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Design and Application of Modern Interior Design Style System Based on Unity3D

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Abstract: With the constant change of fashion trends, interior design styles are changing day by day. Based on Unity3D technology, this paper develops a system for modern interior-style design and application. Taking the residential interior as a case study, the interior style design is achieved through 3D modeling and texture rendering and then combined with the Unity3D engine to achieve scene roaming and interactive design. The system enables designers to express design concepts more intuitively and efficiently and also improves customer participation and satisfaction. Through the experience of designers and customers, the system is verified to have more practical value than traditional interior design solutions.

Keywords: Unity3D technology; Interior design; 3D modelling; Virtual roaming

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1. Introduction

With the rapid development of society and economy, interior design, as an important field of art and technology, has received more and more attention. Traditional interior design relies on manual drawing and two-dimensional planar expression, mainly using flat drawings and hand-drawn models to express design intentions and details, with relatively single and limited information presentation, and also unable to provide intuitive spatial experience. However, the emergence of the Unity3D engine and virtual reality technology provides brand new ideas and tools for interior design, enabling designers to display design ideas more intuitively in 3D scenes and enhance the effect of interior design [1].

2. Research background and significance

With the advancement of computer technology and information technology, Unity3D, as a cross-platform real-time 3D development tool, is widely used in many fields, such as game development, architectural visualization and virtual reality [2–4]. For example, the Unity3D engine is used to develop a virtual shipyard and implement

a virtual simulation teaching system, thus avoiding the safety hazards brought by field visits to the shipyard, and it is also conducive to improving the quality of teaching [5]. Using the Unity3D engine to realize a virtual laboratory system for chemistry, and carrying out chemical experiments in a virtual laboratory can make up for the lack of experimental teaching resources, and also effectively reduce the risks brought by physical experiments carried out by the experimenters' hands [6]. Aiming at the problems of the requirements and processes of fire training and safety education, a virtual reality system is developed based on the virtual reality platform of Unity3D, which makes up for the many deficiencies in traditional fire training [7].

The purpose of this paper is to explore the application of Unity3D in modern interior style design, by analyzing its modern style design and design process to provide a more intuitive and immersive presentation to assist the communication and collaboration between designers and clients and to better satisfy the needs of users. The system can not only significantly improve the efficiency and quality of interior design, but also open up design concepts as well as management models. It can significantly improve the efficiency and accuracy of interior design. At the same time, designers and users can interact in real-time in the 3D design scene, which helps to better understand and optimize the design scheme.

3. Modern interior design process based on Unity3D

The modern interior style design process based on Unity3D is divided into four modules to be carried out: (1) style design, (2) model design, (3) scene interaction design and (4) roaming design. As shown in **Figure 1**, in the style design, black and white minimalist style, Chinese rustic style, French simple European style and rustic fresh style are mainly designed. In model design, it is mainly 3D modeling and texture material mapping; in scene interaction design, it is mainly scene selection, furniture selection and configuration, wallpaper selection, roaming selection and interior design introduction; finally, there are free roaming and automatic roaming in roaming design modules.

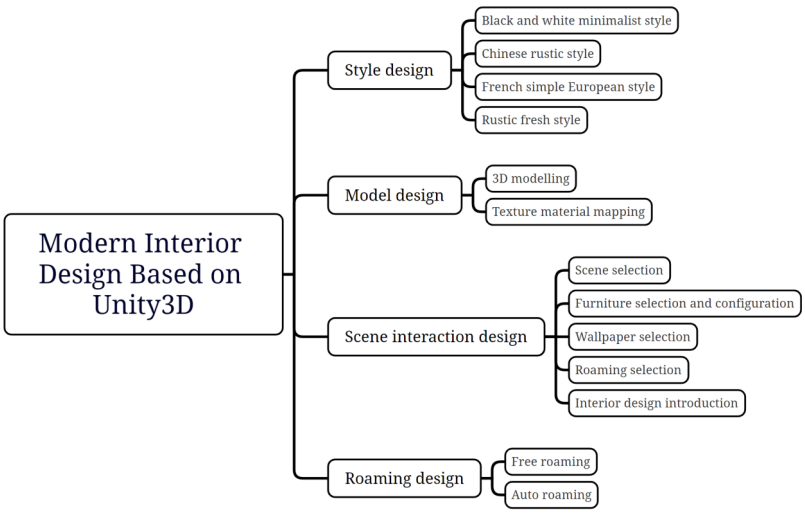

Figure 1. A modern interior design workflow module based on Unity3D.

