

Application of Virtual Reality Technology in Pattern Design Performance

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Abstract:

In the application of pattern design, VR technology can not only perfectly represent the application environment of pattern, but also walk freely in three-dimensional indoor space. At present, VR technology commonly used in the industry can not only roam indoors, but also use VR technology to make pattern system. This paper expounds and analyzes the development history and application cases of virtual reality technology. This paper explores and analyzes the advantages of virtual reality technology in modern industrial design. Several successful cases are cited to illustrate the new idea of applying virtual reality technology to industrial design and its far-reaching significance to the development of modern industrial design. Through the application exploration of virtual reality practice project, this paper finally comes to the conclusion that virtual reality technology does have advantages over traditional pattern design.

Keywords: *Virtual Reality, Industrial Design, Pattern Design, Data Fusion..*

I. INTRODUCTION

With the birth and efficient growth of virtual reality technology, designers pay more attention to how to compare and evaluate relevant design schemes quickly and accurately, and finally judge the value of different schemes fairly and objectively [1-4]. In this process, both designers and product producers will inevitably face unpredictable problems. Designers can only produce samples and modify them over and over again [5]. This method is very unscientific, which will greatly reduce the production efficiency due to the low utilization rate of many artificial assets and other resources [6]. On the other hand, for consumers, the evaluation of design results can only simply rely on the eyes, and the most scientific and reasonable evaluation method should be more real and natural, and evaluate according to the specific use environment of the product. The birth of virtual reality technology makes it possible to realize this demand.

II. IMPLEMENTATION OF VIRTUAL REALITY TECHNOLOGY IN INDUSTRIAL DESIGN

2.1 Introduction and Selection of Virtual Reality R&D Platform

At present, there are two main development engines for games and VR on the market, one is

UnrealEngine 4 and the other is Unity3D. These two engines have high market share, powerful functions and their own characteristics. According to the current domestic market, adopting Unity3D as VR development engine seems to be an ideal choice. It should be noted that, at present, UE4 has less demand among domestic recruitment talents, and Unity3D is easier to get jobs. As shown in Figure 1, during CES exhibition in 2018, Baiteng Automobile released its first concept car [7-8]: BYTON Concept at the press conference. The giant screen in the car attracts the attention of countless people. This kind of large screen can provide users with an experience based on facial recognition, and all this is built by Unity, a VR development engine.



Fig 1. Baiteng concept automobile

Ed Martin, senior product technology manager, said: Unity has been engaged in the game development industry in the past, but today's user experience in the automobile industry has a lot in common with the current game industry. The pioneers of these two industries have discovered these commonalities and started to make new attempts. Applying Unity to the automobile industry is a new opportunity for designers. Unity has been cooperating with many automobile manufacturers for many years. Toyota, Mercedes and Volkswagen Group have all made corresponding virtual reality products through Unity, which can be used to experience autonomous driving and car configuration. Such cooperation makes the automobile design industry even more powerful. Compared with UE4, Unity3D is lighter, easier to learn and cheaper to develop, but its functions are not inferior. The deeper you know about it, the more powerful it is.

Actually, both Unity and UE4 have their own habits, so the author finally chose Unity as the development platform of practical projects. On the whole, Unity is still easier to use, and it has a high market share in China, and the resources of tutorials and plug-ins are more abundant.

2.2 Selection of software environment of virtual reality technology in industrial design

Here is a brief introduction to Chinese Unity 3D 2017, Visual Studio 2017, Maya 2017 and Photoshop CC 2015. Unity3D is a comprehensive and professional high-end game engine developed by Unity Technologies, a famous software company. It is also widely used in the development of VR products.

