

Research on the Application of 3D Digital Model in the Conservation of Digital Cultural Relics: The Example of a Bronze Yatim Father B Beast-Faced Wine Container

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Abstract: With the rapid development and widespread use of information technology, people are becoming more and more accustomed to the convenience provided by digitalization in production life. For museums, the development of three-dimensional digital technology is the most direct and prominent change is for the protection of traditional cultural relics related aspects, after all, compared to the traditional protection of cultural relics, digital channels can make the preservation of its way more permanent, in addition can also go with virtual reality and other technologies to achieve multi-angle, multi-mode observation of cultural relics. Therefore, in the process of development and construction must also accept digital thinking and strengthen digital construction, so as to meet the trend of social development and promote the further development of the museum. Cultural relics are the witness of history, but also the proof of culture, the application of digital technology to protect cultural relics to a greater extent to show its artistic and cultural value, easier for people to access, to better meet the spiritual and cultural needs of the people.

1 RESERACH SIGNIFICANCE

Conservation is an important form of life extension for cultural objects, and it is vital that they are left as 'intact' as possible before they are destroyed or accidentally lost. As one of the most important places to collect, preserve and conserve artefacts, museums are also a source of information for archaeologists and graphic experts, so reducing wear and tear and increasing survival rates are key to their study.

For example, in this case, the Yatim Father B beast-faced wine container was inadvertently found on the London Spring Auction 2019 website by a British collector in his private collection, which in contrast to museum collections means that a large number of artefacts are in the pockets of private collectors, making them unavailable to the world, which is a pity for heritage research. This is a pity.

A drinking vessel often found during the Western Zhou period and the late Shang dynasty, the bronze wine container was used in ancient times to hold wine, and it is also documented that it was often used by the ancients specifically as an aromatic wine during rituals hence the name. There are many different

types of wine containers, the basic form being a flat garden with a short neck, a lid, a bulging belly, a rounded foot, a lid and a carrying beam. The shape of the vessel varies considerably. In this case, the wine container is from the late Shang and Zhou dynasties, where the majesty of the ruling class is emphasized, hence the predominance of animal-face motifs in the design, which highlight the seriousness of the class.

In addition, the non-reproducibility of cultural relics is a key characteristic of heritage, which makes them rare and unique in China, and the low awareness of heritage conservation in the early years and the turmoil of the late Qing dynasty made it difficult for the public to access them outside of museums. The digitisation of cultural relics allows information technology to preserve the original information of the relics themselves, and also to extend the life cycle of the relics.

1.1 Historical Background of Bronzes and Their Types

For example, the famous aesthetician Mr Li Zehou devoted the second chapter of his *The Course of*

Beauty to bronze ornamentation, calling it 'carnal beauty', which evolved from the pottery patterns of the Shang and Zhou dynasties to the mysterious and hideous bronze patterns, which on the one hand illustrates a shift and deepening of the hierarchy. On the one hand, this is an indication of the transformation and deepening of the hierarchy. The bronze was used as a ritual instrument to maintain the basis of the feudal system of the Western Zhou, and the ritual system was based on the patriarchal relationship of slavery, reflecting the strict hierarchy of the slave-owning nobility. In the Records of *the Zhou*, it is stipulated that "the Son of Heaven had nine tripods, the vassals had seven, and the ministers had five". The bronze vessels themselves therefore have symbolic meanings and symbols, with "ritual" ruling through the form of "witchcraft", a process of creating gods and totems, such as the appearance of the "Taotie "Zhang Guangzhi also believes that 'bronze is politics and power', but at the same time he believes that because of the low productivity, people wanted to create gods and spirits in their minds and use them as rituals to please them. He also argues that because of the low productivity, people wanted to create gods in their minds and use them as rituals to please them and to dominate things through divine power

1.2 Status of Digital Conservation of Cultural Heritage in China

At present several regions of China's heritage in the conservation and restoration of the use of virtual reality, three-dimensional data collection, human-computer interaction and other new technologies to achieve cultural digital conservation, digital restoration, digital heritage has become a mainstream development trend. Zhejiang University, for example, has taken the lead in digital conservation and research, proposing techniques for the evolution of the forest and colour of murals, and realising a virtual tour of the Mogao Caves in Dunhuang as a travel system. Beijing Normal University has carried out research on 3D modelling and virtual restoration of the broken terracotta warriors and horses, and 3D modelling and virtual display techniques for the ruins of the Little Wild Goose Pagoda.

In terms of museum conservation, the Jining Museum, for example, is digitally collecting relevant information for submission to the State Administration of Cultural Heritage, which also lays the foundation for digital conservation and management. On the other hand, however, the digital

artefacts exhibited in museums often suffer from a lack of model accuracy and an inadequate interactive system. And the management of resources and display services are still lacking.