4. Modern interior design styles

Modern interior design styles are various. First of all, focusing on functionality, modern interior design focuses

on practicality and functionality, pursuing reasonable space planning and layout, which is used to meet the needs of people's daily lives and work. Then, the emphasis on simple style and integration of technological elements, modern interior design is usually in favor of simple, fresh style, focusing on clean lines and pure materials, the pursuit of simplicity without losing the exquisite design effect. Finally, advanced technological elements such as smart home systems and digital media display devices are integrated to enhance the comfort and convenience of the indoor environment.

4.1. Black and white minimalist style

Black and white minimalist style emphasizes color purity and spatial openness, to pursue the ultimate simplicity and texture, by removing superfluous decorations, with black and white as the main hue. In this system design, the main white as the main color tone, and black as the embellishment, set off a more three-dimensional sense of space. At the same time, this style of design also creates a quiet and restful atmosphere of life, personal taste, and personality.

4.2. Chinese rustic style

The Chinese style is a decorative style deeply rooted in the traditional aesthetics of Chinese culture. The Chinese style integrates thousands of years of oriental wisdom and aesthetics and injects a strong cultural flavor into the modern home space. In the design of this system, no matter the placement of furniture or the choice of decoration, it strives to achieve balance and unity. This style of design reflects an attitude to life, but also a cultural heritage.

4.3. French simple European style

French simple European style is a romantic and elegant intertwining, classic and modern collision style. In this system design, the furniture is simple and exquisite, reflecting practicality and art. The interior is mostly in light and soft tones, like beige, light blue and other tonal senses. This style of design can create a warm and comfortable living atmosphere.

4.4. Rustic fresh style

Rustic fresh style is a style that uses natural elements and soft colors to show a vibrant and energetic atmosphere. In the design of this system, green is the indispensable main color, such as walls, furniture, decorations, etc., all adopt green tones as much as possible so that people seem to be in the green nature.

5. Model design

Through the above analysis of interior design styles, it is understood that different design styles have unique characteristics and forms of expression. For example, the Scandinavian style is generally a bright tone and the use of a large number of wood, while many modern styles are black, white and grey tones. Layout and functionality are also important indicators of interior style, such as space planning, layout, and design treatment for different functional needs. In addition, decorations in interior design can also be used to distinguish between different styles of design, such as murals, patterns, lamps, furniture, and so on. In the following, 3D model construction, material mapping and lighting adjustment will be carried out to achieve different styles of interior effects.

5.1. Three-dimensional modelling

Before modeling, firstly, determine the interior scheme design and space layout. Then, 3D Max tools are combined to create the room space and build structures such as walls, floors and windows. This is followed by the construction of furniture models in various styles such as bedding, lamps, cabinets, and so on. Finally, it is the material mapping and rendering stage.

5.2. Material mapping and lighting

After the model is done, it is the texture material mapping session. Material mapping can be carried out in two ways, one is to do the mapping operation directly in 3DMax software, and the other is to import the model into Unity3D and then map it in Unity3D. The former is mainly for mapping small and delicate furniture, and you need to prepare the materials for mapping in advance, such as photos, texture images, or your own drawn maps. Make sure the resolution and quality of the material are high enough to get a better rendering effect. After the mapping is done, you also need to adjust the lighting to ensure that the mapping shows the desired effect. Finally, the final rendered image is generated by choosing the appropriate rendering settings and output format. Another way to apply texture material to a model is to create a "Material" in the Unity3D engine, as mentioned earlier. Take the four styles of wallpaper as an example, edit in the "Inspector" panel, select the corresponding planes, and bind the created materials to the renderer component to show the four different styles of mapping effects. In the roaming scene, the user can also switch the texture freely.

