Explore the Application of Computer Modeling and Rendering Technology in Rural Landscape Color Design

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Abstract. The model is an important factor that affects the rendering quality. In the process of model construction, the Boolean operation method is usually used. This operation method will consume a lot of computer resources. Improving this operation mode can not only improve the accuracy of the model, but also simplify Model to achieve fast rendering. Not only can the model be simplified, but there will be no discrepancies visually. If the number of sides of the model cannot be reduced, the angle of the camera should be adjusted and the rendering efficiency can be effectively improved on the basis of fully expressing the design content. When rendering rural landscapes, by adjusting the angle, only the nearby objects can be adjusted, the rendering effect can also be achieved and the rendering efficiency is improved.

Keywords: Computer Modeling, Rendering, Design

1. Introduction

The development direction of computer modeling rendering is thin and highly immersive. The development of 5G communication technology will make it possible to separate rendering. Heavy 3D content rendering is done in the cloud and the rendering of motion information such as head control is completed in the computer modeling rendering end. Through 5G communication connection, this will greatly reduce the computer modeling rendering. The requirement of computing power reduces power consumption and weight. At the same time, the characteristics of computer modeling and rendering will also give full play to the high bandwidth and low latency characteristics of 5G communication technology[1].

2. Computer modeling and rendering technology

On the one hand, the rendering effect is detected in animation production to avoid repeated rendering. In the animation process, the rendering of each frame of images and the rendering of a large number of
images are very different in time consumption; and if the effect of rendering each frame of images is not satisfactory, you can adjust in time and re-render, but if you need to render the animation sequence frames Re-rendering will be affected by various factors such as animation specifications, character movements, etc., resulting in more time and money and multi-frame re-rendering will also overcome many unpredictable troubles. In order to avoid these situations, the rendered images are detected from multiple angles during the animation production process and corrections can be made in time to avoid the trouble of correcting multi-frame rendered images\textsuperscript{[2]}.

On the other hand, multi-angle detection reduces errors in rendering. Rendering detection is mainly to avoid wear-outs in the animation. These wear-out screens should be found before rendering. If they are found after rendering, they need to be resolved by re-rendering. However, the modification of the help screen not only takes a long time, but also requires more manpower, resulting in an increase in the animation production budget\textsuperscript{[3]}. Therefore, in animation production, it is necessary to carefully detect the motion state of each character frame by frame, to check the errors in the model during the insertion process, to reasonably match the scene, characters, props, dialogue, body movements, etc. and to continuously check whether the scene is repeated Reasonable, timely find and deal with wearing lens. The modeling method is shown in the figure below.

![Image](image_url)

**Figure 1.** Modeling method

3. **Color analysis of rural landscape**

The agricultural planting form is mainly dry land in the north and paddy fields in the south. The southern region of China pays more attention to the protection of ancient villages, such as Yuanyang Qingkou Hani Folk Village (mainly terraced cultural landscapes and villages), Wuyuan Ancient Village in Jiangxi, known as "the most beautiful village in China" and Peitian Ancient Village in Minxi, Fujian Province, etc. Most of the villages are in the southern region, while the protection and characteristics of ancient villages in the northern region are relatively poor. Most of the more well-known rural landscapes in our country are ancient villages or folk styles\textsuperscript{[4]}. Other famous rural landscapes with distinctive characteristics are few and the development of folklore and other special cultures is not sufficient. Especially in northern areas, focus on economic construction and long-term neglect of rural landscape The construction of rural areas has lagging behind the development of rural landscapes. With the gradual implementation of China's socialist new rural policy, the rural landscape has also been further planned, but the level of rural landscape construction is low, lacking scientific
and rationality, the landscape effect is very messy, lacking standardization and specialization. There are great misunderstandings about the construction of rural landscapes in rural areas in China and it is believed that the construction of several parks and plazas is very serious. The rapid development of urbanization in rural villages and towns in our country, in the process of urbanization, many rural landscapes with human characteristics such as centuries-old trees, ancient buildings, bridges built in the past have been destroyed. The rural landscape in China's rural areas is currently in a state of unscientific and unreasonable development, lack of new elements in the layout and lack of integrity and coordination.

4. Rendering analysis of computer rural scenery

4.1. Reverse ray tracing

The most typical application method of ray tracing rendering is not to simulate from the light source in the direction of light propagation, but to "penetrate" the screen from the perspective of the observer to emit "rays" according to the traceability characteristics of the linear propagation of light. When the emitted "light" touches the first rural landscape in the scene, then the point where this rural landscape is touched by the "light" is unobstructed and then the "light" follows a series of reflections following the principle of optical propagation. If the refraction can reach a light source, then the part touched by this light is "illuminated" by this light source, otherwise it is part of the shadow\(^5\). Then the renderer can use this as the basis to color the corresponding position of the "ray" on the screen (usually in pixels). This method of reverse tracing avoids calculating those rays that will not reach the observer (that is, do not need to be displayed on the screen) when forward ray tracing (tracing light from the light source), saving a lot of unnecessary calculation content. The light processing mode is shown in the figure below.

\[
\begin{align*}
x &= f \frac{X}{Z} \\
y &= f \frac{Y}{Z}
\end{align*}
\]

\[
\begin{bmatrix} x' \\ y' \\ z' \end{bmatrix} = \begin{bmatrix} f & 0 & 0 \\ 0 & f & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}
\]

**Figure 2.** Light processing mode

4.2. Monte carlo ray tracing

The typical reverse ray tracing method, although using physical principles to build a theoretical scheme, but compared to the complex situation in reality, this simulation scheme is somewhat simple and rude. It has two main problems: (1) it can only deal with specular reflection, regular projection and occlusion shadow, ignoring diffuse reflection; (2) because the simulated light energy transfer belongs to the ideal surface, all the rural The surface properties of the landscape are actually single. In order to improve the above problems, on the basis of reverse ray tracing, the diffuse reflection property of the rural landscape surface is introduced and the probability theory is used to determine whether the light reaching the rural landscape surface should be reflected, refracted or diffusely reflected. At the same time, in order to deal with the problem of increased light sampling caused by the introduction of
surface properties, the probability theory is further used to simplify and a small amount of relatively important light sampling is used to simulate the integration result. The specific scheme of this improved method has many forms, they are collectively called Monte Carlo ray tracing. Compared to typical reverse ray tracing, Monte Carlo ray tracing introduces a more complex diffuse reflection material, which leads to a large increase in the number of rays that need to be tracked, so a sampling algorithm is used to reduce the number of rays that need to be tracked[6]. Now, the Monte Carlo ray tracing algorithm with a relatively mature sampling model has a very high operating efficiency, which once made ray tracing out of a professional graphics workstation and can even be used on home-level hardware.

5. Conclusion

After the emergence of hardware based on ray tracing rendering design, the theoretical development has broken through the bottleneck and ushered in another development period. Real-time ray tracing rendering has finally ushered in the dawn of popular application. The degree of fidelity of the images obtained by virtual scene rendering is bound to So a significant improvement. The introduction of real-time ray tracing will greatly improve the authenticity of real-time rendering pictures and will bring tremendous changes in the film and television and cultural industries.

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