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Digital Interactive Design of Art Sculpture Decoration Based on Augmented Reality Technology

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Abstract: The application of digital sculpture technology is an inevitable product of the development of contemporary science and technology, which is also the product of the combination of contemporary sculpture art and modern science and technology. The integration of science and art is not in conflict. The spiritual essence of both is creative. The universality of truth must come from nature, and the loftiest creativity of human beings is the exploration of nature. Therefore, the development of science and technology determines the expression of art. Therefore, this paper proposed digital interactive design of art sculpture decoration based on Augmented Reality (AR) technology. This paper first described the AR technology and analyzed its algorithm, and then tested four classes of a university in the experimental part. The experimental results showed that in terms of sculpture decoration technology, the overall level of classes 1 and 2 in the experimental group was similar, with the average score of 88.9 and 88.5 respectively. The overall level of classes 3 and 4 in the control group was also similar, with the average score of 77.6 and 75.2 respectively. However, the average score of the experimental group was significantly higher than that of the control group, which could prove that AR technology and digital technology could significantly improve students' sculpture decoration technology.

1. Introduction

The application of digital sculpture is the integration of technology and art. The development direction and thinking mode of science and art are completely different, but how to correctly understand the relationship between them is an important issue after the popularization of science and technology. The prosperity of digital art began in the era of computer. With the emergence of

computer, various works of art form are emerging constantly. The creators also use computers to create more things, which is called interactive digital technology. Now the relevant equipment and application of digital sculpture have once again tested the relationship between science and technology and art. This paper took a positive attitude to face it. Of course, there are also some people who support and some who oppose. This is not accidental, and it would inevitably lead to a heated discussion. However, in such a debate, it is particularly important to find the development direction of digital sculpture.

The form of sculpture not only reveals the artist's self-expression, but also reveals the transformative quality that it affects human senses. Christidou Dimitra proposed a multi-sensory perspective of artistic interpretation, which focused on touch as an interpretation resource. Its background was an art museum exhibition designed to interact with modernist sculpture based on touch [1]. Frequent interaction with sculpture could provide creative awareness, so as to better understand and appreciate artistic expression. Chauhan Sumita explored the possible ways to explore the creative potential of dementia patients through meaningful art participation in the sculpture production process [2]. The purpose of Abulude Francis Olawale was to describe the impact of atmospheric deposition on sculpture and the measures to reduce atmospheric deposition, as well as to study the case of atmospheric deposition maintenance sculpture [3]. AR technology was to use computer technology to combine virtual and real to provide users with a new space for AR, and let users experience it personally. Its application in sculpture decoration design was particularly extensive.

At present, the digital application of sculpture is relatively extensive, through 3D modeling and printing technology, the rapid molding and reproduction of sculpture; and virtual display and interaction technology can create immersive art viewing experience; digital restoration and preservation technology effectively protect the historical sculpture and extend its cultural value; multimedia integrated application enables the integration of sculpture, sound, image and other multimedia elements, enrich artistic expression; and the network platform and social enable the sculpture art into daily life, realize the art exchange and sharing across time and space. Valentini Pier Paolo described an innovative method to integrate the force feedback function into the AR environment to perform real-time deformation of functional geometric surfaces. This method solved the engineering problem of interactive engraving applied to geometric modification and optimization [4]. Some cultural relics (two Roman burial lion sculptures) were in unstable state of preservation with damaged or missing parts, which made it difficult for people to see their original appearance. In order to overcome these limitations, Gherardini Francesco proposed an integration method based on three-dimensional (3D) virtual model and AR to enhance the results of artifacts, so as to improve their visualization, analysis and personal/shared knowledge, and overcome space and time constraints [5]. However, they did not conduct simulation experimental research on digital interactive design of sculpture decoration, and did not reach an accurate conclusion.

In order to cultivate more talents in art sculpture decoration, this paper proposes digital interactive design of art sculpture decoration based on AR technology. This paper first studied the digital sculpture art of AR technology, and digital technology was applied in traditional crafts, artistic creation and virtual art. AR technology was analyzed by algorithm. Finally, in the experimental part, four technologies needed in the sculpture decoration process were tested separately. It could be seen from the results that both AR technology and digital technology could improve its level, but the best effect was still sculpture decoration technology. The innovation of this paper was that it not only studied one aspect, but also analyzed and compared four aspects, which was easier to highlight the focus of the paper.

2. Digital Sculpture Art of AR Technology

2.1 Application of Digital Technology in Multiple Fields

Through digital technology, sculpture art has integrated it with sculpture in terms of artistic creation, traditional craft, virtual art, etc. This has greatly improved the sculpture art and the surrounding environment, and integrated it with other industries and fields.

(1) Application of digital technology in artistic creation

Digital technology is much better than traditional sculpture in the process of carving. Due to different technologies and different ways of thinking, digital sculpture not only has a great advantage in technology, but also is much better than traditional sculpture in terms of product quality [6-7]. In traditional sculpture creation, the quality of sculpture has been greatly affected by various factors. In this process, many people would participate in this project. In addition to the original creator, there are many other partners, which are completed by many people. In the creation of traditional sculpture, every link needs to be completed. The completion of each step would lead to the loss of "information". The so-called "information" refers to the details and accuracy of carving.

