.

International Society of Bionic Engineering

Keywords

SaaS (Software as a Service)

Public Science Popularization

Converged Media

With the development of information technology, the presentation of popular science content is no longer limited to traditional forms such as audio, images, texts, and video. Real-time interaction with interactive information is gradually becoming a new trend in the dissemination of popular science. However, the dissemination of popular science knowledge on mobile internet short video platforms varies in quality, with most lacking authoritative verification and facing limitations in cross-screen distribution and interaction with television terminals.

The "Science Popularization Duck"(Ke Pu Ya) APP is an smartphone application based on integrated media dissemination of popular science. Positioned as a leading domestic internet platform for popular science short videos and live streaming, it combines authority, knowledge, entertainment, service, and interactivity. Through short videos and live interactions, it builds a real-time communication bridge for science enthusiasts, technology workers, and researchers, leveraging the power of social media sharing across society. It


advances the certification system for popular science information officers and utilizes the advantages of the short video traffic era to popularize and disseminate scientific knowledge.

In terms of content, the APP focuses on the "science and technology" and "aesthetics" knowledge of traditional Chinese culture. Examples include the mortise and tenon joints construction that embodies the principle of "softness overcoming hardness", the materials and craftsmanship of Xiaoyi shadow puppetry, and the subjective evaluation of the musical tones in Dunhuang Melody Art. Technologically, it utilizes an AI and big data-supported SaaS system to restore, review, and transcode audio and video content from different sources, enabling efficient and synchronized distribution across mobile phones, tablets, TVs, and primary and secondary school educational systems. This system automatically adapts to various platforms, improving network efficiency, and particularly addresses the challenge of bringing

cultural and scientific popularization to rural areas. In terms of collaboration, it connects with authoritative institutions such as the China Association for Science and Technology and the Bionics Society to jointly organize popular science live broadcasts and create digital archives of "popular science + culture", thereby enhancing the public's scientific and cultural literacy.

The APP uses multi-screen transcoding cloud technology to achieve multi-screen distribution and real-time interaction for popular science through short videos and online live broadcasts. Users can interact in real-time across different screens, on TV, tablets, computers, or mobile phones. Currently, the APP has been applied in interactive teaching within the field of educational informatization in Beijing, with peak concurrent interactions involving thousands of users. With the expansion of the multi-screen transcoding interactive cloud platform, there are plans to enable simultaneous online interactions for tens of millions of users by 2025.
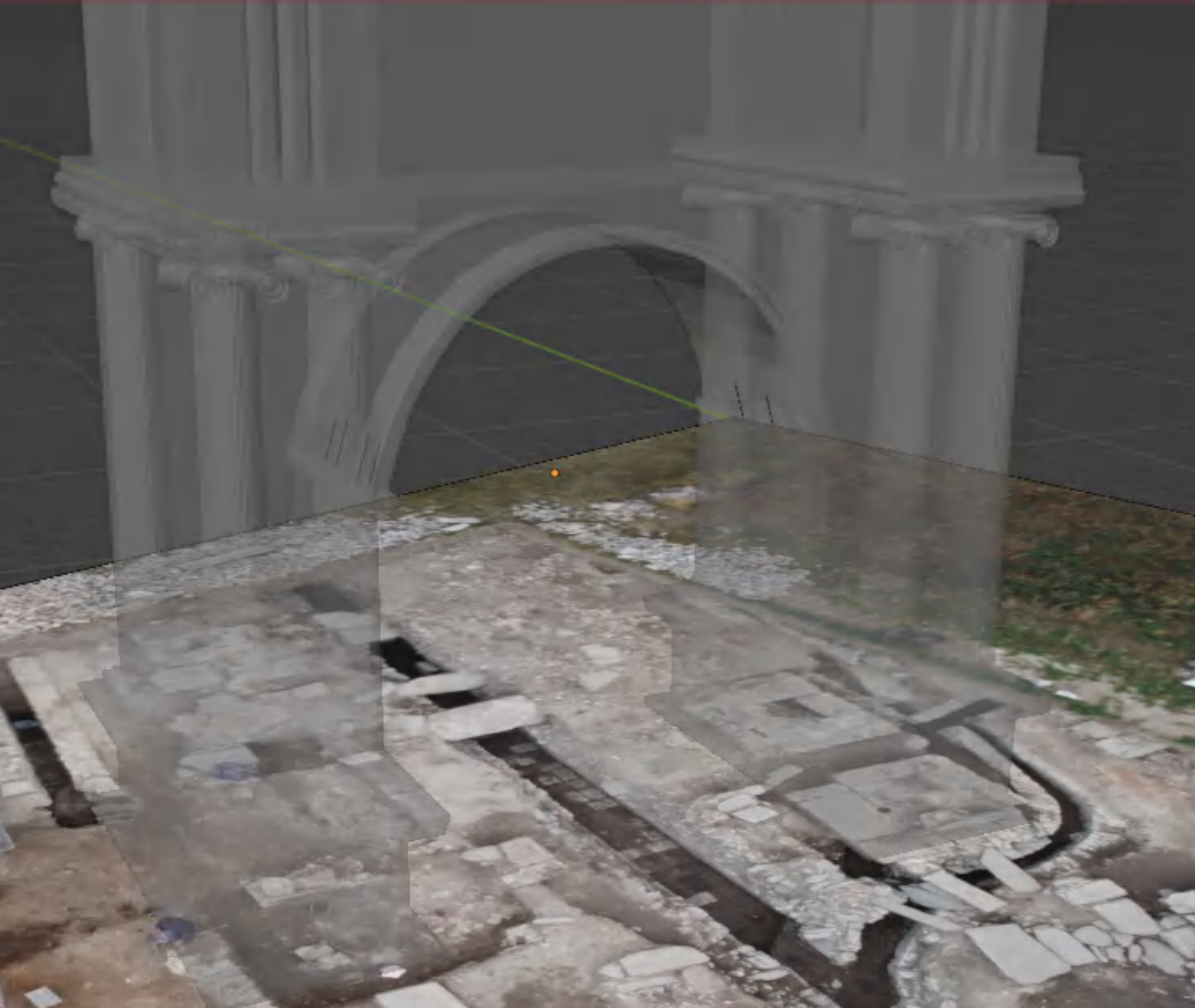
Viminacium for New Millennium

