# Three-Dimensional Reproduction of Cultural Heritage

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**Abstract:** Intangible cultural heritage is of great significance for spreading Chinese culture and telling Chinese stories. In the continuous development of economy and society, the spread and protection of intangible cultural heritage should also be established on the basis of a new technical system, innovating its own development and protection methods. In many technical systems, three-dimensional animation technology has obvious adaptability to the protection of intangible cultural heritage, which is consistent with the reconstruction of intangible cultural heritage scenes and the improvement of intangible cultural heritage display and publicity capabilities. Here, this article proposes a method of cultural heritage reproduction based on three-dimensional technology, combined with three-dimensional technology to effectively reproduce intangible cultural heritage. This article mainly uses human-computer interaction, three-dimensional panoramas, virtual reality and other technologies to replicate Tangling's sculptures. Use the novel and rich visual rendering effects brought by Maya software to release the spread of cultural heritage from time and space, and the advantages of three-dimensional animation in protecting cultural heritage. It reflects the necessity of three-dimensional animation in the protection of Tangling sculpture cultural heritage.

## 1. Introduction

The more advanced the times and the more social progress, the stronger the desire for self-awareness of the country. Cultural heritage is the crystallization of ancestors 'wisdom and creativity. It breeds the nation's unique spiritual thoughts, ways of thinking, and cultural awareness, and is the basic foundation for maintaining cultural identity and cultural sovereignty. Cultural heritage not only has historical value, but also has certain enlightenment for the future development trend. The protection of cultural heritage embodies human subjectivity, inter-subjectivity and historical consciousness in a cultural sense [1]. With the trend of economic globalization and the acceleration of modernization, China's cultural ecology is undergoing tremendous changes, and its cultural heritage and its living environment are seriously threatened. Many historical and cultural cities, ancient buildings, ancient ruins and scenic spots have been destroyed [2,3]. In some areas, illegal trade in cultural relics, theft and excavation of monuments and tombs, and smuggling of cultural relics have not been effectively curbed in some areas, and many valuable cultural logistics resources have been lost outside the territory. Due to excessive development and unreasonable use, many important cultural heritages have disappeared or been lost [4]. In regions with relatively rich cultural heritage of ethnic minorities, due to changes in people's living environment and conditions, the disappearance of ethnic or regional cultural characteristics has accelerated. Therefore, there is an urgent need to strengthen the protection of cultural heritage.

The Tang Dynasty was an important representative of China's feudal society. At the peak of the development of the Tang Dynasty, its economy, culture, politics and diplomacy were highly developed, and became one of the world's leading powers [5]. The prosperous social economy and live in peace and content made people of that era have a lot of research on culture and art. The splendid history and culture of the Tang Dynasty made China the dazzling cultural and artistic capital of the Middle Ages [6,7]. In the field of art and culture in the Tang Dynasty, sculpture stone carving is an important part of its artistic development. Although many tomb relics of the Tang Dynasty were found, there are still many exquisite large-scale stone carvings and Quetai ruins that

have not been valued and protected by people. As a relic of the heyday of ancient China, Tangling sculpture not only inherited the profound historical connotation of the Tang Dynasty, but also witnessed the entire process of the Tang Dynasty from prosperity to decline. It is a witness of history and a carrier of culture and has a very high culture. Value and artistic value are non-renewable cultures [8-10].

At present, the main means of spreading cultural heritage is to spread cultural heritage locally. It is mainly disseminated to tourists through museums and tourist attractions. This way has left a deep impression on tourists, but the scope of influence is not wide enough. The second is through traditional media. By producing well-made or influential newspapers and magazines, this method has far-reaching effects, but the scope is still limited. The third is digital dissemination through the Internet and self-media. If this network-based digital communication method is combined with visual communication, it can theoretically achieve no borders and language restrictions. This article focuses on the use of three-dimensional animation technology to collect data about these physical forms of historical artifacts. And spread them widely through the mass communication channels in the digital age, so as to protect the intangible cultural heritage at the record and record levels.

## 2. Method

### 2.1. Three-dimensional technology

3D technology is to create a virtual space through the 3D animation software 3Ds Max, Maya, etc., build models and scenes according to the shape and size of the objects to be expressed, and then based on the previously designed model movement trajectory, virtual camera movement and other animation parameters, and You need to assign specific materials to the model and add lights. After completing all these operations, the computer can automatically generate the final rendering effect. The three-dimensional technology can simulate the texture, brightness, shape, size, etc. of the object, and can observe the various angles of the object in the three-dimensional animation software, which is more convenient for the artist to perform artistic creation and expression. Three-dimensional digital modeling technology, one is to use the principle of transmitting and receiving pulse laser through the laser scanning system platform to measure the three-dimensional coordinate points set on the surface of the measured object. It is called a point cloud. Then, use computer software to process and reproduce the three-dimensional model of the scene under test, followed by exporting the model file scanned by the three-dimensional scanner, and using Maya software and other three-dimensional modeling software to compare the clothing with the Tang Dynasty. The direct virtual copy of the texture and the three-dimensional space of several pits can simulate the pre-repair of the damaged Tangling sculpture. The three-dimensional animation technology is based on the establishment of three-dimensional animation of key frames, the establishment of models, textures, lights, etc. through the set motion trajectory, virtual camera motion parameter settings and other animation parameter settings. Animation frames with consecutive frames. Through the three-dimensional animation technology, you can observe the various angles of cultural relics without dead angles, and you can perform one-to-one modeling and animation of three-dimensional animation in a proportional relationship in the virtual space. With almost unlimited operability, you can maximize the ideas you want to express.

