Application of Computer 3D Modelling Technology in Environmental Space Design

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Abstract: Today's social information and economic development are inseparable, and the combination of computer three-dimensional data modeling technology and the design industry is becoming more and more close. This paper discusses in detail the basic modeling, material and lighting, renderer settings and post-processing of rendering tools applied by computer 3D modeling software 3dsmax and rendering tool v-ray. And through the demonstration of indoor background wall design practice, it shows the intuitiveness and efficiency of environmental space design using computer 3D modeling technology. It has played an important role in technical support for the improvement of the efficiency and benefit of the design industry.

Keywords: computer 3D modeling; environment space; 3dsmax; v-ray

1 Introduction

The three-dimensional presentation in space design is performed by combining the drawing of two-dimensional plane drawings with computer three-dimensional modeling software. The size of the 2D image is more accurate, but it is not intuitive, and the interaction with the user is weak, so it is necessary to use some 3D modeling software (such as 3dsmax, sketch up, revit, etc.) to perform a 3D virtual presentation of the drawn space. So as to help users get a more intuitive spatial experience.

2 Current situation and development trend of computer 3d modeling and design software

3D modeling software is a kind of computer-aided design software. It refers to the use of the graphics function in the computer, and the corresponding interactive technology, graphics transformation technology, surface modeling, solid modeling and other technologies to carry out corresponding graphics design to help designers complete A data system for design work. This kind of data system is usually based on an interactive computer system with graphic functions, which is mainly composed of graphic display terminal, graphic tablet, computer host, etc. [1].

Computer-aided design in my country began to be used in the 1970s, and by the end of the 20th century, computer-aided design gradually evolved into the main means of presentation of artistic design. For interior design professionals, commonly used computer-aided design software includes AutoCAD, 3DsMax, Sketchup, Rhino, lumion, and Photoshop.

3   3dsmax software application based on environmental space design

3.1   Basic modeling

Autocad is usually imported into 3dsmax software, and used as the basis for the size basis to model the building wall, so as to achieve a real scene experience. When making 3D models, we are used to modeling in two ways, one is two-dimensional line "line" modeling, and the other is polygon "poly" modeling.

Two-dimensional line modeling refers to drawing a closed polygon composed of multi-line segments along the wall of the plan, and then extruding the actual wall height to form a three-dimensional wall model. Two-dimensional lines will also be used in many model making processes: through the commands in the edit menu, bending, right angle, smooth, contour lines, etc. (as shown in Figure 1), combined with the setting of the number of segments, adjust the number of segments according to different needs, usually in the range of 6-20, the higher the number, the more segments, that is, the smoother, which can make the two-dimensional line show different shapes. This modeling method is closely combined with the modeling design of the environment space, and is also a common modeling method in interior design professionals.
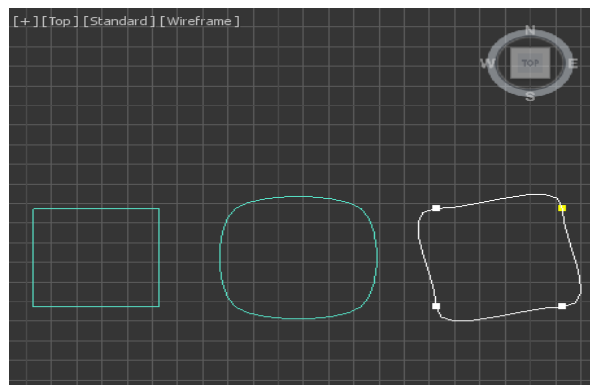