Digital technology is a new art form with two main directions at present. One is to use 3D scanning technology to scan existing works and convert them into virtual 3D digital sculptures. The scanned digital image is input into the corresponding reverse engineering software and 3D modeling software for secondary creation [8-9]. Therefore, in the real world, this technology is not very good. Compared with professional digital engraving software, the function of reverse engineering software is too simple to meet the creativity of artists, so they have not much knowledge. They mostly use 3D technology to process the data of secondary creation through 3D printing technology or digital engraving machine. The other is to reconstruct their own models from 3D software. These artists are people with certain computer knowledge, and their works tend to be more flexible and imaginative. In addition, the material of digital sculpture can be previewed and simulated by using the model drawing software, so that designers can have more feelings on the material.

(2) Application of digital technology in traditional technology

Digital technology can provide advanced technical support for the restoration and restoration of cultural relics. In a series of restoration of cultural relics using digital technology, 3D scanning technology, 3D modeling technology and 3D printing technology are used. Its 3D scanning image can convert the appearance, shape, size and other data of cultural relics into data models. It uses scanning data model and 3D model software to carry out virtual repair of cultural relics; with the help of 3D modeling software, the fragments of cultural relics are spliced, filled, data measured, color restoration of cultural relics, virtual demonstration of damaged cultural relics, and virtual display after restoration. Finally, the filled part is printed out, and the installation gap is repaired (as shown in Figure 1). Most of its work is done through 3D modeling software. By scanning cultural relics, the safety risk of cultural relics can be minimized, and the damage to cultural relics during repair can also be prevented. By taking the protection and maintenance of sculpture cultural relics as an example, the shape information of sculpture must be digitally scanned, collected and sorted to obtain accurate physical data. Based on the measured data, an accurate and effective repair plan is designed, and the 3D digital model is repaired on this basis, so as to simulate the possible problems and provide the most accurate processing method for the damaged parts.

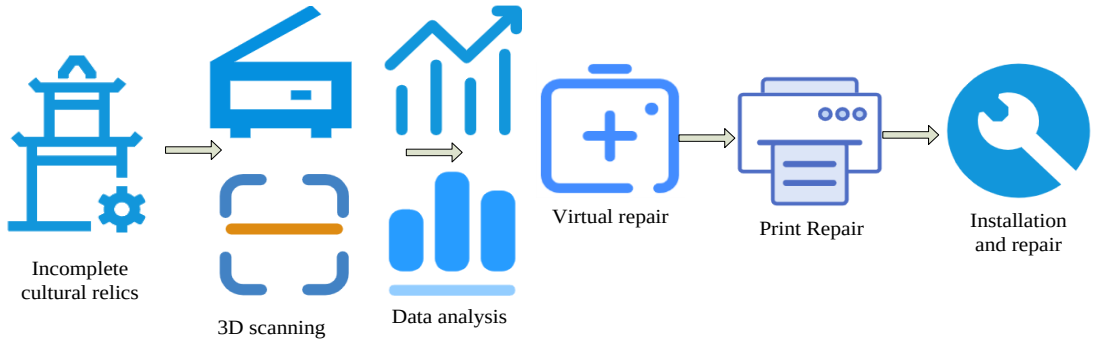

Figure 1. Cultural relics restoration process

(3) Application of digital technology in virtual art

The application of digital technology to sculpture creation is a brand new thinking and innovation, which is not defined by traditional sculpture concepts. Its application cannot be separated from the computer, but it uses the computer to realize virtual digital carving. Digital sculpture is to use the powerful computing power of computers to simulate the carving technology in the real world, and use computers to carve and shape the existing models generated from the virtual world [10-11]. Through 3D model software, artists can think freely and boldly create according to their own imagination. This completely breaks away from traditional manual labor, and breaks the restriction of material and form of objects, which also allows artists to create freely without losing the expression and form of traditional sculpture.

2.2 Augmented Reality Technology

AR technology realizes spatial positioning, image recognition, computer graphics processing, mobile computing, etc. Its basic idea is to use a camera to identify the mark in the real scene, or use a sensor to track the target; the spatial location registration technology is used to stereo match the virtual information of the computer (such as images, text, 3D animation, 3D model) and the real scene. It also combines the virtual and real of the two, and displays them by the display device, so as to achieve human-computer interaction (as shown in Figure 2).