### 2.2. Typical characteristics of intangible cultural heritage

Regarding the characteristics of intangible cultural heritage, many scholars have put forward different views from different angles. But one thing is certain. Analyzing the characteristics of intangible cultural heritage is inseparable from the meaning of intangible cultural heritage that has been agreed upon. Intangible cultural heritage refers to various traditional cultural expressions that exist in intangible form, are closely related to people ’s lives, and are passed on from generation to generation. The above-mentioned traditional cultural expressions related to intangible cultural heritage and cultural space, such as traditional knowledge and practice, traditional craftsmanship, etc., have the characteristics of public welfare. The protection of intangible cultural heritage is not

an act of seeking private gain, but an act of pursuing public welfare. It is precisely because the intangible cultural heritage has the characteristics of public welfare that it has practical protection value. The formation of any kind of culture is inseparable from specific environmental factors. Without a specific environmental soil, culture loses its foundation for existence. The formation of intangible cultural heritage is no exception, it must also exist in a certain environmental space. The specific natural environment and humanistic environment gave birth to specific intangible cultural heritage. Intangible cultural heritage does not exist in the spiritual realm of human beings from birth to development, but is always associated with specific communities and environmental factors. This shows that any kind of intangible cultural heritage is closely related to a specific geographical environment. The intangible cultural heritage formed by different natural environment and human environment must be very different.

## 3. Experiment

The main 3D animation software used in this article is Maya. Maya is a subsidiary of Autodesk. In addition to 3D MAX, another excellent 3D modeling and animation software also has excellent performance in modeling, digital cloth simulation, motion matching, animation and other modules. Based on the principles of computer vision and close-range photogrammetry, study material and cultural heritage, and use the method of restoring the scene structure from motion to reconstruct the three-dimensional model of the target scene. In order to realize the three-dimensional digitalization of the image of the material cultural heritage, the connotation of the material cultural heritage is changed from representational and patterned to the combination of the three-dimensional cognition and cultural identity of the material cultural heritage, and people's cultural literacy is improved. Understanding and identification of material cultural heritage. Through the "repair" of Tangshan Mausoleum's material cultural heritage sculpture through three-dimensional animation technology, the three-dimensional technology's "repair" of cultural heritage was analyzed and studied from a new perspective, and the restoration method was explained. Through the virtual research on the virtual material cultural heritage, in-depth understanding of the real material cultural heritage, combined with the three-dimensional technology with the computer as the core, analyzed the "repair" method. The use of computers to repair the material cultural heritage in a three-dimensional space can further promote the repair of the material cultural heritage, thereby simulating and perfecting the preservation, and performing digital simulation repairs on some specific items that cannot be repaired. The expansion of the three-dimensional space and the intuitive features of the three-dimensional technology can restore the "recovery" of the culture, maximize the mining of cultural relics, and provide some effective references for future cultural remediation workers.

## 4. Research And Analysis Of The Three-Dimensional Reproduction Of intangible Cultural Heritage

### 4.1. Problems in the development and protection of intangible cultural heritage

At present, the dissemination of China's intangible cultural heritage is still in the period of flat communication composed of words, videos and pictures, and lacks the ability to communicate in three dimensions and scenes. After the commercialization of virtual reality technology, virtual reality movies have gradually developed, cultivating the public's habit of virtual reality communication products and weakening the public's interest in printed promotional products. Affects the ability to spread intangible cultural heritage. On another level, the characteristics of the intangible cultural heritage itself make it impossible to fully display in two-dimensional products, which affects the public's perception of its charm and thus affects the attraction of the intangible cultural heritage. The online display channels of intangible cultural heritage on the Internet are relatively rich, mainly including text, pictures, audio and video formats, such as WeChat public account tweets, short videos and documentaries. Face-to-face offline display mainly includes performance display and lobby display, which are relatively single. Judging from the specific effects

of online display and offline display, offline display has comprehensive, tactile and experience characteristics, which is not only conducive to the spread of intangible cultural heritage, but also to the public's deep understanding of intangible cultural heritage. However, the current offline channels and methods of intangible cultural heritage further limit its own advantages and affect its specific effects. Table 1 lists the main issues in the development and protection of intangible cultural heritage.

