

## Research on Sculpture Art Creation Method Based on Digital Technology

Zeng Weilin

Hebei Academy of Fine Arts, Xinle City, Hebei Province, 050700, China

### Abstract

*Sculpture, as a traditional art category, plays an important role in human history. As an important cultural carrier, sculpture art has always been of great significance in human social and cultural life since ancient times. However, under the impact of social reform, the audience range of sculpture products is shrinking. Breaking the traditional boundaries of the industry and enhancing the overall influence of the industry are the main tasks of sculpture development today. And it brings great convenience for the artist's creation, and also provides more possibilities than traditional sculpture production. It provides valuable experience for the digital application of domestic sculpture art to mature. In the creation mode of traditional sculpture art, the factors that affect the quality of sculpture works come from many aspects. This paper mainly discusses the application of digital technology in the field of sculpture art as the research background, the application of digital technology virtualization means in the creative process of sculpture art, and how the intervention of digital technology changes the creative thinking of sculpture art.*

**Keywords:** Digital age, Sculpture art, Creation

### I . Introduction

In today's society, computer technology has become an important production technology, and digital technology with computer as a tool is widely used in daily life, involving more and more fields. Sculpture, as a traditional art category, plays an important role in human history [1]. As an important cultural carrier, sculpture art has always been of great significance in human social and cultural life since ancient times. China and even the world's manufacturing technology will face a huge historical opportunity of optimization, upgrading and replacement [2]. Digital sculpture is an art form based on digital technology and carved by 3D digital software. However, under the impact of social reform, the audience scope of sculpture products is shrinking. Breaking the traditional boundaries of the industry and enhancing the overall influence of the industry are the main tasks of today's sculpture development [3]. At present, the development time of sculpture art under digital technology is relatively short. However, it has shown obvious new advantages and new characteristics, which has brought higher freedom and convenience for artists' creative activities, and also given sculpture more possibilities [4]. With the support of digital technology, the creation accuracy of sculpture works will be significantly improved, and the creation cycle and cost will also be reduced, saving artists a lot of time and energy to invest in more artistic creation.

Sculpture industry, as a traditional art industry, is of great significance to enhance people's understanding of beauty. Although digital technology has been developing for a short time, its advantages are obvious [5]. And it brings great convenience to artists' creation, and also provides more possibilities for artists' creation than traditional sculpture production [6]. On the whole, the digitalization of sculpture art develops earlier and faster in foreign countries than in China, and technology and creative thinking are imported into China [7]. It provides a very valuable experience for the digital application of domestic sculpture art to mature. In the creative mode of traditional sculpture art, the factors that affect the quality of sculpture come from many aspects. There are layers of processes in the process of sculpture creation, especially for large-scale sculpture, in addition to the sculptor himself, it also needs to participate in the cooperation of many parties [8]. As an independent and interdisciplinary new professional classification and occupation type, digital sculpture art has got rid of the traditional easel creation mode. The tools of creation include material tools and digital software tools. The hands of the creators are liberated, and the limitations and

inconveniences are also disappeared [9]. Today's sculptors should not only have a solid foundation in art, but also master certain digital technology.

## II. Digital Technology Gives More Possibilities for Sculpture Creation

### A. High Efficiency

Traditional sculpture creation has to go through a series of tedious preparatory work, such as setting up the skeleton, adding mud, turning over and casting. Manual work takes a long time, which requires high manpower and environment [10]. In digital technology software, copying, pasting and modifying can be easily completed, which greatly improves the efficiency of sculpture creation. The traditional way of sculpture creation is cumbersome, and it needs a lot of modification from artistic conception to the completion of plane effect drawing [11]. Indian Buddhist sculpture works, this Buddha follows the principles of classical art, the details of carving delicate, to show people the Buddhist ideal of sage imagination. As shown in Figure 1.



Figure 1 “Sitting Buddha with a Crown” •

It takes many attempts from the rendering to the model stage, which leads to the sculpture creation in the traditional mode becoming a long time and a large amount of work [12]. In addition, while realizing the platform migration under the digital technology, the foundation and soul of sculpture art creation itself have not changed. It is still based on the technical methods and aesthetic orientation of traditional modeling aesthetics, and pays attention to the inherent charm and cultural connotation of sculpture works. Moreover, the emergence of digital carving software has changed the workflow of many designers.

