

The Transformation of 3D Scanning Technology and Sculpture Art

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Keywords: Digital sculpture, traditional sculpture, 3d scanning technology.

Abstract: Digital sculpture is a complete set of sculpture making process formed on the basis of traditional sculpture. With the emergence of VR technology, it makes three-dimensional sculpture creation into a new stage. A way of sculpture creation in the virtual space enters into our sight. The transition from handmade to computer screen to real three-dimensional space marks the arrival of the era of digital sculpture. Sculpture in the future will usher in a new means of creation, a new display window, and the application of sculpture will continue to expand. In this paper it mainly introduces 3d scanning technology and its application and reflects on the future development of 3d digital technology and sculpture art.

1. Introduction

Three-dimensional scanning is a digital technology integrating optical, mechanical, electrical and computer technologies. It mainly scans the shape structure and color of objects in real space to obtain the spatial coordinates of objects' surfaces. As a digital camera, it records realistic image into digital information, which can be computer processing and editing. And the data that 3d scanner comes out is 3d digital information, it can transform the 3d information of the real thing into the virtual digital information that the computer can process directly, which provides a quite convenient and fast means for the digitization of the real thing.

We can easily scan the existing objects into 3d data accurately by using 3d scanning, and use 3d software to edit it in the computer to get the 3d data model. At the same time, when the entity is transformed into digital data, the three-dimensional data can be easily spread to all parts of the world through the Internet, and it can be copied and edited indefinitely. It can scan real objects into virtual three-dimensional data. Combining them with the virtual space and virtual objects in the computer, it can bring great convenience to our life such as shopping online. After storing our own scanned data into the Internet, we can directly generate the fitting effect of the clothes we want to buy online in the computer, or directly customize the clothes according to the virtual data. The convenience it can provide is not only that, but also beyond our imagination. In terms of sculpture, three-dimensional scanning can be used to save sculpture data. Whether it is traditional classical sculpture or modern famous sculpture works, they can be scanned into data and saved. A powerful database of sculpture models can be established, and it can also be easily shared around the world. At the same time, this way has a great help to share and disseminate sculpture data and personalized production. With the development of scanning technology, it may also develop into a separate art discipline like photography - "Three-Dimensional Photography".

2. The Application of Three - dimensional Digital Technology in Sculpture

2.1 Build a sculpture database

Artist Cosmo Wenman has transformed the digital files of the classical Greek sculpture Venus (figure 1) and the goddess of victory into documents that can be printed on a 3D printer and posted online, which can be downloaded and printed[1]. Wenman hopes to turn the sculptures in the world cultural heritage sites into files that can be downloaded and 3d-printed. In this way, everyone can download or modify the sculptures and 3D print them. Although it is not the original, it can be very

close to the original. His idea has been approved by the Basel museum in Switzerland, which also allows him to 3D scan any sculpture in the museum and share the documents he scans. Eventually, he wants everyone to be able to download three-dimensional digital files of masterpieces of sculpture from around the world. I think that is what most ordinary people want to achieve. If this way can promote, every museum or gallery scans its sculptures into 3d-printed files and uploads them to the Internet to build a world-class sculpture database which is available for download and share. It has a great help for the sculpture lovers all over the world. People can print classical sculpture as a decorative and ornamental in 3d printing store or use near home printer. At the same time, it can promote people's love for sculpture to some extent.



Fig. 1 Venus

2.2 Use of printed materials.

“Pan clay strips” is an important technique in pottery creation. Wijnakker who is a designer at a 3D company in the Netherlands and Heerik who is a graduate of the Eindhoven School of Design have developed a printer that can print ceramic sculptures. It is very similar to the way of printing the initial blank and the clay strip. It is made of clay strips that circle and superimpose one layer after another according to the outer outline and edge line of the object. It finally forms a hollow ceramic blank. With a height of 83 cm and a bed of 79cm long and 58cm wide, the co-developed 3D printer can print a clay work in about 15 minutes. The printer was first developed to print simple shapes, such as pottery bottles and pots. A lot of experience had been gained a year later. And new improvements were made to print out more complex forms with better firmness. It can print the general shape of the character and then refine and process it on this basis. It can also print more abundant shapes by combining the technology of 3d scanning and 3d software. It can be shown in figure 2[2].



Fig. 2 The process of ceramic sculpture printing

The use of clay has a long history in human civilization. No matter it is a ceramic commodity or a work of art, it can be preserved for thousands of years without damaging our environment or causing any pollution. In the past, ceramic products have always been shaped by human beings. The emergence of ceramic printers will be a turning point for ceramics to move towards a new civilization. In the future, ceramic printing will definitely be more delicate and robust with a higher degree of complexity.

2.3 Computer data sculpture.

A few different sculptures in Manhattan were designed by artists Michael Rees and Richard Dupont and made directly from a 3D printer. Rees' sculpture “Ghraib Bag” is a plastic sculpture that

uses computer modeling to match the body parts together. It is then printed on a 3D printer. It is different from traditional sculpture, where there are many links missing such as making clay manuscripts, turning, and no need for the author to elaborate the works. However, the artist Dupont's work "Going Around by Passing Through" was directly used a 3d scanner to scan the artist's own face, which was then distorted, folded and deformed in a computer.

2.4 Break through the limits of artificial.

3D printing can not only print 3D objects that can be seen by the naked eyes, but also print tiny 3D objects that can't be seen by the naked eyes. Artist Jonty Hurwitz has pushed the limits of 3D printing by using the technology to print several nanoscale sculptures that are thinner than a human hair[3]. He spent nearly ten months designing, making and carving. Eventually, these sculptures can only be seen through a microscope, and he calls them "nano-sculptures".

