Research on the Extraction and Treatment Technology of Ceramic Artwork Surface Pattern

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Abstract: With the development of high technology, the digitization of artworks and cultural relics is no longer a problem. Digital inkjet technology and color ink quality are constantly improving, and many digital products such as digital oil painting, digital Chinese painting, digital calligraphy, digital printmaking, digital paper cutting, digital embroidery and other digital art reproductions have appeared on the market. With the rapid development of 3D technology, its application range is becoming more and more daily, from the restoration of cultural relics, simulation manufacturing, digital sculpture to the production of ceramic art. However, in the process of copying these three-dimensional cultural relics or works of art, 3D printing technology still pays more attention to the modeling of objects, and colors and patterns still have to be drawn manually by hand. However, in addition to modeling, patterns are also an important part of artwork. Chinese traditional patterns have a long history and brilliant achievements. Promote the digital protection of traditional patterns so that Chinese traditional culture can be perfectly inherited. Based on this background, this article focuses on the three-dimensional pattern of ceramic artware body, positioning for high-quality copying and design re-creation, in-depth research on the collection and image stitching technology of three-dimensional pattern of ceramic body, constructing an image copying system, realized From the shooting, preprocessing, image correction, two-dimensional transformation of stereo images, image registration, and image fusion to the creation of a complete two-dimensional pattern, the whole process of digitization.

1. Introduction

In the early excavation of ceramic relics, due to the limitation of the level of science and technology at that time, many cultural relics were damaged due to improper protection. Nowadays, breakthrough technology has been made in the repair of damaged ceramics and other cultural relics. People can use 3D printing technology and computers to repair and replicate ceramics, which has become an important way to prevent cultural relics from being destroyed again. 3D printing technology has the advantages of rapid and accurate molding, but it cannot completely replace the traditional restoration of cultural relics. It can only be used as an auxiliary method. After 3D printing, the color of ceramics and external decorative patterns need to be colored and fine-tuned. In order to maximize the restoration of ceramic relics. In addition to modeling, patterns are also an important part of ceramic art. The ceramic pattern is a ceramic maker's aesthetic consciousness, and the artistic pattern depicted on the ceramic is an important decoration on the ceramic. The ceramic patterns mostly use the image of life or the image with a beautiful symbol as the material. It originates from life, and is presented to people's eyes through ceramic crafts. It is an artistic expression of the nature of life. It has been preserved to the present with the ceramic. Its pattern color and style are influenced by the ceramic production process. According to the different forms of ceramics, ceramic patterns are also divided into flat body patterns and three-dimensional patterns. The patterns on porcelain bottles, etc., due to the curved nature of the ceramic type, the patterns have a three-dimensional effect; the flat body patterns mostly refer to the design Patterns on flat ceramics, such as ceramic murals, porcelain plates, etc. The patterns of different styles reflect the distinctive characteristics of the times and decoration. Not only the decoration of patterns as the main body of porcelain, but also the use of decorative patterns to match the theme of painting. The ceramic body patterns we see today are all inherited and copied from the patterns of unearthed

ceramic works or handed down ceramic works of art.

2. Collection of Ceramic Patterns and Image Stitching

Generally, in addition to image fusion and acquisition, image stitching technology also includes image registration and preprocessing. In order to meet different needs, a variety of processing methods can be adopted, but on the whole level, the steps are almost consistent and non-existent The obvious difference is that image acquisition is to capture real-time original images and lay a solid foundation for panoramic stitching; the purpose of image preprocessing is to minimize the image registration coefficient as much as possible, so that the registration accuracy is significantly improved. Generally, in addition to image correction and denoising, it also includes image projection; image registration is to find a suitable spatial transformation to align the coordinate points at the overlap. The purpose of image registration is to ensure accuracy, and at the same time, reduce the amount of calculation as much as possible. This is an important part of image stitching. From a certain level, its quality depends on the registration accuracy of the image. Can perform image stitching operations. Because of the difference in gray levels, seams and brightness differences are prone to occur. From this perspective, after image stitching is completed, image fusion should be achieved as much as possible.

In the process of collecting the original image through the hardware device, it will face various interference factors, which will reduce the image quality. In order to effectively improve the quality of the image, it is necessary to perform image correction and denoising operations. In this way, the image can be Achieve a good phenomenon effect, reduce the amount of calculation, improve matching efficiency and speed. The purpose of image preprocessing is to ensure the accuracy of image registration, thereby ensuring the quality of the final stitched image. For different images, due to differences in their corresponding coordinate systems, they need to be converted into the same coordinate system before they can be registered. Here, the projection model is used to construct the panorama. In the transformation of the image, flexible perspective control is required. At present, in the projection transformation of the panorama, the main models used are sphere, cube, plane, and cylinder.

Registration accuracy is of great significance to image quality. Image registration is to perform overlap analysis on two images with different properties to achieve the calibration of the reference image. The nature of them includes the comparative analysis of different shooting times, shooting angles of the same target, and different effects of different equipment. Then the image needs to be docked to find the matching points and spliced to get a large image. The key of stitching lies in the calculation of a small amount of information to provide guarantee for accurate image stitching, which is the key technology of image stitching.

The feature space is formed by combining several images participating in the registration, and its properties include gray values, borders, stripes, corners, statistics, obvious features, etc. of the image. When choosing the registration image of the feature space, you should try to choose a uniformly distributed area, and the feature has an obvious image, according to a specific principle to constitute the feature space. A reasonable feature space can improve the registration efficiency. Using less data can realize the analysis of the data and simplify the calculation amount. At the same time, the independent processing ability can avoid the influence of noise factors, can complete the image processing with limited conditions, and has strong adaptability.

