Research on Environmental Art Design Based on Computer 3D Animation Technology

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Abstract. In order to improve the ability of environmental art design, a method of environmental art design based on computer three-dimensional animation technology is proposed, and a three-dimensional animation imaging model of environmental art design is constructed. Combining the RGB decomposition technology to extract the color components of the environmental art design three-dimensional animation image, use the color template space projection algorithm to perform the block fusion processing of the environmental art design three-dimensional animation image. The simulation results show that the three-dimensional recognition ability of environmental art design using this method is better, and the performance of feature reconstruction is better, which improves the three-dimensional visual presentation ability of environmental art design.

Keywords: Three-dimensional Animation Technology, Environmental Design, Rural Landscape, Three-dimensional Vision

1. Introduction

With the advancement of beautiful rural construction, environmental art design has become the basis of rural construction. With the support of computer vision and three-dimensional animation software, environmental art design is carried out, and a three-dimensional animation design model of environmental art design is constructed, using the three-dimensional image simulation method to carry out the three-dimensional animation simulation of the environmental art design, combined with the edge contour feature decomposition of the three-dimensional animation image of the environmental art design and the information fusion technology, extract the environmental art design [1-4]. The color feature components of the 3D animation image, the construction of the spatial area feature distribution model of the 3D animation image of the environmental art design, the realization of the 3D simulation of the environmental art design, the study of the 3D animation simulation method of the environmental art design, and the improvement of the environmental art. The effectiveness of the design is of great significance [5-8]. Propose an environmental art design method based on computer three-dimensional animation technology, construct a three-dimensional animation imaging model of environmental art design, use the feature decomposition method of three-dimensional color feature space to reconstruct the three-dimensional environmental art design, extract the three-dimensional dynamic feature quantity of the environmental art design, based on computer the software optimizes the three-
dimensional animation design of environmental art, and finally conducts simulation experiment analysis to demonstrate the superiority of this method in improving the efficiency of environmental art design [9, 10].

2. Analysis of the current teaching situation of 3D animation courses in my country

2.1. Paying too much attention to the teaching of software tools, while ignoring the teaching of animation rules
At this stage, most of the animation, game, network, media and other majors in my country's universities include a large number of software development courses in the curriculum. Some universities even start several courses of three-dimensional design software with similar functions. Students will most time and energy are spent on the learning and use of 3D design software. Once new technologies are produced, they are tired of following up and chasing them and become slaves to new software, new technologies, and new functions. In addition, there are relatively few professional theoretical works written for three-dimensional animation courses in my country at this stage. Most of the three-dimensional animation works are published by translating foreign books. In order to better cater to readers and gain the favor of readers, often referred to as "three-dimensional animation" or "digital art", misled many students of related majors, making them simply think that as long as they master the technology of using three-dimensional software, they can create excellent animation works. Students did not pay much attention to the basic principles of animation and main rules, animation creation procedures, etc., which caused the fundamental misunderstanding of animation education. Therefore, no matter how deep the students understand the software, it is difficult to create animation works of ideas and creativity.

2.2. The existing 3D animation teaching model is too traditional
At present, most of our country's 3D animation courses still adopt a teaching mode that combines classroom theoretical explanation and experimentation. Teachers usually explain the definition, parameter settings and operation methods of the software according to the chapters divided in the textbook and distinguished by software function modules. In actual computer courses, students usually use software to issue test commands to teachers to complete corresponding homework. This teaching mode separates the theoretical courses from the computer operation process, and the knowledge learned in the theoretical courses cannot be verified in time and quickly digested, causing low learning efficiency and failing to achieve the learning effect well. In addition, this traditional teaching mode is usually carried out with the teacher as the core. Students cannot play their initiative and can only passively listen to the lectures and passively obtain the content explained by the teacher. Most of the content learned in this learning method It is repetitive and mechanical. The knowledge and skills acquired by students in this way are difficult to be comprehensively applied through their own play, which is not conducive to the improvement of students' own quality.

2.3. Inadequate team spirit and ability
In traditional 3D animation teaching, all the learning processes of students are completed relatively independently. Whether it is the process of acquiring knowledge in the classroom, the process of experimentation after class, or the process of completing homework, it is the student's personal matter, and it is rarely carried out in a team or group under the leadership and organization of the teacher. For long-term learning in this way, the connection between students and their surrounding students will become less and less, and there will be a lack of opportunities to discuss and communicate with classmates. Therefore, in the future 3D production team, they will not have the spirit and ability to cooperate with the team members., It takes a certain amount of time to adapt to this new environment.