Firstly, Jonty Hurwitz scans the models in all directions in three dimensions to generate data from the models in a computer. The sculpture is then edited and printed using a special and complex 3D printing technology. The sculpture is placed on layers of protective lenses. When viewed under a microscope, it took more than half an hour for the artist himself to find his own "nanoscale sculpture". His works are dominated by the human body, one of which was inspired by sculptor canova's "saving eros from psyche" and is very similar. It is full of sculpture aesthetic and strong sense of form. In order to let the audience know how small the sculpture is, the author compares the sculpture with the pinhole and the ant head. A human sculpture is placed in the middle of the pinhole, like standing in a square, while a two-man sculpture is placed on the ant head, which is smaller than the ant's antennae. However, the physical structure of the sculpture is not ambiguous at all.

3. Reflections on the Application of Three-dimensional Digital technology in Sculpture

Three-dimensional digital technology has the function of shaping images. Its ability to shape three-dimensional images can provide fresh blood for sculpture production and innovation. It can provide convenience for sculpture creation in many aspects. This new technology brings not only challenges, but also opportunities for reform. Although 3d digital technology has so many advantages in sculpture, it still has many limitations.

3D software has many advantages, but it is not easy to be widely used in sculpture. Because it also has quite a few limitations. Firstly, cognitive deficiency. It is a new technology. There are fewer people who know it, fewer people who are skilled in it. It spreads slowly, and the technology updates quickly. So it is difficult to catch up. Secondly, the necessity is not strong. There are many ways to make sculpture. Artists do not have to use this technology when they want to express their own ideas or want to create a piece of work. Thirdly, digital virtual sculpture is not as intuitive as physical sculpture. If three-dimensional virtual sculpture is produced in a computer, it is indirect production. There is still a process from virtual sculpture to physical sculpture. The author can only watch the production through a computer screen, which is different from the actual operation. Fourthly, virtual production does not have the touch feeling of physical production. In the computer production, modeling or characterization is usually done through the mouse or digital board. There is no direct touch feeling of sculpture objects, no direct contact with objects with hands and the lack of the most intuitive feeling. It is the product of pure reason, lacking the most direct communication and communication between the author and the object, while art is often the product of sensibility.

3D scanning can accurately scan objects into computer data without touching objects, upload model data to the computer and facilitate the dissemination and editing of applications. But because of the technology limitations, 3d scanners are currently expensive. When scanning, people need to scan from multiple angles. And the scanning speed is slow. The shape of the object must be fixed, and any slight change can cause errors or overlap. For slightly complex shapes, some dead corners that cannot be scanned will be encountered in the scanning process resulting in partial loss of the object, and later processing is required[4].

Although 3D printing technology can directly print the 3D data model in the computer into the

entity accurately, and directly turn the virtual into reality and provide great convenience in sculpture creation. It is also limited in many ways. Firstly, it is inseparable from the computer three-dimensional data. Without the computer drivers and model files in print format, it can not print. Secondly, its limitations of materials and high price. At present, household printers generally use poly which is extracted from corn or cassava. It is safe, low-carbon, non-toxic and environmentally friendly. But its material sense is not strong, single, and its printing accuracy is not high. Industrial-grade printers have very high printing accuracy and relatively rich materials, but they are expensive to print, which is much higher than traditional sculpture. Thirdly, large scale of sculpture cannot be printed directly. It needs to be divided into several small parts for printing and assembly. These limitations led to that the 3D digital technology in production of sculpture is not widely used. But this is just a start, with the development of science and technology and the upgrading of technology, the function of the 3d software will be more rich, more convenient and easier operation. The material of 3d printing will be more rich, while the price will be cheaper. We also believe that 3d digital technology will be applied to the sculpture creation in the future.

4. The Future Direction of Development

Since its birth, 3d digital technology has been more widely applied in film and television industry. Therefore, it is the development of 3d animation that brings deeper changes to sculpture art and challenges traditional sculpture forms. It is a question whether this realistic three-dimensional language is a new form of sculpture and what kind of organic system it should display. In the face of such a completely new technical means, people are surprised that it is completely different from all traditional means of sculpture. While bringing us convenience, it also brings us unprecedented doubts. If it is a new sculpture language, then our traditional sculpture art concept should make a major adjustment.

At present, sculpture only uses digital technology as an auxiliary means. Three-dimensional digital technology can make the final effect of sculpture creation accurately present. Sculpture itself is characterized by changeable shapes and complex structures, which makes it difficult to combine digital technology with sculpture. However, with the improvement of modern science and technology and three-dimensional digital technology, sculpture and three-dimensional digital technology will be better integrated, and new formal languages and creative methods will be developed. For example, Holographic projection is a virtual three-dimensional display.

3D digital technology in the sculpture creation should not be in pursuit of achieve the same effect with the traditional sculpture. It should not be passive imitation and more should not attempt to replace traditional sculpture creation way. It should play to the advantages of digital sculpture to become its new form language and form their own digital sculpture.

5. Summary

Three-dimensional digital technology is just a kind of technology and means that can be used to make sculptures. The most important thing is human thought, and the key lies in artistic thinking. Compared with the traditional way of manual sculpture, three-dimensional digital technology has the advantage of accurate, neat, accurate, and the realization of complex objects. It can be accurate to zoom in and out of proportion and shorten the production time and save manpower. But it is just a technology and a tool that can be used to replace the sculptors work. The core of sculpture art lies in the professional quality of artists with spatial imagination, artistic aesthetic ability and artistic accomplishment. Moreover, 3d digital products without artistic quality cannot become artworks. What kind of artworks can be produced by 3d technology, the key lies in how artists want to express with it.

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