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Research Article

Research on the Visual Texture Presentation of Fabrics

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Abstract: This article discusses the process of repairing, optimizing and manufacturing of fabrics by 3D software, and the 3D scanned imaging theory. To present a simulated texture effect on the fabric, it needs to refer to three necessary conditions of visual texture and use the advantages of 3D software. It will be possible to form a highly simulated visual texture fabric after optimized testing.

Key words: Visual texture; Fabric; Presentation; Optimization

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The research on the presentation of fabric texture is mainly divided into two categories: one is based on the comprehensive consideration of the fabric's tactile and visual effects; the research on the texture presentation of fabrics uses the complicated drawnwork and crepe embossing based on the improvement of textile technology. The second one is from the perspective of the visual effect of the fabric, and the presentation research is conducted started from the 3D effect on the surface formed by the secondary printing and dyeing process of the fabric.

From the perspective of people's hasted lifestyles, fashion of apparel and marketing, the changing speed of apparel products are contradictory to the cost of product consumption. People prefer to use clothing products with good aesthetic effects and low consumption costs to keep up with every fashion trend. As the material basis of all apparel products, fabrics also satisfy consumers who pursuit fashion visual effects. The cost of visual texture effects produced by printing and dyeing processes is much lower than that produced by textile technology. Therefore, the innovative presentation method of visual texture with more optimized visual texture effect is the key research goal.

1 Concept and formating conditions of visual texture

1.1 The concept of visual texture refers to a psychological feeling of visual experience generated by the synesthesia effect of vision on tactile texture.

We can get the same tactile sensation as the surface texture of the actual object. This kind of performance is different from the inherent texture of the object shown by photography. It emphasizes the sense of sight and touch in the plane, and pays more attention to the sense of existence that expresses its own texture through the plane.

1.2 One of the conditions for the formation of visual texture is the visual and tactile experience of the texture material itself.

The experience of vision, tactile and sensation is formed through observation, wearing, touching and feeling,. For example, fur texture fabrics are visually composed of individual hair fibers, having fluffy and thick visual effect. It is warm and soft by touching, and can keep good warmth in cold weather. The second one is the reflex stimulation of the two-dimensional image to the experience memory when the visual texture is reproduced. Third, it is that the texture of visual illusion can be maintained for a certain period of time. Therefore, the optimal visual effect of texture can be presented on the fabric, based on satisfying the three necessary conditions for forming the visual texture.

The visual and tactile experience of texture material itself generally comes from those often met in life. It is mainly divided into two types: natural texture and artificial texture. Natural texture also includes plant texture and animal epidermal texture, such as crocodile skin texture, lizard skin texture, ostrich skin texture, fish scale texture commonly used in clothing. Plant texture includes tree epidermis texture, plant growth structure texture such as flowers, pine cones, etc. Artificial texture mainly refers to the texture formed by the use of a certain repetitive artificial structure of materials, such as knitted sweater texture; bamboo, willow, and hemp braided texture; artificial fold process texture.

Therefore, in the research on the visual texture of fabrics, experimental samples will be selected from the above-mentioned texture materials from which people have gained experience, and two kinds of natural and artificial texture samples will be selected to start the experiment. When the visual texture is reproduced, whether the two-dimensional image can produce a stimulus reflection on the experience mainly depends on the true degree of the two-dimensional visual texture effect. The true degree of the visual texture is directly proportional to the degree of stimulation, that is, the more it looks and the image in our memory. The higher the stimulus is, the more you believe in its authenticity. The degree of authenticity determines whether the visual illusion of texture is established. The visual illusion texture is established for infinite time until the eyesight moves away from the observative object. The longer it takes to determine its authenticity, the better the visual effect of texture. Therefore, how to shape the true degree of visual texture based on the above analysis is the main content of the research.

2 Presentation and optimization of the visual texture of the fabric

2.1 The texture scanning is for the real texture effect itself which requires media tools to reproduce the real texture in a two-dimensional form.

In the past, the materials of the bionic texture mostly came from pictures and artificial texture molding by computer software as the source of the material. Both of them are the transformation process from three-dimensional texture to two-dimensional one. First, it is to form a two-dimensional image mechanically through the camera as a medium. The influence of light, shadow and angle of is excluded, and the imaging principle of the camera is used to restore the realism of the texture. It is not necessary to have logical correlation, and whether the final visual texture is authentic has not been verified by experiments.

