

Innovative Expression of Liao Khitan Culture in Three-dimensional Scene Shaping

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Abstract: Liao Khitan culture, as an important part of ancient northern ethnic culture in China, has rich historical and cultural values. However, with the changes of the times, its inheritance faces many challenges. Therefore, this study uses three-dimensional (3D) scene modeling technology to show the unique charm of Liao Khitan culture in a novel way. In order to achieve this goal, this article deeply analyzes the core elements of Liao Khitan culture, such as clothing, architecture, art, etc., and presents these elements in the 3D scene with high precision and realistic visual effects by using 3D modeling, mapping and animation. Furthermore, the paper pays attention to user experience and designs rich interactive functions, so that users can understand and experience Liao Khitan culture in a more intuitive and interesting way. The research results show that the communication effect of Liao Khitan culture is significantly improved through the innovative expression of 3D scenes. Users can not only feel the charm of culture personally, but also deepen their understanding and recognition of culture through interactive experience. This achievement has injected new vitality into the inheritance and development of Liao Khitan culture.

1. Introduction

Liao Khitan culture, as an important part of the ancient northern national culture in China, not only has a profound historical background, but also maintains a cultural value that cannot be ignored in modern society[1]. The Liao Khitan ethnic group has left rich cultural heritage in the history of China, including unique architectural style, exquisite handicrafts, colorful festivals, and celebrations [2]. All these reflect the unique aesthetics and lifestyle of Liao Khitan people. However, with the changes of the times, the inheritance and development of Liao Khitan culture are facing many challenges. Therefore, it is particularly important to explore new ways of inheritance and make Liao Khitan culture glow with new vitality in modern society.

With the progress of science and technology, 3D scene modeling technology provides new possibilities for the protection and dissemination of cultural heritage [3]. Through 3D scene modeling, the elements of Liao Khitan culture can be presented in a more intuitive and vivid way, which not only helps to enhance the public's awareness and interest in Liao Khitan culture, but also provides strong support for the protection of cultural heritage [4]. The purpose of this study is to explore the potential of Liao Khitan culture in 3D scene modeling, with a view to contributing new ideas to the inheritance and development of cultural heritage.

2. The history and characteristics of Liao Khitan culture

2.1. The origin and unique elements of Liao Khitan culture

Liao Khitan culture originated from the Qidan ethnic group in northern China, a nomadic people with a long history. In the long historical development process, the Qidan ethnic group gradually formed its own unique cultural traditions and customs. During the Liao Dynasty, the Khitan culture reached its peak, which not only made brilliant achievements in politics, economy, and military affairs but also formed distinctive characteristics in the fields of culture, art, and religion. Liao Khitan culture occupies an important position in the history and culture of China and has made important contributions to the multicultural development of the Chinese nation.

The unique elements of Liao Khitan culture are rich and varied, among which the most representative ones include costumes, architecture, art and religious beliefs. The clothing of the Qidan ethnic group is mainly fur, with bright colors and unique styles, which embodies the roughness and boldness of the nomadic people. In architecture, the Qidan ethnic group created unique architectural styles, such as stupas and tombs in Liao Dynasty, which showed their exquisite architectural skills and unique aesthetic pursuit. In the field of art, paintings, sculptures and other works of the Qidan ethnic group are full of strong national flavor and life interest. In terms of religious beliefs, the Khitan people believe in Shamanism and Buddhism, which have a far-reaching impact on the cultural and social life of the Khitan people.

2.2. Meeting point of Liao Khitan culture and 3D scene modeling

The rich elements of Liao Khitan culture provide a broad creative space for 3D scene shaping. For example, elements such as clothing and architecture of the Khitan ethnic group can be reproduced through 3D modeling technology, so that the audience can personally experience the charm of Khitan culture in virtual space [5]. Furthermore, the use of 3D animation technology can also restore the historical scene and lifestyle of the Khitan people, so that the audience can have a deeper understanding of the connotation and characteristics of the Khitan culture. In addition, projects such as digital museums or cultural sites of the Khitan culture can also be built through virtual reality technology, providing new ways and means for the protection and dissemination of cultural heritage.

3. Theory and practice of 3D scene modeling

3.1. Basic concepts of 3D scene modeling

3D scene modeling refers to the use of computer technology to create a virtual environment with a sense of 3D space [6]. It covers a series of technical means such as 3D modeling, mapping, lighting, animation and so on, aiming at providing users with an immersive visual experience. In modern society, 3D scene modeling technology has been widely used in game design, film and television production, architectural design, urban planning, education and training and other fields [7].