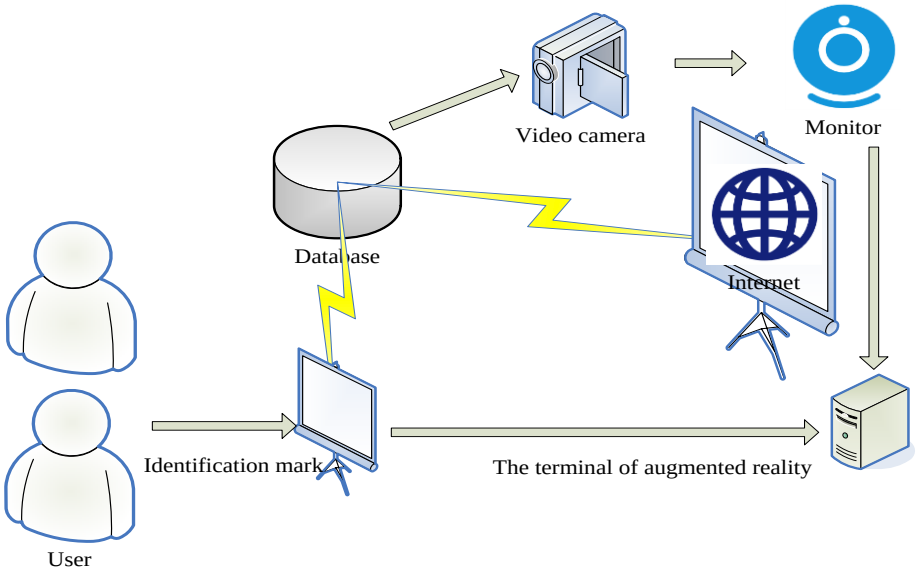

Figure 2. Schematic diagram of AR technology

(1) 3D registration technology

The goal of 3D registration technology is to locate the target in reality. In order to locate it, tracking and registration should be carried out, which is an important part of the implementation of this technology and also a key technology for the performance of the whole AR system.

AR technology includes plane coordinate system, camera coordinate system and physical world coordinate system. It also includes the conversion of two-dimensional image coordinate system and fluorescent pixel coordinate system. That is to say, the data generated by the real environment is collected by the camera and displayed on the fluorescent screen. This process is the conversion between two plane images, which is relatively easy. This paper focused on the transformation of the above three coordinate systems, and gave the corresponding processing methods. $Q_s(a_s, b_s, l_s)$ is used to describe the midpoint coordinates of the physical world coordinate system; $Q_e(a_e, b_e, l_e)$ can be used to describe the midpoint coordinates of the camera coordinate system; $Q_z(a_z, b_z, l_z)$ can be used to describe the midpoint coordinates of the plane coordinate system.

(2) Camera pose estimation

Generally, if a camera is used, the internal parameters of the camera do not need to be calculated. This uses the corresponding relationship between the image on the two-dimensional plane of the camera and the image of its corresponding three-dimensional coordinate system to obtain the camera's motion matrix D and rotation matrix K. The camera pose estimation is to restrict the generated image geometrically to achieve the two-dimensional coordinates from the real three-dimensional world coordinates to the screen.

Camera attitude estimation is generally based on their mutual conversion relationship and camera internal parameters. Therefore, from the two-dimensional and three-dimensional transformation relationship, a functional relationship for estimating the pose parameters can be obtained, as shown in Formula (1):

$$G(q, Q, J_a, K, D) = 0 \quad (1)$$

Among them, $Q = (A, B, L)$ represents the specific coordinate points of the real world; $q = (v, u)^D$ is the projection of Q corresponding to the two-dimensional plane; (K, D) is the rotation matrix and translation matrix of the camera; J_a is the internal parameter matrix of the camera. According to the aperture imaging model, the following formula can be obtained:

$$\begin{pmatrix} dv \\ du \\ d \end{pmatrix} = J_a(K, D) \begin{pmatrix} A \\ B \\ L \\ 1 \end{pmatrix} \quad (2)$$

Among them, d represents the scale factor; (K, D) represents the rotation matrix and translation matrix of the actual image to the video image on the fluorescent screen; J_a is the camera internal parameter matrix.

In Formula (2), the J_a matrix is obtained by calculating the internal parameters of the camera. At the same time, (K, D) matrix is obtained through the operation of a single corresponding matrix. The homography of a plane reflects that there is a certain mapping relationship between the projections of the same point on different planes, so this relationship is a multidimensional matrix drawn by the homography matrix. For example, in a virtual three-dimensional space, a point P is mapped to a q point on a two-dimensional plane, and the corresponding relationship between the

two points can be converted into the form of matrix multiplication in Formula (5). The formal definition of the homogeneous coordinate expression of P and p points is shown in Formula (3) and Formula (4).

$$P = [A, B, L, 1]^D \quad (3)$$

$$p = [a, b, 1]^D \quad (4)$$

Another form of homography is shown in Formula (5):

$$p = wFP \quad (5)$$

Among them, the parameter w represents any scale scale that is usually outside of matrix F. Matrix F includes two aspects. One is to describe the deformation of an object in the imaging process, or the physical changes in the image. Generally, the physical deformation of the target object is represented by the rotation matrix K and the displacement matrix D. Through the expression of the homogeneous coordinate formula described above, the above matrix can be converted into the matrix shown in Formula (6).

$$S = [K, D] \quad (6)$$

According to the matrix SP, the conversion relationship with the camera matrix N is calculated, as shown in Formula (7):

$$p = wNSP, N = \begin{bmatrix} g_a, 0, e_a \\ 0, g_b, e \\ 0, 0, 1 \end{bmatrix} \quad (7)$$

If the rotation matrix is represented by three 3x1 vectors, the rotation matrix K can remove one column vector after processing. Therefore, in P coordinate, $L = 0$, the following formula is obtained:

$$\begin{bmatrix} a \\ b \\ 1 \end{bmatrix} = wN[k_1, k_2, d] \begin{bmatrix} A \\ B \\ 0 \\ 1 \end{bmatrix} = wN[k_1, k_2, d] \begin{bmatrix} a \\ b \\ 1 \end{bmatrix} \quad (8)$$

On this basis, the camera's 3D and 2D coordinates are obtained by solving the homography matrix, and then the camera's attitude is obtained by combining the camera's internal parameter matrix and homography. The main goal of this method is to integrate virtual objects into real scenes in real time, which is the so-called 3D registration technology.