Figure 1 Line Editing

Polygon modeling is to add editing commands to the polygon, which can disassemble, attach, and deform the existing three-dimensional model, so that the three-dimensional model can achieve the ideal display form. The modeling method is similar to the process of sculpture, and the details are gradually piled up and portrayed from the initial simple geometric shape rough embryo. It can be converted into editable polygons on the basis of other modeling methods, and

then edit and modify the basic elements of the model (points, lines, surfaces, boundaries, elements). For example, as shown in Figure 2, first make a cylinder, and then use the commands in the polygon editing menu to input data on its points, lines, and surfaces to make a faucet. Polygon modeling will form a lot of decent faces during the editing process. Under the premise of ensuring the effect, the number of faces should be appropriately reduced to improve the rendering speed, thereby improving work efficiency.
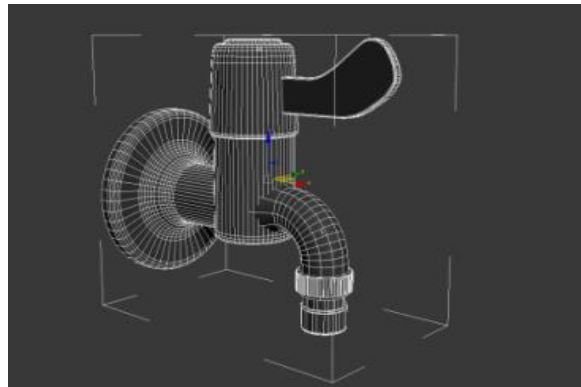

Figure 2 Body Editing

3.2 Materials and Lighting

Different renderers will have different functions and display methods in the material editing menu. Here we take V-ray's material editor and lighting as an example. In the basic version of the material editor, a 6×4 table will be displayed (Figure 3). Through careful observation of the object, find out the material characteristics: highlight, reflection, texture, transparency, etc., and adjust the value in the material editor., colors, and textures to infinitely approach the appearance of objects in real life to ensure the authenticity of the rendering effect.
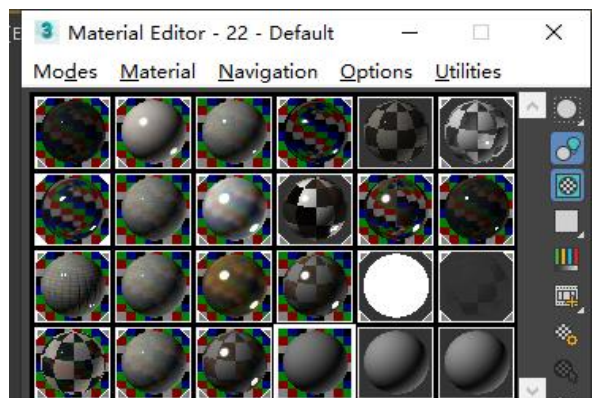

Figure 3 Material Edit Menu

In the arrangement and setting of lights in interior design, there are two different options: one is the natural light effect during the day, and the other is the indoor lighting atmosphere effect at night. In the lighting settings of VrayLight, you can adjust the physical value, multiplier value, color temperature, etc. according to your needs, and you can also adjust the size of the lighting parameters. Under the same conditions, the size of the light area ×multiplication value = brightness, the larger the area, the smaller the multiplication value, on the contrary, the smaller the area, the greater the multiplication value. Select "Temperature" in the mode selection to adjust the color temperature. The common light source value in life is generally between 3000-6500. The larger the value, the cooler the lighting effect, and the smaller the value, the warmer the lighting environment. However, when setting the color temperature of the light, it is usually necessary to appropriately lower the actual color temperature value to ensure that a more realistic and natural lighting effect can be achieved. [2]Because in the operation of 3dsmax, even with the blessing of Vraysun, it is difficult to achieve a particularly natural warm light effect, so it is necessary to use VrayLight -plane appropriately for fill light. After checking Invisible in the settings, the light body will not appear in the rendered image. The value in the subdivision settings should be ≥24 to prevent "jaggies" and "moiré" in the rendering.

3.3 Renderer settings

V-ray renderer is the most commonly used renderer in interior design. The combination of material editor and renderer can express most of the material scenes in life. In the "Color Map" option, you can choose different color types, "Linear Multiplier", "Reinhard" and "Exponential", these three different options refer to the different effects of the final rendered picture.