3. Principles and Algorithms of Image Correction

In the process of acquiring images, there are some distortions (distortion), which appear through the interactive interface. There are three main cases of image distortion, one is geometric distortion, the other is gray-scale distortion, and the third is color distortion. There are many factors that cause distortion, such as shooting posture, imaging system, insufficient bandwidth, relative motion, scanning nonlinearity, etc.; the sensor device itself can also cause inconsistent response, point light source illumination, non-uniform illumination, etc.; the display device has inconsistent

photoelectric characteristics. For the distorted image, if it is restored, it is image correction. During the image acquisition process, subject to the shooting angle, lens manufacturing accuracy, and the non-linearity of the imaging system, these factors may cause geometric distortion of the image; among them, the geometric distortion is mainly manifested as position, shape, size, etc. The actual ratio does not match. For geometric distortion, there are two types of system distortion and non-system distortion, in which the system distortion is regular, and the distortion can be predicted; the non-system distortion shows obvious randomness. Before the image has been processed, distortion correction must be implemented for the image to process the geometrically distorted image so that it is free of geometric distortion, so as not to affect the subsequent processing effect. When performing geometric correction on an image, the basic methods used are as follows: one is to construct a geometric correction model; the second is to determine model parameters; and the third is to implement correction. In the specific operation and calculation process, it is divided into two steps: the first step is to establish a mapping relationship so that the image pixel coordinates and the corresponding coordinates of the object point are related, and the unknown parameters in the mathematical model are solved based on the mapping relationship To achieve the correction of pixel coordinates; the second step is to clarify the gray value under different pixels.

The improvement of the resolution of digital cameras and the development of digital image technology have greatly expanded the application fields of digital cameras, and gradually people have also pursued higher colors for images. However, in the process of shooting, there is a large deviation in the color of the image obtained under different conditions. Using different digital cameras, the resulting image colors will be different; the same camera will definitely have different image colors under different shooting conditions; the same camera will shoot under different angles under the same shooting conditions, and the image colors will also Will be different. Broadly speaking, color distortion is the phenomenon that the actual color of the research object is inconsistent with the color presented by simulated reproduction. The causes of color distortion are roughly the following two points. The image acquisition quality of a digital camera is not only affected by the shooting conditions, but the digital camera's own parameters also affect the image quality. Light and shooting environment will greatly affect the shooting effect of the subject. Due to the nature of the light source, the strength, the surface structure of the subject, and the viewing distance, the shooting effect will also vary. The color of the light source is called "light source color", which is often reflected on the bright surface of the subject receiving light, which affects the change of the color of the bright surface. The color of the bright surface of the subject is the result of the combination of the inherent color of the bright surface and the color of the light source. Highlights on the bright side of the subject often show the color of the light source itself. Each light source has a color, for example, the color of natural light is different in different time periods of the day. The tungsten filament lamp indoors and outdoors is warmer than the color of daylight, with a red-orange color. Understanding the changes in natural light and various types of light on the color of the light source can provide a good reference for us to choose the light source. In addition, the subject will be in a certain environment, and the color of the surrounding environment may sometimes affect the color change of the subject. Especially when the surrounding environment is relatively bright and close to the subject, the color effect will be greater. The image quality of a digital camera is affected by various conditions such as the lens, image sensor, aperture, exposure time, and file format, and the difference in camera parameters is directly reflected in the color difference of the captured image. For the camera, the lens, like the human eye, will have a crucial impact on the clarity of the captured image. Professional lenses not only have higher sharpness, but also reduce chromatic aberration and restore color to a high degree without distortion; and the larger the image sensor of the camera, the higher the pixels, the greater the amount of information that can be recorded, the grain The higher the degree of detail, the better the effect after the image is enlarged. On the contrary, the smaller the amount of information recorded, the lower the degree of fineness of the particles, and the worse the effect after image magnification; any lens has a certain aberration, reducing the aperture can reduce the aberration, but due to the effect of diffraction, the aperture (shrink The aperture will reduce the effective aperture) too small will reduce the contrast

and resolution. So there is a concept of the best imaging aperture, usually the best aperture is two or three stops smaller than the maximum aperture of the lens; accurate exposure can effectively encourage the image to record more information, especially color information, the more accurate the exposure, then the image the higher the color saturation.

4. Conclusion

With the development of the economy and the improvement of living standards, people's tastes are constantly improving, and the demand for artworks is also increasing. However, the best artworks are often of high value, and are collected by collectors at home or collected by museums. Ordinary people It's hard to see the true content. Excellent art is a good example for people to study and study. It is difficult for people to directly observe and appreciate the true works of excellent art. They can only secondly choose high copy. The technology that can reproduce excellent works of art almost perfectly is the urgent need of people today. The digitization of works of art is to use the current digital technology and other means to perform an accurate digital data processing on the works of art, and to scan some excellent works of art to obtain data that can be stored in the computer by means of scanning, thereby realizing the virtual digitization of the works of art. Virtual artwork can be stored on a computer or searched on the Internet. Art works are the hard work of every artist, and preservation and restoration are extremely difficult. Artwork copying is to use these digital methods to copy the original work with high simulation. The size, medium, color, etc. must be consistent to be infinitely close to the charm of the original work. The specific steps include high-definition scanning, high-precision output, and color management. In today's digital age, high-simulation, safe, and convenient digital archiving and copying of artworks are indispensable and important means for the preservation and inheritance of the artistic value of artworks.

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