2.3 Combine AR Techniques With Sculpture

AR technology can incorporate interactive elements into sculpture exhibitions, where viewers can view sculptures through AR devices (such as AR glasses or mobile apps) and gain an interactive experience that transcends reality. "Future Touch" is an interactive sculpture exhibition utilizing AR technology, which combines traditional sculpture with AR technology to bring audiences an unprecedented immersive art experience. In this exhibition, the artists chose a series of representative sculptures as the display objects. Visitors will be provided with a special AR glasses

when entering the exhibition space. The AR technology comes into play when the viewer wears the glasses and stands in front of a specific sculpture. Through the AR glasses, viewers can see virtual elements and animations appearing on the sculpture, which blend perfectly with the sculpture itself to create a new visual effect. To achieve this interactive effect, artists and engineers first 3D scanned the sculpture to create a highly accurate digital model. Then, they used AR technology to add virtual elements and animations to these digital models. Finally, with AR glasses and a positioning system in the exhibition space, viewers can see these virtual elements at the right time and location. When the audience visits the exhibition, they can not only appreciate the beauty of the sculpture itself, but also see the virtual elements and animations on the sculpture through the AR glasses and interact with the sculpture in real time. This interaction not only enhances the audience's sense of participation and immersion, but also allows them to have a deeper understanding and experience of the sculpture. The "Future Touch" interactive sculpture exhibition successfully combines AR technology with sculpture, bringing a brand new art experience to the audience. This combination not only demonstrates the potential of AR technology in the art field, but also injects new vitality and expressiveness into traditional sculpture. At the same time, the project also provides useful reference and inspiration for the combination of AR technology with more art forms in the future.

Projection mapping is the direct projection of digital images onto the surface of a sculpture, combining it with the sculpture to form a new visual art work. For example, in the "Night of Light and Shadow Sculpture" exhibition, the artist utilizes AR technology to project dynamic images onto static sculptures, creating a dreamlike effect. The "Dance of Light and Shadow" is a sculpture exhibition that combines AR technology and projection mapping, which utilizes AR technology to project dynamic light and shadow onto the sculpture, bringing the audience a brand-new artistic experience. In this exhibition, the artists chose a variety of sculptures with different styles and themes as the display objects. They then used advanced projection equipment and high-precision AR technology to map dynamic light and images onto these sculptures. These light and images echo the form and theme of the sculptures themselves, creating a stunning visual effect. To achieve this projection mapping effect, the artists and engineers first needed to take detailed measurements and analyze the sculptures to ensure the precision and fit of the projections. They then use specialized projection equipment and AR technology to accurately project dynamic light and images onto the sculpture. These light and images can be adjusted in real time according to the shape of the sculpture and the position of the audience to ensure the best viewing effect. Visitors to the exhibition will be able to see the dynamic light and images projected on the sculptures. These lights and images echo the form and theme of the sculptures themselves, creating a mysterious and dreamy atmosphere. Viewers can walk around the sculptures and appreciate the different visual effects presented from different angles. This interactive way of viewing allows the audience to experience and perceive the charm of the sculpture in a deeper way. The "Dance of Light and Shadow" projection sculpture exhibition successfully combines AR technology with projection mapping, bringing a new way of expression and viewing experience for traditional sculptures. This combination not only enriches the artistic expression of sculpture, but also provides the audience with a more immersive and interactive artistic experience. At the same time, the project also demonstrates the broad application prospects and great potential of AR technology in the art field.

In addition to this, mixed reality installations, augmented sculpture gardens, interactive kinetic sculptures, and collaborative AR sculpture projects are also important aspects of combining AR technology with sculpture. By combining AR with sculpture, a wide range of creative possibilities can be offered for digital interactive enhancement of traditional art forms.

3. Digital Interactive Design of Urban Sculpture Decoration

3.1 Practical Significance of AR Technology and Digital Technology for the Development of Urban Sculpture

With the development of urban landscape design, urban sculpture design has gradually become a popular profession. At present, the sculpture art industry has formed a huge industrial chain.With the rapid development of urban construction, the demand for environmental art is also increasing. Urban sculpture, street sketch, public art, decoration, etc. have become an indispensable part of people's daily life. The main goal of training is to have certain design, operation, project planning ability, basic landscape modeling design skills, and basic production and production technology, including the construction management of indoor and outdoor projects, comprehensive application of knowledge analysis, solving relevant project problems, and market development ability. Its core technology includes: painting technology: sketch, basic pattern, color composition; modeling technology: planar and three-dimensional composition; sculpture decoration technology: decoration foundation, sculpture foundation, metal technology foundation; design technology: architectural design and environmental planning, interior design, model reproduction process, computer-aided design, etc. [12-13].