The settings of the camera are very close to the camera settings in daily life. The auxiliary software is also designed to simulate the real shooting scene. ISO aperture, shutter speed, angle of view width, white balance, etc. can be adjusted through the editing menu, as shown in Figure 4. Show.
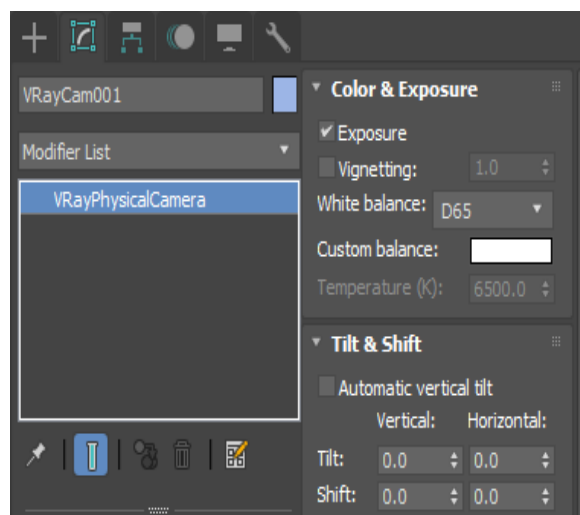

Figure 4 Renderer setting interface

3.4 Post-processing of effect images

You can add channel rendering images through the 3dsmax plug-in or use the "Rendering Elements" in the V-ray renderer. The rendering channel map can be filled with different color renderings through the material name, warm and warm colors, and rendering names. The renderedimage There is no light and shadow effect, no contrast (Figure 5). When the rendered image and the channel image are imported into Photoshop software at the same time, you can use the magic wand tool to render the object you want to adjust more conveniently, so as to make the required adjustment. After post-processing, it can achieve a more realistic performance effect, fully display the artistry and implementability.[3]
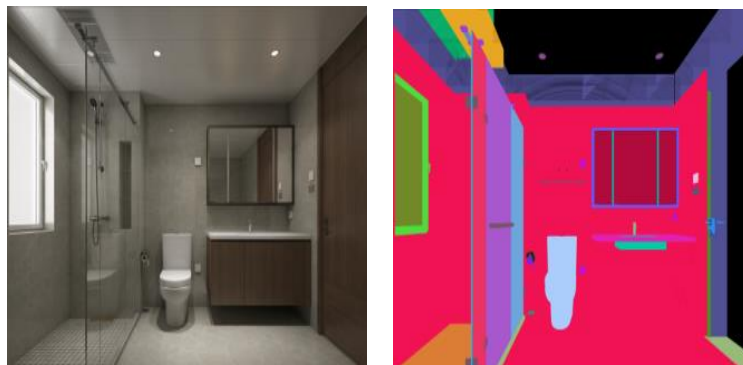

Figure 5 Color rendering

4   Application of computer 3d modeling software in environmental art design

Nowadays, many 3D modeling software have been applied to the actual environmental space design work. Computer 3D modeling software is a means of expressing design ideas and performing environmental art design, not the final result. Designers use these auxiliary software to show their design intentions to non-professionals, instead of just focusing on the beauty of the drawings, they should pay more attention to the interaction between people and space, and the interaction between people and emotions. Make a truly meaningful design that can satisfy users.[4]