Powerful sculpture modeling function and color drawing function liberate artists' inspiration, which can make designers pay more attention to design and creation and minimize the difficulty of software operation. Moreover, there are a series of processes in the creative process of traditional sculpture creation, and each process has the necessary continuity, and there will be a certain loss of “information” when undertaking the previous step every time [13]. The “information” mentioned here mainly refers to some texture details of the sculpture surface and the accuracy of sculpture modeling. In the creation of digital sculpture, the production process is reversible, many links can be modified and adjusted repeatedly, and multiple versions can be generated [14]. At the same time, drawing and thinking are carried out at the same time, which often leads to clerical errors in the process of manuscript drawing, and redrawing in case of modification or even serious influence the designer's working speed and fluency of conception [15]. In the traditional period, if artists want to make a standard cube sculpture structure, they need to measure, cut and polish repeatedly, and it is difficult to achieve the same effect of the finished products on all sides and corners. Digital sculpture creation can avoid the related problems, save the time of sculpture creation, provide more time and space for artists, and provide many possibilities and more creativity for sculpture creation.

### *B. Virtuality*

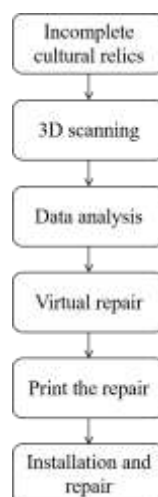
Sculpture creation under digital technology can provide readers with a virtual real environment with correct perspective relationship, examine works from multiple angles, and provide fine works from multiple angles and directions. Whether it is a living ornament or a giant city sculpture, when it enters a space, it will change the original space pattern and nature, so that people can not ignore their own volume. As shown in Figure 2.



*Figure 2 Urban Sculpture*

Although the real development of digital engraving software started in the last four or five years, the development speed is very fast. Not only the quantity and function of software have been improved by leaps and bounds, but also the application in the industry has been greatly expanded. This makes artists waste a lot of time and energy on things unrelated to sculpture creation, resulting in excessive capital and time costs unrelated to creation. It is a negative impact on artists, which not only increases the artist's creation cycle, but also affects the efficiency of artists' creation. At the same time, compared with the traditional paper erasure, software erasure is faster and does not leave traces, does not affect the designer's judgment of the overall effect, and greatly improves the efficiency of the designer's drawing manuscript.

Under strict logic control and parameter design, the work meets the actual requirements of mechanical distribution, although it has complex structure and novel shape. While bringing high-level visual impact and installation experience to the viewer, the safety, stability and longevity of the viewer and the sculpture itself are fully guaranteed. Traditional sculpture creation can get the final artistic effect only by making, turning over, carving or forging clay manuscripts, which has a long construction period and uncertainty. The 3D modeling software is used to assist the splicing and filling of cultural relic fragments, data measurement, cultural relic color recovery, and virtual demonstration of the process of cultural relic damage. And the virtual display of the finished product after the repair, the final printing filling parts, the installation of the gap section to complete the solid repair. As shown in Figure 3.



*Figure 3 Repair process*

In the other part, artists build models from scratch directly from 3D software. These artists are characterized by a relatively young group of people, who have a certain computer foundation and software learning ability, and have the ability to cooperate with one or more sets of software. The works are more flexible and full of personal imagination. Sculpture as a three-dimensional object, first of all, it can intuitively and truly feel the theme of image. Secondly, a real object has not only volume but also weight. Simulate the effect of different light sources, let artists and readers experience the shocking visual effect.

### **III. The Influence of Digital Technology on Sculpture Creation**

#### ***A. Renewal of Sculpture Creation Concept***

Compared with traditional sculpture production, sculpture creation under the influence of digital technology can be said to update the process and mode of traditional production. At the same time, the use of software for dimensional calibration has higher accuracy, which helps designers to judge the design results better from manuscripts and provides favorable conditions for sculpture creation. The common form of contemporary sculpture art is as a public object, which appears in people's field of vision for a long time, frequently and all-weather. Its existence is a static and fixed place, which depends on the flow of people to achieve information exchange. Its characteristics are similar to architecture. And some sculptures are architectural decorations. This traditional process has the disadvantages of low efficiency due to repeated labor, high cost of human and material resources, and low controllability due to the increase of personnel. At the same time, when digital sculpture is made in software, it doesn't have the touch like traditional sculpture, it depends entirely on the visual experience. As well as the auxiliary tools in 3D modeling software to create digital sculpture model, it has higher requirements for the overall grasp of artists.

By the same token, the artist's dependence on the site is weakened. The artist can make the early stage of sculpture at home, and a computer and a hand-painted board can complete a lot of early stage work, which provides convenience for the artist's creation. In order to meet the needs of different industries, the digital screen imitating the traditional design working conditions has been developed. It makes designers enjoy the convenience brought by digital technology on the basis of using traditional drawing techniques, strengthens the work comfort of designers, and reduces the threshold of using digital technology. The transition from expensive art collections to art derivatives makes artists expand from the relatively small circle of the art world to the field of vision that the general public can consume. Through 3D digital scanning and 3D printing, artists can quickly get the model data and real objects they want. By combining with traditional sculpture production, artists' creative ideas are greatly broadened.