In the process of 3D scene modeling, firstly, it is needed to create an object model in the scene with 3D modeling software, and then endow the model with real materials and textures through mapping technology [8]. Then, by adjusting the lighting and shadow effects, the scene is more realistic. Finally, animation technology is used to add dynamic effects to the objects in the scene, thus forming a complete and dynamic 3D virtual environment.

3.2. Application case of 3D scene in cultural inheritance

In recent years, many institutions and individuals have tried to integrate traditional cultural elements into 3D scenes in order to realize the effective inheritance and dissemination of culture.

Case 1: The Palace Museum has launched a 3D scene application called "Architectural Catalogue of the Forbidden City", through which users can enjoy the 3D models of the palaces in the Forbidden City on their mobile phones or computers (see Figure 1) and learn more about their historical background and cultural connotation. This not only provides users with a brand-new way of cultural experience, but also effectively spreads the history and culture of the Forbidden City.

Case 2: The French Louvre launched a 3D virtual tour application, where users can visit the exhibition halls of the Louvre through VR devices at home and enjoy many the world famous paintings and sculptures at close range. This way not only breaks the geographical restrictions, but also gives more people a chance to appreciate the charm of the world's top artworks.



Figure 1 3D model of the palace

3.3. Fusion strategy of Liao Khitan culture and 3D scene

To realize the integration of Liao Khitan culture and 3D scenes, it is needed to dig deep into the core elements and characteristics of Liao Khitan culture, including costumes, architecture, art and so on. Then, according to the characteristics of these elements, appropriate 3D modeling techniques and mapping methods are selected and presented in a realistic form in a 3D scene. Furthermore, we can also combine the historical background and story of Liao Khitan culture to add rich dynamic effects and interactive functions to the 3D scene. For example, a virtual museum with the theme of Liao Khitan culture can be designed, in which users can freely visit various exhibition halls and learn more about Liao Khitan culture by clicking on the exhibits. This can not only enhance users' sense of participation and immersion, but also effectively spread the essence and value of Liao Khitan culture.

4. Innovative expression of Liao Khitan culture in 3D scene

The innovative expression of Liao Khitan culture in 3D scenes needs to follow the following principles: respecting historical facts, maintaining cultural authenticity, paying attention to user experience and interaction, and pursuing artistic beauty (see Table 1).

Table 1 Principles of innovative expression of Liao Khitan culture in 3D scenes

Principle	Statement of principle
Respect historical facts	When innovatively expressing Liao Khitan culture in 3D scenes, we must strictly follow historical facts to ensure that the cultural elements, historical background and characters presented are in line with historical records, and are not distorted, exaggerated or fabricated.
Maintain cultural authenticity	Innovative expression should be faithful to the essence and characteristics of Liao Khitan culture, avoid excessive commercialization or entertainment, and ensure the authenticity and purity of culture.
Focus on user experience and interactivity	When constructing a 3D scene, we should fully consider the user's sense of participation and experience, and let the user know and feel the charm of Liao Khitan culture more deeply by enhancing interaction.
Pursuing artistic beauty	On the basis of maintaining the cultural authenticity, we should pay attention to the artistic design and aesthetic presentation of the scene, and let users have a deeper impression on Liao Khitan culture through exquisite visual effects and immersive experience.

In order to realize the above principles, this study proposes the following methods:

(1) Dig deep into the historical data and documentary records of Liao Khitan culture to ensure that the cultural elements presented are authentic.

(2) Using modern 3D modeling and animation technology, the unique charm of Liao Khitan culture is displayed with realistic visual effects.

(3) Combining users' needs and habits, rich interactive functions and operation experiences are designed, so that users can experience Liao Khitan culture in an immersive way.

(4) Pay attention to the aesthetic design of the scene, and create a 3D environment with artistic appeal by means of color matching and light and shadow effects.