6. Scene dynamic interaction design

In the interior design system, there are five buttons: Scene, Furniture, Wallpaper, Roaming and Introduction, which users can click to achieve interactive effects. The "Scene" button sets up five different interior design styles so that the user can set up the interior effect according to their personal preference. The "Furniture" button sets up various styles of furniture such as beds, lamps, tables and chairs for users to choose from. The "Wallpaper" button sets different styles of wallpaper patterns for users to choose from. Users can also choose "Free Roaming" and "Auto Roaming" to tour the 3D interior scenes. The "Introduction" button mainly shows the user the various styles of interior design in the form of a window.

7. Roaming design

The system is designed with two roaming methods, free roaming is a roaming method in the scene interaction design, users can roam freely in the indoor environment, and browse all the indoor areas and corners. Auto roaming is another roaming method, the scene has set the roaming path, the user's field of vision as long as the direction of the roaming path to follow the direction of the movement, immerse yourself in a different style of interior space. As shown in **Figure 2**, the interactive operation interface developed by this system is displayed.

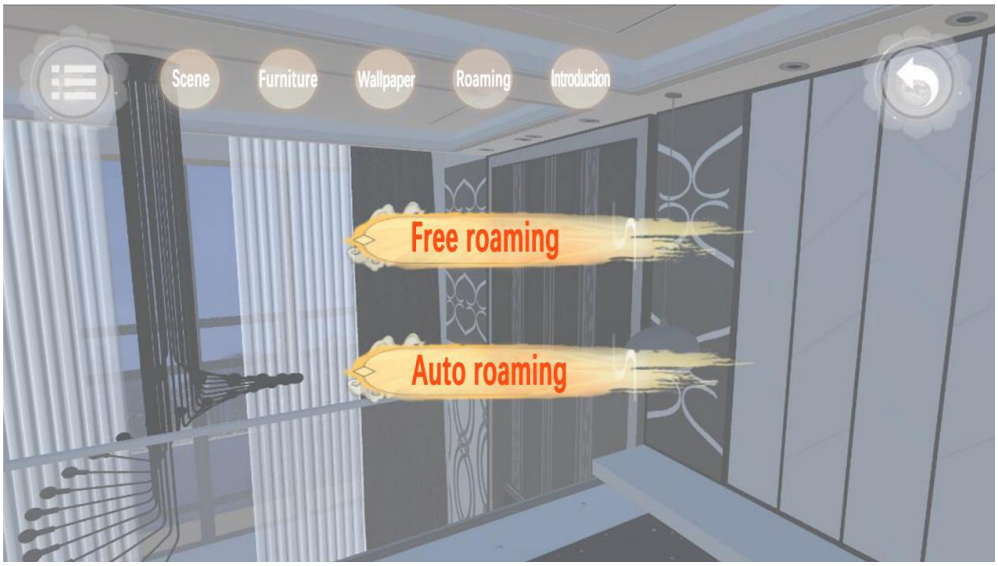

Figure 2. A modern interior design system based on Unity3D roaming interactive interface.

8. Conclusion

Unity3D is a powerful real-time 3D development tool that offers new perspectives and possibilities for modern interior design. This article delves into the application and practice of Unity 3D technology in interior design, as well as its changes and opportunities for innovation in traditional interior design. Unity 3D technology brings unprecedented innovation to the interior design space, enabling designers to express design ideas more intuitively and efficiently, and also improving customer engagement and satisfaction. With the development of advanced technologies such as artificial intelligence and big data, the interior design system needs to be further optimized and innovated. At the same time, Unity3D-based interior design will become more popular, and this system will also contribute to the sustainable development of the interior design industry.

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Disclosure statement

The authors declare no conflict of interest.

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