#### ***B. Prospects for the Future of Sculpture Creation under the Influence of Digital Technology***

The times are constantly changing and updating, and sculpture art under the influence of digital technology is gradually evolving into a new sculpture art form. At the same time, the appearance of three-dimensional manuscripts makes designers no longer need to rely on imagination to make models. Even with the development of 3D technology, the sculpture process can give up the steps of making small manuscripts and directly construct products according to three-dimensional drawings. Greatly improve the efficiency of sculpture making. At the same time, under the action of digital technology recovery mechanism, the viewer can refresh the page or click on the corresponding module, and the static and orderly 3D sculpture works can be re-presented in front of people. Because of the previous sculpture artists' modeling ability and "acceptance" of the sculpture process problems, for the size, modeling and other factors are not considered carefully, resulting in rework and other problems, with the help of reverse engineering technology. According to the specific problems of the original sculpture, we can quickly modify and redo the sample, which effectively reduces the trial mold and the repeated process. As shown in Figure 4.



Figure 4 Comparison diagram of sculpture production process

Because of its huge volume, urban sculpture has its particularity compared with sculpture art placed indoors, and the two most important differences are observation viewpoint and structural strength.

Like the theory of Mr. Sun Zhenhua, a sculpture expert, said: “the problem of non sculpture, or sculpture is facing a wave of deconstruction, shaking the foundation of contemporary sculpture, sculpture creators are more concerned about their inner voice and have courage.” Moreover, we believe that sculpture will not be replaced by digital technology, and the relationship between new technology and sculpture is not a replacement. What kind of combination should they continue to use, how digital technology can help traditional sculpture creation, and how to extract the essence and eliminate the dross, still need artists to continue to explore and try. Moreover, the sculpture creation under the traditional mode has a fixed process and requires high process continuity. For the inspiration that appears in the creative process, it is often difficult for creators to try immediately. Assuming digital integral interpolation is performed on a straight line existing on the xy plane, the origin of the coordinate is the starting point of the straight line, and the coordinate of the end point of the cut is  $A(x_a, y_a)$ . As shown in Figure 5.

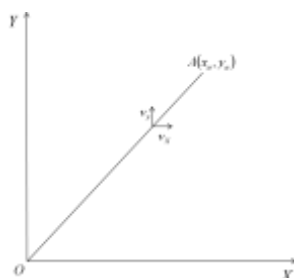


Figure 5 Schematic diagram of the relationship between sub-speed and total speed

$v_x$  represents the moving speed of the moving point in the x-axis direction,  $v_y$  represents the moving speed of the moving point in the y-axis direction, then the increment of the moving distance of the moving point in the x-axis and Y-axis directions is expressed as:  $\Delta x = v_x \Delta t$ ,  $\Delta y = v_y \Delta t$ , combined with the linear function, the following equation can be obtained:

$$v_x / x_a = v_y / y_a = K \quad (1)$$

In the above equation, K represents the scale factor. In the  $\Delta t$  time interval, the displacement increment in the X and Y axis directions can be expressed as  $\Delta x = v_x \Delta t = Kx_a \Delta t$ ,  $\Delta y = v_y \Delta t = Ky_a \Delta t$ . If  $\Delta t=1$ , it can be expressed as a nearly differential form of  $dx = Kx_a$ ,  $dy = Ky_a$ .

At this time, the moving process of the moving point from the origin to the end point can be regarded as the accumulation process of the X-axis accumulator and the Y-axis accumulator every  $\Delta t$  time, with increments of  $Kx_a$  and  $Ky_a$  respectively. If the accumulated value exceeds the pulse equivalent, overflow will occur, and the servo system will feed a pulse equivalent under the action of overflow pulse, and finally realize the exit of a given straight line.

We believe that in the information age led by digital technology, sculpture art will find its right place, and we also firmly believe that digital technology will help the development of Chinese sculpture and open a new chapter.

#### IV. Conclusions

The vitality of art lies in innovation and creation, which will lead to the loss of its due position in the process of society. Thanks to the multiple support of digital technology, the limitations of traditional sculpture art creation mode in space, time, materials and techniques have been broken, and the practical errors caused by various human factors have been effectively solved. Artists use scientific and technological means to create new artistic expressions. Art is also penetrating into science, reflecting the progress of science and technology, imperceptibly changing the inner world of artists and even the public, changing the existing aesthetic concepts and cognition. Now sculpture art creation uses three-dimensional modeling software to simplify the process of creative realization, increase the complexity of creativity, and diversify the development of artistic modeling. Use 3D printer to print out small scale entity of sculpture works. Therefore, it can be predicted that with the increasing development of digital technology, it will bring immeasurable sustainable impetus to the future sculpture creation.

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