At present, most of the urban sculpture art is still the traditional handmade, there are problems of complex technology, low efficiency and high cost. At the same time, the creation of the works is limited by the traditional technology, which makes the design and production of large-scale sculptures lack of strict technology and reliable theoretical basis, and there is a great deal of randomness. The emergence of AR technology and digital technology has solved the above problems. From cheap desktop computers to expensive industrial printers, an increasingly mature digital engraving industry system has been quietly formed [14-15]. Through the research and analysis of AR technology and digital technology, it can be seen that no matter what difficult products designers design, AR technology can be easily completed. The traditional carving art has its unique creative characteristics. In the long-term accumulation and development, it has formed a complete set of technologies and has been widely recognized. The complementary advantages of the two have great practical significance for the development and upgrading of the carving industry in the future. The use of AR technology and digital technology for sculpture creation can not completely replace traditional sculpture, but it can be combined with traditional craft technology to a certain extent. This effectively solves some complex problems in the traditional production process, and provides new impetus for the innovation and development of the urban sculpture industry.

3.2 Experimental Design

This paper selected four classes in the field of art sculpture in a university to carry out the experiment, which were classes 1, 2, 3 and 4. There were 60 students in each class, and their basic information was shown in Table 1. Their painting technology, modeling technology, sculpture decoration technology and design technology were tested and assessed respectively. The four classes were divided into experimental group and control group. Class 1 and Class 2 were experimental groups, which used AR technology and digital technology for professional teaching. Classes 3 and 4 were the control group, which were taught by traditional teaching methods. After teaching, they would be tested in four fields to compare their grades. Among them, those who scored less than 60 were unqualified, 60-80 were qualified, 81-90 were good, and 91-100 were excellent.

Table 1. Basic information of students

		Number of people	Proportion
Gender	Boy	128	53.3%
	Girl	112	46.7%
Age	18-22	28	11.7%
	22-24	180	75%
	Above 24	32	13.3%

(1) Painting technology

Sculpture and painting collide and blend with each other, so that a good combination can create a good sculpture; on the contrary, it would backfire. The transition from oil painting to sculpture would face the transition from two-dimensional to three-dimensional. Sculptors rely on their own memories and experiences to create a three-dimensional space, which is not a simple plane supplement and plane arrangement. This is not only a matter of form, but also the rotation of space. The whole structure composed of tangible and intangible blocks is expressed in the form of sculpture. In the modern art world, the power of art emerges in endlessly. In the process of carving, some people inherit the influence of painting form, and transform an intuitive aesthetic feeling into a mechanical toy, so as to use the childish thoughts of children to break the traditional thinking. Some people restore the most primitive beauty in sculpture and make it develop along a harmonious path. Therefore, painting technology is also very important in sculpture design. The assessment results of painting technology in this paper were shown in Figure 3.

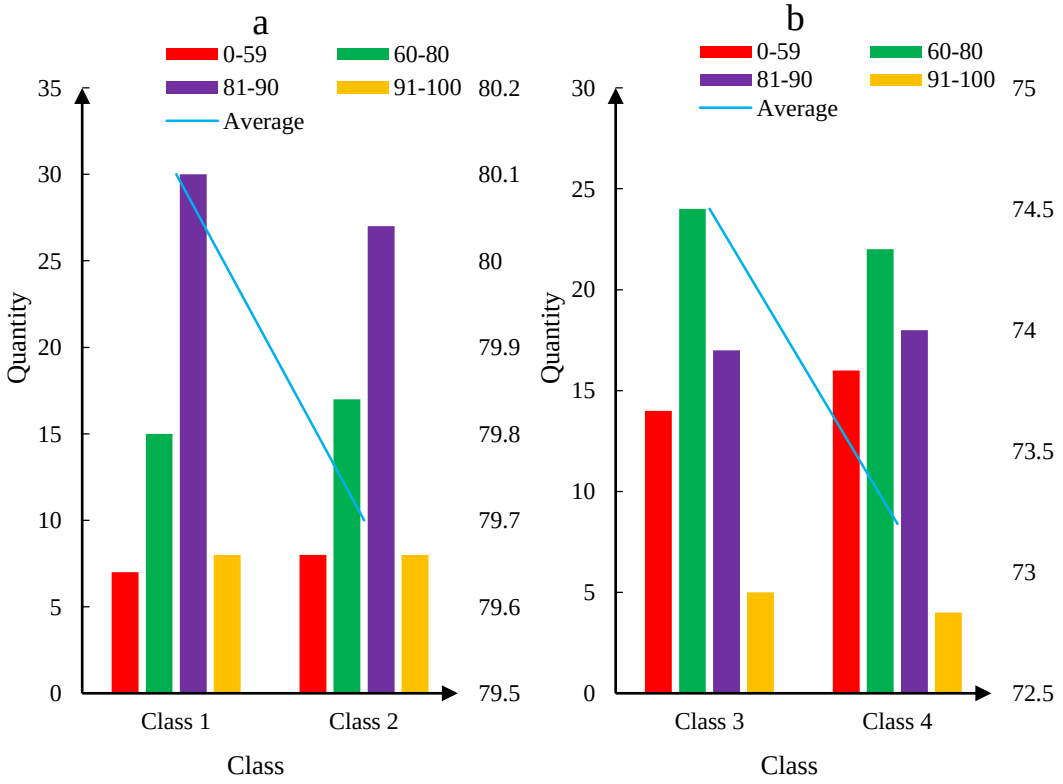

Figure 3. Assessment results of painting technical performance of experimental group and control group