2.4. The teaching environment and teaching facilities are too old
Due to the large differences in teaching conditions and teaching funds in various universities in my country, there is also a corresponding distance in the environment of 3D animation teaching and the configuration of teaching facilities. A large number of colleges and universities that offer three-dimensional courses do not set up corresponding teaching facilities and experimental sites according to the teaching characteristics of the course. Their teaching environment is no different from that of traditional courses. They still use ordinary multimedia classrooms and Computer classroom to proceed. Among them, the performance of teaching equipment cannot meet the high requirements of 3D animation design, especially the low performance of graphics cards, which often causes teachers to frequently encounter jams and crashes during classroom presentations and student operations, which greatly reduces classroom efficiency. In addition, the large-screen projection equipment used by many schools to teach theoretical courses is also difficult to meet the requirements of 3D animation teaching, because the content displayed by teachers of 3D courses is different from ordinary PPT files displayed in other subjects. These 3D softwares exist in the form of huge and complex 3D software. These 3D softwares not only have very complicated operation interfaces, but also contain various types of operation commands. The fonts are very small, and the demonstration process has formed a dynamic form due to rapid switching, which is affected by ordinary projection equipment. The impression of low resolution and long distance makes it difficult for students sitting in the back row to distinguish the text on the screen. Therefore, it is reasonable to say that this kind of projection teaching method will greatly reduce the learning effect of students. The author believes that in the process of 3D teaching, network broadcasting or electronic classroom software should be used to form a local area network screen system. This system can not only completely transmit the content displayed on the teacher's computer screen to the student's computer screen. It can also easily realize the interaction and communication between students and teachers, which has a positive effect on the quality of teaching.

3. 3D animation imaging and feature analysis of environmental art

3.1. Environmental art design 3D animation imaging

In order to realize the optimization of environmental art design, perform 3D animation simulation in computer software, use the block pixel feature matching method to reconstruct the 3D visual features of environmental art design, combine with vector quantization decomposition to perform 3D animation imaging processing of environmental art design, and extract the environment The color feature components of the three-dimensional animation imaging of artistic design, improve the principal component feature analysis ability and color feature discrimination ability of environmental artistic design, carry out the three-dimensional animation reconstruction of environmental artistic design in the color space, and adopt adaptive feature detection for environmental artistic design Multi-viewpoint fusion tracking of 3D animation, extract the edge contour feature value of 3D animation imaging of environmental art design, and construct the multi-viewpoint reconstruction model of 3D imaging of environmental art design as shown in Figure 1.

![Figure 1. Multi-viewpoint reconstruction model of 3D imaging in environmental art design](image)
In the multi-viewpoint reconstruction model of environmental art design three-dimensional imaging shown in Figure 1, the dynamic fusion of environmental art design three-dimensional animation images is based on the multi-texture fusion method, and the regional block pixel autocorrelation function of environmental art design is defined:

\[ Z = \sum_{i=1}^{n} \left[ I(x_i, y_i) - I(x_i + \Delta x, y_i + \Delta y) \right]^2 \]  

(1)

Among them, \( \Delta x, \Delta y \) are the fusion pixel sets of the environmental art design feature blocks, and \((x_i, y_i)\) are the edge feature points of the dynamic fusion of the three-dimensional animation image. According to the method of pixel edge fusion and feature decomposition, the pixel feature quantity output of the 3D animation simulation feature reconstruction of environmental art design is:

\[ I = Z + \Delta I \]  

(2)

Among them, \( \Delta I = (II)^T \) is the boundary pixel of the environmental art design three-dimensional imaging. The KroneckerDelta function is used to segment the prior distribution field of the environmental art design three-dimensional imaging to calculate the correlation coefficient of the environmental art design three-dimensional distribution field.

\[ C = \sum_{i=1}^{n} I(k \cdot I) \]  

(3)

Among them, \( k \) and \( l \) respectively blur the pixel value of the correlation feature detection and the spatial region segmentation feature value. The feature decomposition method of the three-dimensional color feature space is used to carry out the three-dimensional reconstruction of the environmental art design, and the three-dimensional dynamic feature quantity of the environmental art design is extracted, thereby realizing the image information collection of the environmental art design.

### 3.2. Three-dimensional dynamic feature extraction of environmental art design

Using virtual scene reconstruction technology for environmental art design three-dimensional animation image acquisition and feature projection processing, binary fitting and edge contour detection of environmental art design three-dimensional animation image, combined with envelope contour detection method to carry out the edge of environmental art design contour detection, combined with environmental art to design the color space of the three-dimensional animation image, block fusion feature values, update the model, and get the iterative formula as follows:

\[ A = \left( \rho k + (1 - \rho) l \right) \times C \]  

(4)

Among them, \( \rho \) represents the two distribution fields that control the three-dimensional imaging of the environmental art design. Extract the gray-scale pixel feature quantity of the three-dimensional animation image of environmental art design and combine with Euler-Lagrange equation to obtain the boundary area equation of the observation point of the three-dimensional animation image of environmental art design as:

\[ T = \frac{d}{dt} \left( \frac{\partial A}{\partial t} \right) - \frac{\partial A}{\partial t} \]  