2 RESEARCH METHODOLOGY AND TECHNICAL APPROACH

The first step in the process is to collect reference drawings of the object and as many three-views as possible to obtain as much information and detail as possible about the object, so that the artistic style and use of the scene can be adequately reproduced. Once the design parameters have been collected, the basic modelling process begins, and the bronze is finally modelled in 3D. The software and technology used to produce this paper is shown in the figure below. (Figure 1)

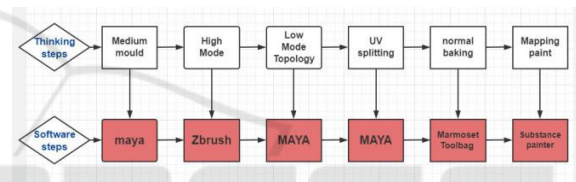


Figure 1: Basic production process

3 A STYLISTIC COLLECTION AND STYLISTIC DETERMINATION OF A BRONZE SUB-TEMPERATE BRONZE WINE CONTAINER WITH ANIMAL-FACE DECORATION

The bronze sub-temple B animal-faced wine container is from the late Shang and Western Zhou periods. The wine container was one of the main types of vessels used for ancestral worship, and its role as a ritual vessel is more indicative of the style of decoration of the period than that of a food vessel, as in the case of this bronze vessel, which is symmetrical in the centre, with a flattened, beast-headed, beast-headed vessel at either end of the upper part of the lid, with a bud-shaped knob and 'horns' at either end of the lid. The central part of the cover is surrounded by birds of prey, and in the middle of the vessel there is a sheep's head in relief, the largest area of which is

occupied by the taotie animal-face motif in the middle of the vessel. This sense of sacred majesty was the main tone in the production of this model. (Fig. 2) As there are only a limited number of images for reference, we have also chosen to use a large number of bronze wine containers from the same period as a stylistic reference. (Fig. 2)



Figure 2: Bronze Yatim Father B beast-faced wine container.



Figure 3: Reference to the production of the Shang and Zhou wine container types.

4 MODEL MAKING THOUGHT PROCESS

In order to use less resources to achieve a better visual effect, the amount of data in the model is increased according to the needs of the project, in this case the medium model is completed first and then the high

model details are portrayed using ZB. This allows a low precision model to produce the effect of a very high precision model. A tongue-in-cheek metaphor for this process would be to give a peeled apple and its surface a layer of peel, with the peel being given a natural material that is full of visual information and gives sufficient texture. Such a digital resource will also save resources and storage for subsequent imports.

4.1 Middle Mould Production

Once the preparations have been completed, the basic creation of the centrepiece begins. At this stage, it is important to establish the basic size and silhouette of the object as closely as possible, without paying too much attention to detail, and to make the proportions and features as accurate as possible. At this point we have completed the basic middle modelling stage.

4.2 High Mould Stage Production

The high modelling stage is about giving the model enough detail so that after smoothing it can still guarantee a sufficient amount of detail, but in this process it is not just a matter of jamming, there are many points that need attention, for example, in the wiring, for the chamfering of the curvature, the spacing between the line segments determines the curvature of the transition between the face and the surface of the model, this kind of detail is often overlooked in the modelling process of soft and hard structure details Processing. When the card line is completed, it is imported into the Zbrush software to carve the surface pattern and to complete the details of the oxidation of the surface bronze using brushes, and after such a long history, it is inevitable that deformation and ageing will be avoided in the process of preservation and use, and this is the part that the designer needs to be competent to deal with, as to why not rely on the software SP to do the ageing of the mapping, the author I think that for next-generation prop models, chamfers and basic textures are the basis for the texture of the bearer, if it is simply a texture to replace the basic texture can only be in a particular perspective can not help, if the transfer of the axial will be very abrupt. As shown in Figure 4, the chamfering and articulation of the model in Zbrush is shown.



Figure 4. Detail of the high mould imported into MAYA software.

4.3 Production of Normal Diagrams

After converting the model topology into a low film in Maya, the base colour mapping (Figure 5) is produced in the software SP to give the material characteristics, for example, bronze itself is an oxidised copper material, and in everyday use it is bound to produce an oxidation reaction when it comes into contact with air, making it necessary to give a little green patina on top of the copper material to add detail (Figure 3). This visual impression will give us a psychological indication of what the material is, where at the same time the highlights will also reflect the texture of the object. In the case of the metal here, for example, the highlights are gathered and bright, giving a sense of hardness, and in the case of the bronze beams, the chamfered corners are smoother than the rest, probably due to use and wear, which is not difficult to imagine, as the gripping part of the handle has been held for many years and worn relatively flat.

It is worth noting that the overall control of roughness plays a crucial role in the production of the material, and this variation is what gives the overall model its realistic character, for example, in the right-hand half of the lid where the paste must be less coarse than the rest of the bottle, and in the bronze where the grain is raised and less oxidised to retain the original texture of the bronze. (Figure 4-3)

In general, the use of texture can be adjusted by overlaying the SP layers and using the corresponding brushes to adjust the degree of oxidation of the metal and the effect of the grey layer at the joints. The final result is the desired colour change and visual effect.



Figure 5: Material mapping display.



Figure 6: Overall base colour.



Figure 7: Variation in bronze roughness

4.4 Post Output

Once the materials are complete, the 3D model should be imported into Marmoset toolbag4 for final rendering and adjustment, and the lighting should be designed for display. This is especially true for corner joints. The final mapping was completed in SP and then finally imported into Eight Monkeys Light Render to produce the final result. (Figure 8) (Figure 9)



Figure 8: Final rendering.



Figure 9: Detail view of the model.

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As mentioned above, the bronzes of the Shang and Zhou dynasties are of great aesthetic value, and as stated in *the Khao Kheow Book*, "The wise man creates things, the clever man describes them, and they are passed on to the world as work". These valuable artefacts should be preserved using digital technology to be disseminated in a more convenient way to today's society, and better combined with modern art design to give them a historical heritage. This paper examines the advantages of digital technology in the conservation and transmission of the bronze Yatan-fu B animal-faced wine container, such as ease of preservation, breaking the boundaries of time and space, ease of dissemination, and public acceptance. It is hoped that this will help future research in this field and enable these precious cultural relics to be appreciated and disseminated by more people.

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