As shown in Figure 3, Figure 3 (a) showed the assessment results of the painting technical performance of the experimental group, and Figure 3 (b) showed the assessment results of the

painting technical performance of the control group. It could be seen from the figure that the overall level of classes 1 and 2 in the experimental group was similar. The number of people who failed was 7 and 8, and the number of people who passed was 15 and 17. The number of good people was 30 and 27, and the number of excellent students in both classes was 8. The average score was 80.1 and 79.7 respectively. The overall level of classes 3 and 4 in the control group was not significantly different. The number of people who failed was 14 and 16, and the number of people who passed was 24 and 22. The number of good people was 17 and 18, and the number of excellent people was 5 and 4. The average score was 74.5 and 73.2 respectively. The overall level of the experimental group was significantly higher than that of the control group, which could be concluded that AR technology and digital technology could improve their painting skills.

(2) Modeling technology

Traditional carving art can be divided into many types according to materials and requirements. For example, for copper sculpture, the first draft of the statue is made, and then it is carved according to the patterns on the drawings. It can only be completed through wax mold, melting, polishing, coloring and other processes. In the traditional carving process, many processes and details are handled by professionals. Carelessness would cause irreparable damage, which would lead to the creation failure of the work. The 3D modeling technology is different from the traditional industrial manufacturing technology. It digitizes and automates the processing and manufacturing process of various materials in the form of digital media. When the system is manufactured, it first uses computer software to make three-dimensional product samples of the target, and then uses a three-dimensional printer to print each part layer by layer. Finally, the finished product is exactly the same as the design product samples. The assessment results of modeling technology in this paper were shown in Figure 4.

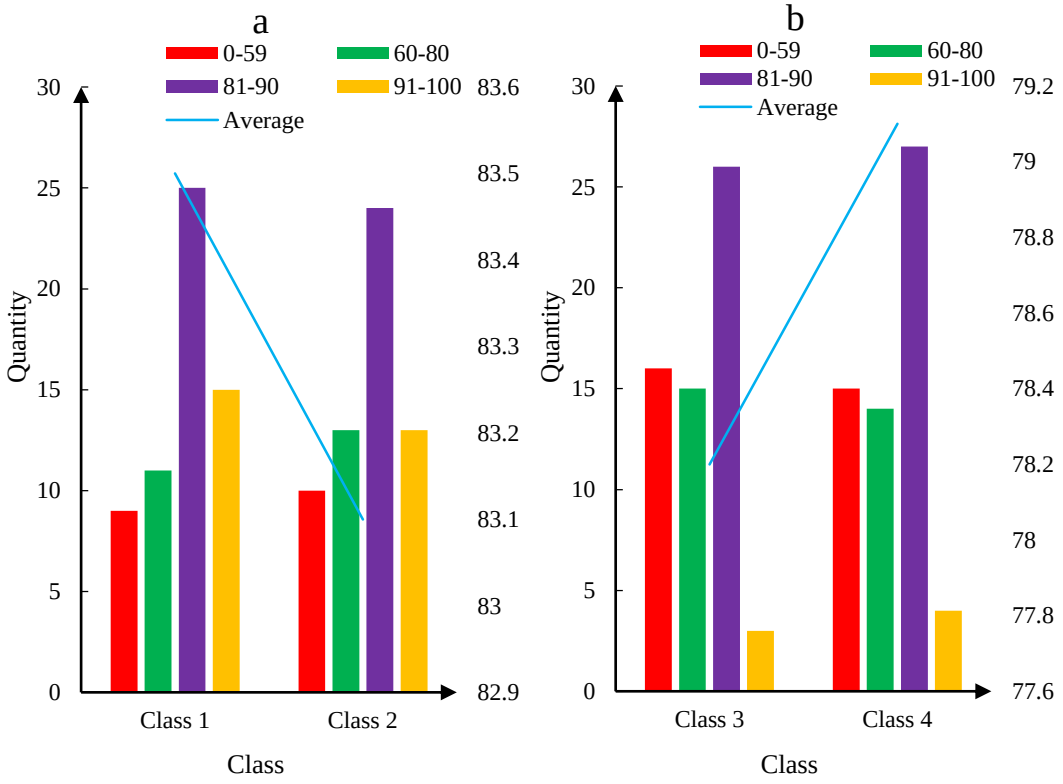

Figure 4. Assessment results of modeling technical performance of experimental group and control group