(5)

According to the result of edge contour feature detection, effectively enhance the details of the environmental art design 3D animation image and improve the 3D animation simulation ability of the environmental art design. The statistical information distribution characteristic value of the corresponding environmental art design 3D animation image is the value of the environmental art design 3D animation image volume data. Body data. Assuming that the 3D animation image of the
environmental art design satisfies the normal distribution, \( n \sim N(0, \sigma^2) \), combined with the continuous reconstruction method, the 3D dynamic feature reconstruction output of the 3D animation image of the environmental art design is obtained as:

\[
\begin{align*}
H_m &= \left( h_1, h_2, \ldots, h_{B-1}, h_B \right) \\
T_w &= \begin{pmatrix} H_m \cr C_p \cr M_s \cr G_c \end{pmatrix} = \begin{pmatrix} \left( h_1, h_2, \ldots, h_{B-1}, h_B \right) \cr (x, y) \cr (h, w) \cr (V_{\min}, V_{\max}) \end{pmatrix}
\end{align*}
\]

Combine the RGB decomposition technology to extract the color components of the environmental art design three-dimensional animation image:

\[
w = f_{B,G,B} \times h_{\sigma_f}
\]

Among them, \( f_{B,G,B} \) represents the RGB component, and \( h_{\sigma_f} \) is a 2D Gaussian kernel with a standard deviation of \( \sigma_f \). The edge contour detection output of the environmental art design three-dimensional animation is:

\[
P = (w + T_w) \times h_{\sigma_f}
\]

Where \( h_{\sigma_f} \) is a Gaussian kernel with a standard difference of \( \sigma_f \). According to the color feature extraction results of the environmental art design three-dimensional animation, the three-dimensional dynamic feature quantity is extracted and reconstructed.

4. Simulation experiment and result analysis

In order to test the performance of this method in 3D animation reconstruction and design optimization of environmental art design, use MAYA, 3DStudio MAX, and SoftImag software for 3D model design, set the prior pixel value of environmental art design 3D animation to 1200×2400, and environmental art design. The viewing point distribution area is a 200×200 grid area, and the gradient feature coefficient is 1.45. In the three-dimensional animation design of environmental art, take the tree of the environmental landscape as an example, perform three-dimensional animation simulation, and perform three-dimensional animation reconstruction in the texture mapping area of 1 surface and the texture mapping area of 2 vertical surfaces, and the reconstruction results are shown in Figure 2. Shown.

![Figure 2. 3D Animation reconstruction results of environmental art design](image)

It can be seen from Figure 2 that the visual reconstruction ability of 3D animation reconstruction using the method of this paper for environmental art design is better. When the line of sight rotates with the tree, there will be no visual error. The normal direction rotates with the rotation of the line of sight, and the visual reconstruction ability is strong. The test uses different methods for the mean error
of environmental art design, and the comparison results are shown in Table 1. The contrast methods used are the landscape space environment design method based on virtual reality technology (method A) and the landscape environment design method based on digital multimedia technology (method B). Analyzing Table 1, we can see that the average error of environmental art design using this method is low, the visual reconstruction performance is better, and the 3D animation reconstruction ability of environmental art design is improved.

Table 1. Comparison of mean error of environmental art design

| Number of iterations | Method of this article | Mean error Method A | Method B |
|----------------------|------------------------|---------------------|----------|
| 100                  | 0.102                  | 0.253               | 0.244    |
| 200                  | 0.034                  | 0.214               | 0.183    |
| 300                  | 0.021                  | 0.165               | 0.145    |
| 400                  | 0.014                  | 0.125               | 0.122    |
| 500                  | 0.004                  | 0.109               | 0.098    |

5. Conclusion
This paper proposes an environmental art design method based on computer three-dimensional animation technology, constructs a three-dimensional animation imaging model of environmental art design, uses edge contour feature detection method to carry out visual reconstruction of environmental art design, and combines RGB decomposition technology to carry out environmental art design three-dimensional animation. The color components of the image are extracted, and the color template space projection algorithm is used to perform the block fusion processing of the three-dimensional animation image of the environmental art design to improve the reconstruction ability of the three-dimensional animation of the environmental art design. Based on MAYA, 3DStudioMAX, and SoftImag software, the 3D animation design simulation of environmental art is carried out. The research shows that the 3D reconstruction ability of the 3D animation design of environmental art by the method in this paper is better and the error is lower.

Acknowledgments
Project of Environmental Design Major with Distinctive Features at Xingzhi College of Xi'an University of Finance and Economics. (No. TSZT201603).

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