5   Design practice of computer 3d modeling software——taking the indoor modeling background wall as an example

Indoor background wall design is an important factor in space design, and it is also the most discussed and researched position in interior design practice, so it is more representative. The background wall has a relatively independent interface and design. Considering the scene and specific use functions, it can play a beautiful and practical role. [5]First, determine the purpose of the background wall. The living room here is wider, so the thickness of the cabinet is 200mm,

which can play a certain storage function. When making the external cabinet door, pay attention to the opening direction of the cabinet door and the size of the handle. Here, you can convert the cuboid into an "editable poly", select the upper and lower edges to "connect", and then combine "extrusion", so that You can get a cabinet door shape that matches the size. In the process of making this modeling wall, the model can be divided into multiple parts for production (as shown in Figure 6), which can greatly reduce the workload of model making, and also need to combine different materials to provide convenience for later material assignment. [6]This background wall can be divided into four parts in total. You can make the outer contour model first, use the box to determine the specific size and proportion, and then perform "polygon editing" on it. When making the metal frame of the TV background wall, use the "Chamfer" tool in the polygon editing menu to shrink or expand its outline, and combine with the "Extrude" command to make a metal frame with four sides closed. The position of the wooden grille can be achieved by copying the box to achieve this shape. When copying, select "Instance Copy" for easy adjustment.
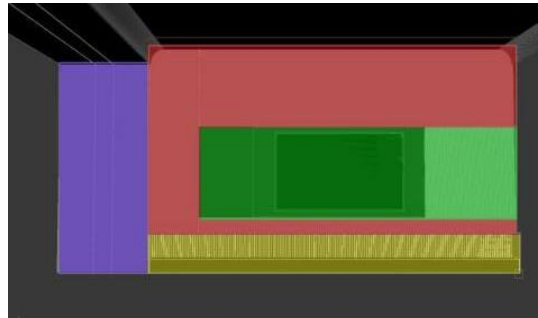

Figure 6 Background wall modeling

When editing the material, the large-area cabinet door panel should be adjusted first. This kind of cabinet door panel similar to the matte material only needs to adjust the basic parameters in the reflection. The default value of the reflection glossiness is 1, which is the strongest Reflective gloss is not suitable here, so it is recommended to adjust it between 0.55-0.8. Metal, on the other hand, needs a stronger reflective gloss, so the parameter will be between 0.8-0.9. If there is a reflection texture you can attach a "bitmap" to the reflection glossiness. The material of the wood veneer needs to add a "bitmap" to the diffuse reflection, and then adjust the reflection color and gloss, generally between 0.65-0.9. If the color of the map is not suitable, you can click "Color Correction" to adjust the saturation of the map., Brightness, Contrast, etc.

Combined with indoor lighting and rendering renderings (Figure 7), in the new v-ray 5.0 version, more adjustments can be made to the rendered images, similar to PS, which can greatly improve the efficiency of post-rendering retouching. In the "BF Algorithm" mode, you can even adjust the lighting parameters directly in the rendering window to get better results.[7]
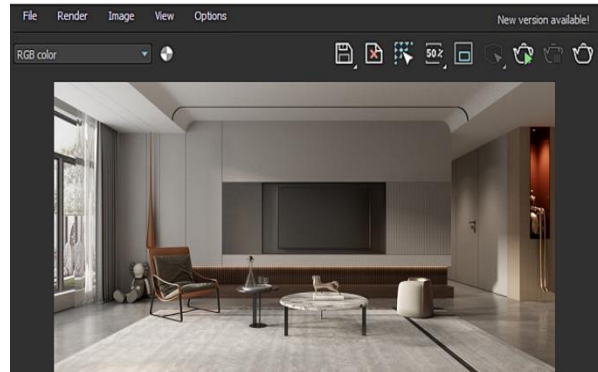
Figure 7 Rendering effect

6   Conclusion

Through the above discussion and practice, the application of computer 3D modeling software to space design can greatly improve the efficiency of design. The application of computer 3D modeling software in space design can make up for the lack of static pictures in traditional design, and also allow users to more clearly see the structure and material effects of each part and the final design scene and layout in the three-dimensional space. At the same time, the input of manpower and space can be greatly reduced. The purpose of the design is never to show on the drawings, but to satisfy the user after production. Computer 3D modeling software will effectively improve the efficiency of design work, better display the design effect, and play an important technical support role in improving the efficiency and benefit of the design industry.

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