Case sources

Institute of Archaeology

Keywords

Virtual Reality

3D Reconstruction

Archaeological Database

Situated on the Danube Limes archaeological site,Viminacium once was the administrative capital of the Roman province of Moesia Superior and an important military camp, established in the 1st century AD. The downfall of the city started in the 4th century, and at the end of the 7th century, the site was abandoned.

The archaeological excavations began in the end of 19th century, and were continued sporadically throughout the 20th century, except for the large-scale rescue excavations conducted in the 1970s and 1980s, that were primarily focused on the areas of the necropolises. The new era in the research of Viminacium came at the beginning of the 21st century, with the new multidisciplinary team of the Institute of Archaeology, introducing new technologies in archaeological excavations.

In order to share obtained knowledge with the wider public but more importantly to protect the site from the ongoing coal exploitation in the strip mine that surrounds Viminacium, a decision was made to open the site for public and visits. Thus, in 2006 Viminacium Archaeological Park was opened as the very first spot on the map of cultural tourism in Serbia, and in 2009, the site was given the highest level of protection granted by Serbian law. In the past 18 years of its existence, each year Viminacium improved its capacities and touristic offer based on emotional design and experiences previous: Domus Scientiarum – research and visitors' center, Limes Park – educational center with facilities that can host 480 youngsters, Adventure Park, Museum for discovered objects, together with variety of workshops such as Roman cuisine, calligraphy, pottery, etc. One of the biggest achievements is the exhibition

Itinerarium Romanum Serbiae and Viminacium that so far was established in more than 25 cities throughout Europe, North and Latin America and Africa.

By 2019 the development path of Viminacium has been established and its outlines has been defined. On the base of the previous achievements done in 21st century, it was clear that the future goals need to be oriented towards the digital progress and dialogue and engagement of young generations in knowledge sharing and heritage protection. In the past 20 years, the interdisciplinary team, together with experts from other institutions, started implementing the 3D technologies have now become part of standard documentation that practices in Viminacium, that now has one of the largest digital data bases in the field not only in Serbia but the wider region of the Balkans.

Further on, the full benefits of this approach became apparent in the presentation of the site, as well as our educational and scientific efforts. The team know that disseminating the team research and historical knowledge to the broader public and local communities stands as a fundamental aspect of archaeological endeavors. The 3D recording methods and the models and reconstructions that came out of it, allowed the team to fully capture the public attention. Thanks to the development of new technologies and methods we can much more easily the past is brought to the audience. Combined with creative storytelling and other technologies, this proved to be a correct path, one which we plan on continuing in developing the Viminacium.