As shown in Figure 4, Figure 4 (a) showed the assessment results of modeling technical performance in the experimental group, and Figure 4 (b) showed the assessment results of modeling technical performance in the control group. It could be seen from the figure that the overall level of classes 1 and 2 in the experimental group was similar. The number of people who failed was 9 and 10, and the number of people who passed was 11 and 13. The number of good people was 25 and 24, and the number of excellent people was 15 and 13. The average score was 83.5 and 83.1 respectively. The overall level of classes 3 and 4 in the control group was also similar. The number of people who failed was 16 and 15, and the number of people who passed was 15 and 14. The number of good people was 26 and 27, and the number of excellent people was 3 and 4. The average score was 78.2 and 79.1 respectively. The overall level of the experimental group was significantly higher than that of the control group. It could be concluded that AR technology and digital technology could improve its modeling technology.

(3) Sculpture decoration technology

Decorative sculpture is an art form. It is an art form combining sculpture and decoration. It can play the role of decoration and beautification of the environment. In a narrow sense, it refers to the carving forms that exist through special processing under special conditions, including round sculpture, relief, openwork, etc. Broadly speaking, it refers to sculpture with decorative significance, which is an artistic form and aesthetic taste. This is a cultural phenomenon and a popular art that embodies the humanistic spirit and the aesthetic appreciation of the times. Decorative sculpture uses the basic modeling elements such as point, line, surface and body to combine material and color to create adaptive, spatial, symbolic and technological works of art. Through its unique artistic characteristics, it forms a special type of art.

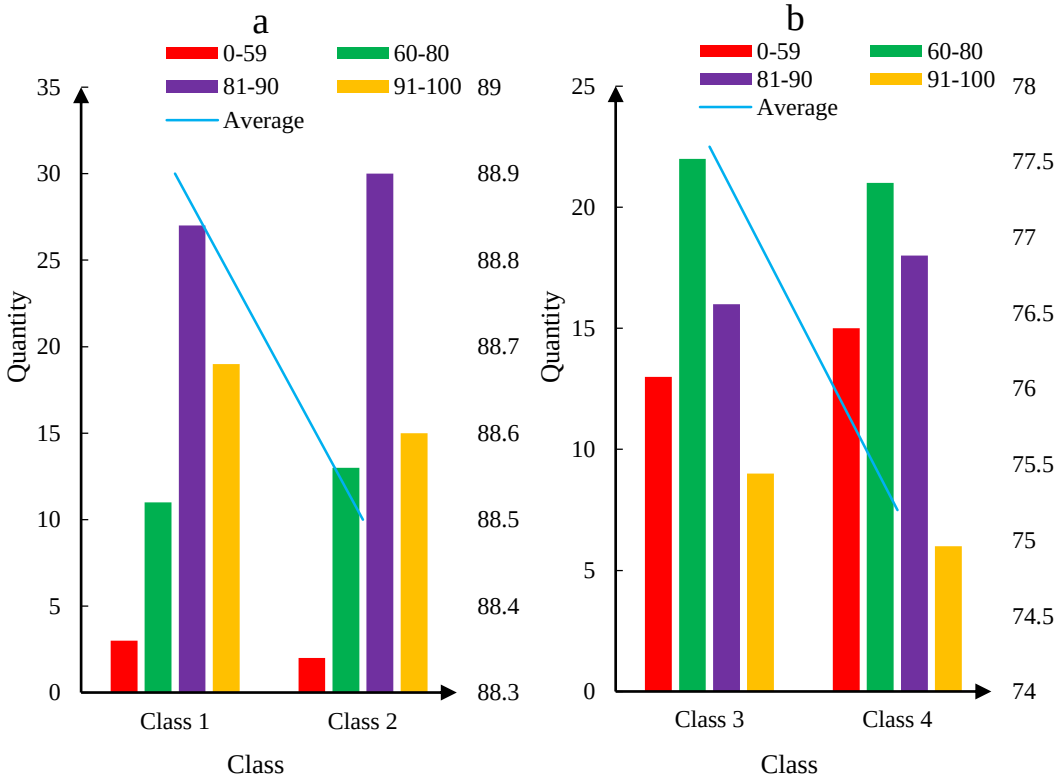

Figure 5. Assessment results of sculpture decoration technology performance of experimental group and control group

As shown in Figure 5, Figure 5 (a) showed the evaluation results of sculpture decoration

technology performance in the experimental group, and Figure 5 (b) showed the evaluation results of sculpture decoration technology performance in the control group. It could be seen from the figure that the overall level of classes 1 and 2 in the experimental group was similar. The number of people who failed was 3 and 2, and the number of people who passed was 11 and 13. The number of good people was 27 and 30, and the number of excellent people was 19 and 15. The average score was 88.9 and 88.5 respectively. The overall level of classes 3 and 4 in the control group was also similar. The number of people who failed was 13 and 15, and the number of people who passed was 22 and 21. The number of good people was 16 and 18, and the number of excellent people was 9 and 6. The average score was 77.6 and 75.2 respectively. The overall level of the experimental group was significantly higher than that of the control group. It could be concluded that AR technology and digital technology could improve its sculpture decoration technology.