Specific implementation steps are shown in Figure 2:

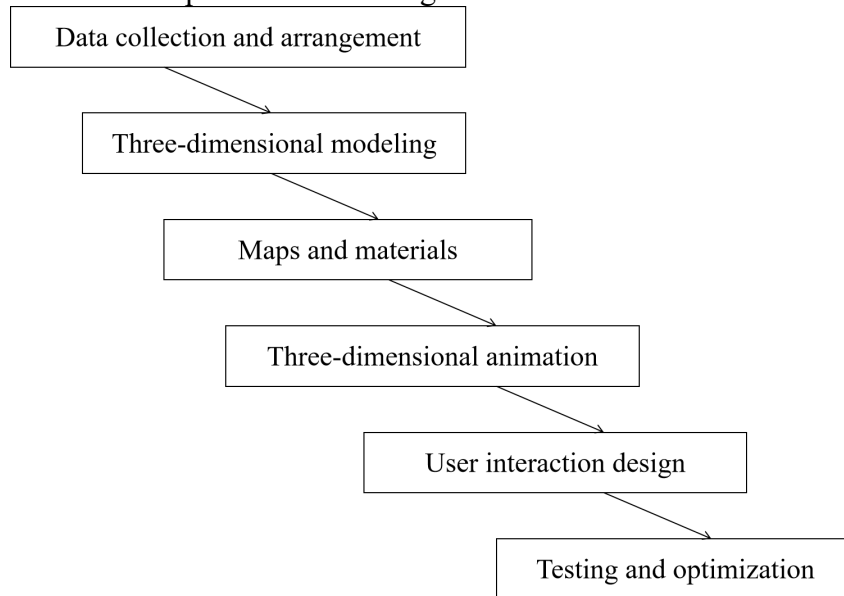


Figure 2 Implementation steps

Collection and arrangement: collect historical materials, pictures and documents about Liao Khitan culture extensively, and make systematic arrangement and analysis.

3D modeling: based on the collected data, using professional 3D modeling software to create accurate models of Liao Khitan cultural elements, such as clothing, architecture and so on.

Maps and materials: Apply high-quality maps and materials to the model to restore the true texture of Liao Khitan culture.

Animation production: according to the characteristics of Liao Khitan culture and the story, design vivid animation effects, such as character movements and scene changes.

Interactive design: provide users with various interactive ways, such as clicking, dragging and rotating, so that they can appreciate and explore Liao Khitan culture from multiple angles.

Testing and optimization: Test the completed 3D scene several times to ensure its compatibility and performance on different devices and browsers.

Its innovation is mainly reflected in the following aspects:

(1) The true restoration of cultural elements: By digging deep into the historical data and literature records of Liao Khitan culture, this study strives to truly restore the core elements and characteristics of Liao Khitan culture in 3D scenes.

(2) Interactive cultural experience: This study focuses on user experience and interactivity, and designs a variety of interactive ways and operating experiences, so that users can understand and feel Liao Khitan culture more deeply.

(3) Pursuit of artistic aesthetic feeling: In the process of designing 3D scenes, this study pays attention to the application of aesthetic elements such as color matching, light and shadow effects, so as to create a 3D environment with artistic appeal. This innovative expression not only enhances the visual enjoyment of users, but also helps to better spread the charm of Liao Khitan culture.

5. Conclusions

The core of this study is to explore how to integrate the elements of Liao Khitan culture into the 3D scene in an innovative way, so as to realize the effective spread and protection of culture. This article deeply studies all aspects of Liao Khitan culture, including clothing, architecture, art and religious belief, and discusses how these elements can be combined with 3D scene modeling

technology to create cultural products with both historical charm and modern feeling. By digging deep into the core elements of Liao Khitan culture, this article successfully combines these elements with the 3D scene modeling technology to realize the innovative expression of Liao Khitan culture in 3D scenes. It not only provides new ideas for the inheritance and development of Liao Khitan culture, but also provides valuable reference for future research in related fields. Looking forward to the future, this study believes that the following aspects can be explored and improved in depth:

Application of augmented reality (AR) technology: Study how to combine AR technology with Liao Khitan culture, so that users can watch and interact with the 3D model of Liao Khitan culture in real time through mobile phones or other devices.

Integration of virtual reality (VR) technology: further explore the application of VR technology in Liao Khitan cultural exhibition, create a more immersive cultural experience environment, and make users feel as if they are in the historical scene of Liao Khitan culture.

Design of multi-sensory interaction: In addition to visual interaction, we can also consider adding multi-sensory interaction methods such as hearing and touch to provide a more comprehensive and authentic cultural experience.

Integration of social functions: Integrating social functions into 3D scenes allows users to share their cultural experiences with others and form a new platform for cultural exchange and dissemination.

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