Undoubtedly digitization allows us new methods of communication with young audiences which in the

end is the one that in the future will safeguard and protect our cultural heritage. And since the future of our heritage is in the hands of youth, application of 3D models and digitization in general proves to be a very good educational method for improvement of better understanding and valorization of cultural heritage. Roman heritage in the Balkans project was focused on the use of VR and digital storytelling. As a concrete outcome of the project, an application was developed for Internet users and visitors to archaeological sites. Through the use of VR equipments and 360º views, users can explore various buildings whose reconstructions emerge from

recorded ruins. Following the digital narratives, users can test their knowledge through quizzes and explore archaeological artifacts found at these sites. Selected locations are showcased through Virtual Reality digital narratives within an application available online and installed in museums at archaeological sites. In Viminacium VR headset is available as part of the touristic offer.

CoolTour project represents a valuable step in digital communication rather than just digital technologies. We wanted to utilize all available, free digital platforms

and tools and to educate people in the field of cultural heritage. Specifically tailored to youth, the CoolTour entailed the development of a digital social platform for young people, through which they would be able to create and share content related to archaeological sites, as well as read a handbook for fostering dialogue with youth using digital technologies, aimed at managers of archaeological sites.

In the realm of cultural heritage dissemination, a new initiative has emerged under the Creative Europe program: Immersium project. Central to this initiative is the development of the IMMERSIUM mobile application, which seamlessly integrates an interactive digital guide through archaeological sites with immersive gaming experiences (https://immersium.eu/).Through the utilization of new technologies such as augmented and virtual reality (AR and VR), 3D reconstruction, and gamification, visitors are transported back in time to explore the rich history of archaeological sites like Viminacium, Stobi, and Emona. The exhibition "Itinerarium Romanum Serbiae and Viminacium" is one of the best examples of promotion of Serbia's cultural heritage in the world, becoming one of the most recognizable brands of our country, representing heritage of 18 Roman emperors born on the territory of Serbia and Viminacium. During last 11 years, the exhibition had its setting at four continents in more than 25 cities around the world, passing on the knowledge that scientists in Serbia have achieved.The exhibition also visited the Colosseum Archaeological Park in 2023, when it was visited by more than 50,000 visitors from all over the world, in just two months.The exhibition consists of 18 heads of emperors born in Serbia and a model of the Roman city of Viminacium and the legionary camp at Viminacium. It was done on the basis of multi-year multidisciplinary research of the ancient city and the legion camp, mostly based on geophysical results research.

Reconstructed 3D models and reconstructions. These models, together with the excavation and research data, allowed us to start creating the reconstructions of the excavated areas, features, structures and discoveries. At the end of 2023 the remains of a very special

object – a triumphal gate were discovered. Almost immediately, based on the measurements and known analogies (together with external experts), work on the reconstruction and 3D modeling began. The result was a 3D model which, in the end, was printed.

Viminacium Virtual Tour: Pushing the boundaries further, 2019 witnessed the debut of yet another multimedia marvel: the Viminacium 3D application. This dynamic platform not only showcased the modern and ancient structures of the park but also offered immersive narratives guided by virtual companions, granting visitors a comprehensive 360º view of every facet of the park's landscape and heritage.

Intensive coordinated development of science, technology, and culture at the Institute of Archaeology started in 2003. By 2017, and especially in 2019, it gained full potential, particularly in the realm of international cooperation. Many projects are the result of collaborative international efforts supported through various EU grants: Roman Heritage in the Balkans 2019 and 2021 (Western Balkans Fund), Immersium 2021-2022 (Creative Europe), Cooltour 2022-2024 (Erasmus+).

In 2019, the Viminacium Virtual Tour was created, available on the park's website, and proved to be a very important tool for communication during the COVID pandemic when the majority of the public was forced to follow cultural content exclusively online.

Finally, 3D modeling and reconstructions have been successfully applied in archaeological research in recent years, with almost every archaeological discovery immediately followed by its reconstruction. Based on the application of new technologies such as ground-penetrating radar and photogrammetry, the ideal reconstruction of the Viminacium city and military camp has been created. Additionally, 18 busts of Roman emperors born on the territory of modern-day Serbia were prepared for an exhibition, which last year was set up in Italy at one of the most renowned world heritage sites – the Archaeological Park Colosseum, which is visited yearly by 7,000,000 tourists from all over the world. The exhibition itself was visited by 50,000 people in just two months.

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