(4) Design technology

Powerful and easy to use carving tools can be used to provide sculpture works matching with artists and designers for sculpture creation: Large rendering systems and polygon models are used to create a more realistic scene, and the sculpture is measured, planned and calculated through accurate drawing of 3D modeling. The development of digital drawing software would provide useful reference for art designers to create more and better works. The application of 3D modeling in sculpture design is mostly carried out in the plane. Although it has certain 3D functions, it is far from meeting the needs of designing complex shapes. However, the 3D modeling software has the ability of accurate drawing, which plays a great role in the later budget, design and production.

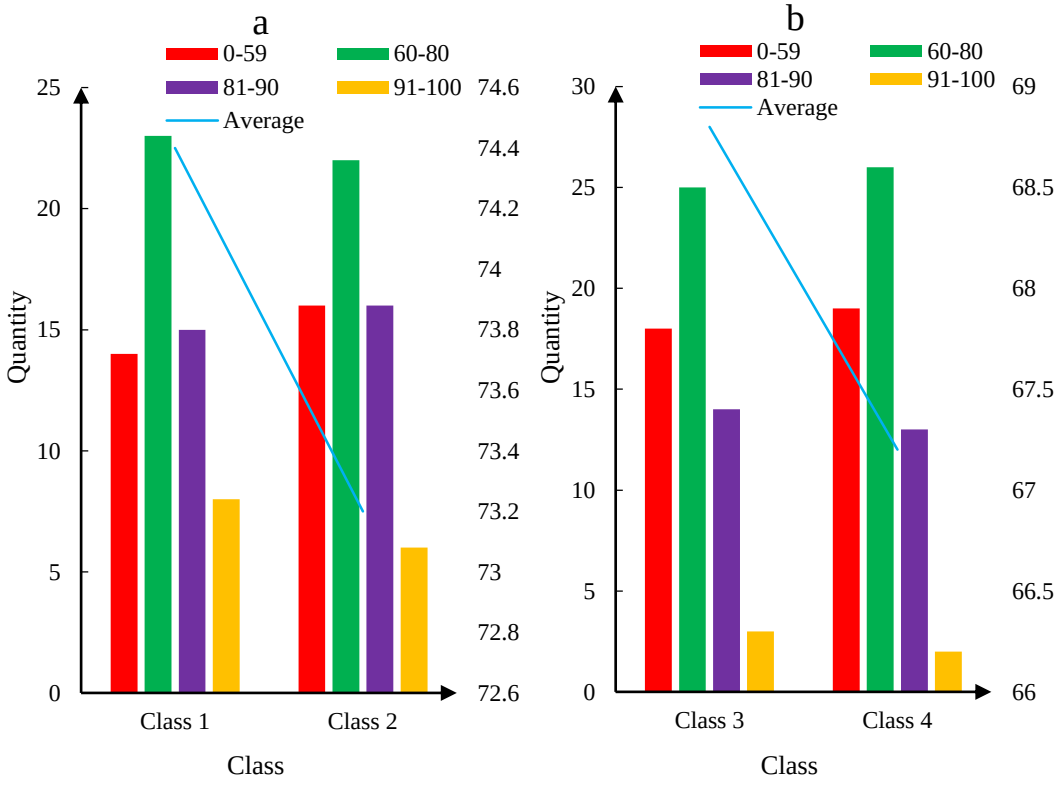

Figure 6. Test results of design technical performance of experimental group and control group

As shown in Figure 6, Figure 6 (a) showed the design technical performance assessment results of the experimental group, and Figure 6 (b) showed the design technical performance assessment results of the control group. It could be seen from the figure that the overall level of classes 1 and 2 in the experimental group was similar. The number of people who failed was 14 and 16, and the

number of people who passed was 23 and 22. The number of good people was 15 and 16, and the number of excellent people was 8 and 6. The average score was 74.4 and 73.2 respectively. The overall level of classes 3 and 4 in the control group was not significantly different. The number of people who failed was 18 and 19, and the number of people who passed was 25 and 26. The number of good people was 14 and 13, and the number of excellent people was 3 and 2. The average score was 68.8 and 67.2 respectively. The overall level of the experimental group was significantly higher than that of the control group. It could be concluded that AR technology and digital technology could improve its design technology.

4. Conclusions

At present, the application of digital technology in sculpture art is still in its infancy. AR technology and digital carving technology are relatively mature. This has also been widely used in other areas and has high reliability. With the continuous development and maturity of AR technology, there is certain technical support in all aspects of sculpture design, which makes it break away from the traditional clay production and enter the digital design era. This paper aimed at the experimental design of AR technology and digital painting carving technology, and tested the modeling technology, sculpture decoration technology, sculpture design technology and painting technology respectively. According to the results, the application of AR technology and digital carving technology could improve its modeling technology, sculpture decoration technology, sculpture design technology and painting technology. In particular, the effect of sculpture decoration technology was very obvious. However, this paper still had some limitations, because the number of samples was small and there would be some contingency. Error calculation was also difficult to avoid. It was hoped that the latter could be improved and enhanced.

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