**Table 1.** Problems in the development and protection of intangible cultural heritage

| Problem | Specific problem | Proportion |
|---|---|---|
| Not attractive enough to spread | Stay in the period of plane communication composed of text, video, and pictures, and have insufficient ability for three-dimensional and scene-based communication | 23.5% |
| Weakening of offline display channels | The offline display channels and methods further restrict their own advantages and affect specific effects. | 25.5% |
| Intangible cultural heritage inheritance | The lack of core technical content in the communication process, such as the lack of music scores, will affect the subsequent communication problems. | 31.1% |
| Insufficient ability to apply modern technology | The technical foundation and financial capacity are relatively weak, which affects its integration with modern technology. | 42.4% |

### 4.2. Three-dimensional reproduction innovation of cultural heritage communication

The three-dimensional animation panoramic interactive system in this paper is a virtual display system based on computer and Internet. Unlike other digital display methods, it contains the following three essential elements. One is a full-angle interactive experience. This is the most important function of the system. Unlike two-dimensional planar photos or 360° panoramic photos, this display can display cultural relics at any angle with the movement of the mouse under the control of the user. Users can zoom in, zoom out, and change the angle as needed, without any restrictions. The interactive performance of the three-dimensional interactive cultural relics reproduction system is through human-machine dialogue, which maximizes the dominant position of tourists. The second is Internet-based communication. It can be run on any networked computer in the world without the need to install complicated software or users to learn any complicated knowledge. The third is to integrate multiple information interaction methods. In addition to disseminating visual information, the system should also incorporate rich cultural relics knowledge, background story introduction, music effects and other content. It enables people to experience the historical environment and background of cultural relics by themselves. The system can be divided into two parts, one is the web page part, and the other is the Maya software display part. Among them, the webpage system is responsible for the user's browsing, operation and management of the webpage. The display part of Maya is responsible for realizing three-dimensional interactive operation. The implementation process of this article is shown in Figure 1.

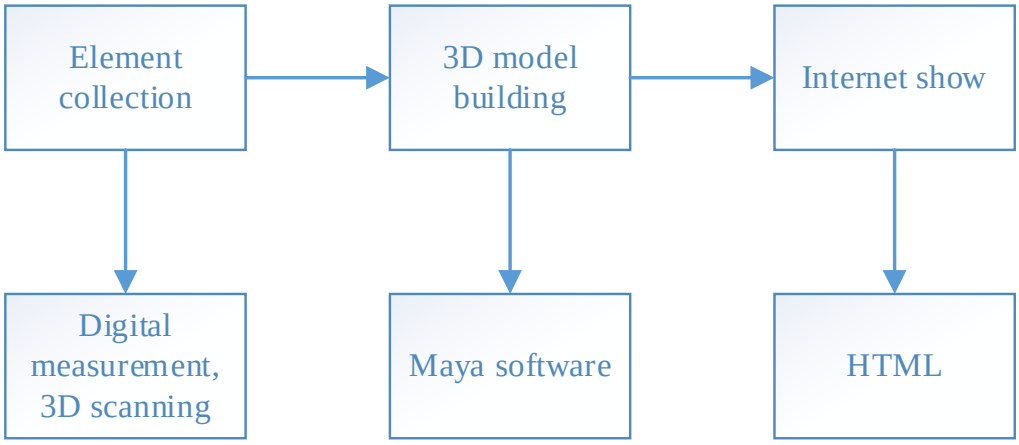


**Figure 1.** The realization process of three-dimensional panoramic interaction

Maya software has rich 3D performance support. Can support 3D texture modes, including diffuse, bump, normal, height and more than 100 shader shaders. More than 20 post-production effects and high-quality particle systems. Support various 3D models (such as 3ds and fbx) direct import and automatic conversion. Rich 3D functions can provide all-round and powerful support for the restoration and reconstruction of various cultural relics, 3D omnidirectional display, digital protection and virtual tourism. Obtaining a series of digital photos of objects is a technical method to analyze and calculate the spatial shape of objects. At present, the application of this method in the field of cultural relics protection has been relatively mature, especially in the research of Tangling sculpture protection, the research of this method has been very deep.

## Conclusion

3D Animation Panoramic Interaction is a 3D scientific research project, which is supported by modern interactive design and virtual 3D animation technology, and combines archaeology, historical research, aesthetic research and other disciplines. Using Maya software technology, it can create cross-platform, real 3D interactions, fully display the appearance of cultural relics, and can integrate text, sound, and other virtual reproduction communication methods. This method can meet the urgent needs of modern society for the protection and dissemination of cultural relics and cultural heritage. By introducing three-dimensional animation technology in the development and protection of intangible cultural heritage, problems in the process of inheriting intangible cultural heritage can be effectively solved. However, the current combination of intangible cultural heritage and 3D animation technology is not enough. In the subsequent development, it is necessary to conduct in-depth exploration in conjunction with the development and protection of specific intangible cultural heritage.

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