Second, using software tools to artificially generate texture effects is a relatively ideal way of texture shaping in the field of computer graphics. However, one of the disadvantages is that the large amount of engineering requires a high degree of proficiency in computer software. As the study of visual texture of fabric belongs to the category of artistic aesthetics, and there is a lack of personnel with knowledge and skills in the two disciplines.

In view of the above drawbacks, the solution is to use the structured light non-contact photography principle, 3D laser scanning measurement, high-speed and high-density measurement of the texture surface, the output of the three-dimensional point cloud (pointCloud) as the physical texture acquisition method of the texture imaging target. It is different from the camera extracting two-dimensional images of the texture, while the 3D scanner obtains the three-dimensional information of the texture. Through specific structured light onto the texture surface to be measured, the two cameras forming a certain angle acquire corresponding images synchronously, and then decode and calculate the phase of the images, and use matching technology and triangle measurement principle to calculate the two cameras The three-dimensional coordinates of the pixel in the common viewing area. The three-dimensional texture model is presented, forming a 1:1 real data model.

2.2 Data optimization

The cloud data of 3D laser point obtained by the above-mentioned 3D laser scanner needs to be imported into geomagice software through data transmission. Then it reads in high-density point cloud data and coordinate information. And three-dimensional texture data with high-precision is built through the software. After a series of rectified operations such as opening the manifold, processing the pointed object, and automatically filling the hole, the complete 3D data of the scanned texture is finally obtained.

The data model processed by geomagice software is actually a three-dimensional texture reproduction, and cannot be directly used in fabric design. This is because its discontinuity and boundary specificity can't complete the continuous output of the pattern, so we still need to be optimize the three-dimensional structure of the data. We also need to use Zbrush, a three-dimensional editing software with a high degree of freedom, to project the texture fluctuations into contour bitmaps, and then adjust and change the contour bitmaps that can be continuously distributed or arrayed. That way, the texture can naturally form a continuous distribution without traces on the X and Y axes, and the height difference is controlled through the length of the Z axis; the clarity of the texture is controlled through the smooth command, and then the contour bitmap is reprojected into a flat entity to form the solid three-dimensional texture again, thus completing the basic changes in texture.

2.3 Test

The experimentally adjusted and optimized visual texture is returned to the geomagice software with a regular quadrilateral continuous texture model to measure the precise value of texture fluctuations. The 3D texture is verified with parameters such as height difference and distance, and we set five numerical textures which have a fixed value to the original rise and fall of the texture. And then the experimental participants conduct a visual evaluation to select the most realistic and 3D texture effect visually to output the pattern with optimal texture undulation, size and roughness, and to record the absolute size of the parameters. We summarize the experimental experience, and look for the general laws of similar textures in order to form a pattern of texture presentation that can be referred to.

With the strong support of experimental reports and theories, the optimized visual texture is presented. We select the appropriate fabric, transfer the visual texture to the fabric through digital printing, and conduct a visual test through volunteers. It mainly meets the third condition of the visual texture, that is, the visual illusion of the texture from the perspective of time. This part is mainly visually psychological experiment. It is concluded that the optimized visual texture fabric will be better put into the market in the future.

3 Application of visual texture fabric

The formation of visual texture is a process of transforming from 3D to 2D by preserving the synesthetic effects of 3D vision, touch and psychology. The visual texture fabric can be replaced in almost any occasion where texture is used. It can be used to make daily necessities and industrial products according to the different fabric materials, such as shoes, bags, clothing, and other clothing products; furniture surfaces, wallpaper, home bedding, and other house renovations. The visual texture has left a lot of development space for the functional development of fabrics, which can be combined with any fabric material and also emphasizes environmental protection. This will also be the future development direction of the textile industry.

4 Conclusion

Visual texture is 2D, and the three necessary conditions for presenting visual texture require a complicated process of verification. The article mainly discusses the process of experimenting with 3D tools to present 3D with 3D technology, and to further optimize the experimental hypothesis that gives the fabric the best texture effect. Among them, the virtual reverse transformation and optimization process are technical difficulties, which will be further developed in subsequent research.

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