Microsoft Visual Studio (VS for short) is a very practical and powerful software for code writing and development. It is launched by Microsoft Corporation of the United States and is specially designed for developers. Version VS has been constantly updated and developed, and its functions are becoming more and more powerful. The latest version of VS supports writing in many programming languages. Including C#, C++, Python, Visual Basic, HTML, JavaScript, Node.js and other high-level and low-level programming languages. VS is rich in functions, intelligent identification and shortcut keys are convenient and efficient, and the framework is mature and easy to repair and test [9]. Visual Studio brings great convenience to developers.

Autodesk Maya is a world-renowned 3D animation software produced by Autodesk Company of the United States, which is mainly used in product advertising, 3D animation, post-effect and so on. MAYA has powerful functions and is the main production tool of world-renowned film special effects companies. Nowadays, almost all animated films and long-form animations are made with Maya.

Maya includes the most advanced polygon modeling, key frame animation, special effects of particles and fluids, cloth simulation solution, hair rendering and other functions. Maya has won numerous awards, and it is also the only 3D software that won the Oscar for scientific and technological contribution. Nowadays, Maya software production process is recognized as the preferred solution for 3D animated films. Adobe Photoshop, which we often refer to as "PS", is an image processing tool launched by the famous Adobe company.

Photoshop, a well-known image processing software, is almost a tool used by young people nowadays, and its popularity rate is quite high. Processing the main bitmap image, that is, the digital image composed of pixels. As one of the most famous image processing softwares of Adobe, PS is an essential tool for almost all designers, photographers and artists in the world, and is recognized as the best image and design application in the world. Adobe introduced PS supporting iPad in 2019. From retouching and synthesis to stain repair and blending mode, users can apply all familiar desktop tools and workflow with just a finger.

2.3 Selection of presentation mode in industrial design using virtual reality technology

In today's world, there are many kinds of VR devices, each of which has its unique functions and unique advantages and disadvantages. Therefore, for the selection of VR devices, how to select appropriate VR devices is also a key point of virtual reality exploration. Through the understanding of most VR devices in the current market, the author finally determined two more suitable VR devices. One is a VR head display jointly developed by HTC and valve, namely HTC vive. It mainly includes three parts, as shown in Figure 2: a head mounted display, two handheld handle controllers and a pair of positioning base stations. The function of positioning base station is to synchronously track the display and controller.

In the head display, HTC vive has 2K resolution, which greatly improves the picture quality. Now the head display has supported wearing glasses while wearing the head display. Users with medium and low myopia can clearly see the picture details even without glasses. The specific parameters are the picture refresh rate of 90hz, the data display delay of 22ms, and the field of view angle of 110 degrees [10]. The

head display is also equipped with steamvr tracking technology, G-sensor correction, gyroscope gyroscope, proximity distance sensor and other sensors.



Fig 2. HTC Vive accessories

The controller and the spatial positioning and tracking base station do not need any camera to capture the positioning, but completely rely on the laser and optical sensor to determine the position information of the moving object. The space positioning and tracking base station can set up standing posture, sitting posture and room model. There is no minimum space limit for standing posture and sitting posture. The room mode can walk within a certain range. The minimum range can support a space of $2\text{m} * 1.5\text{m}$, and the maximum space is a diagonal distance of 5m between the two base stations, i.e. $4\text{m} * 3\text{m}$.

III. PRACTICAL APPLICATION OF VIRTUAL REALITY TECHNOLOGY IN INDUSTRIAL DESIGN

3.1 System implementation of practical project

As shown in Figure 3, the UI interface is simple and easy for users to operate. The initial interface has only two buttons, one is to control the light interface, and the other is to control the display and hiding of the body. The disc button in the middle is hidden at the beginning. When we right-click the body, the color wheel in the middle will be displayed, and its function is to control the change of body paint color. The background grid of the button is realized by grid programming in order to facilitate control. For the two buttons in the lower right corner, in order to better user experience and avoid some unfriendly bugs, we have added the same animation effect to the two buttons. At the same time, it also adds the function to facilitate users to judge the current operation state. When we click the button, the text will change from off to on, and click again to change back to off.

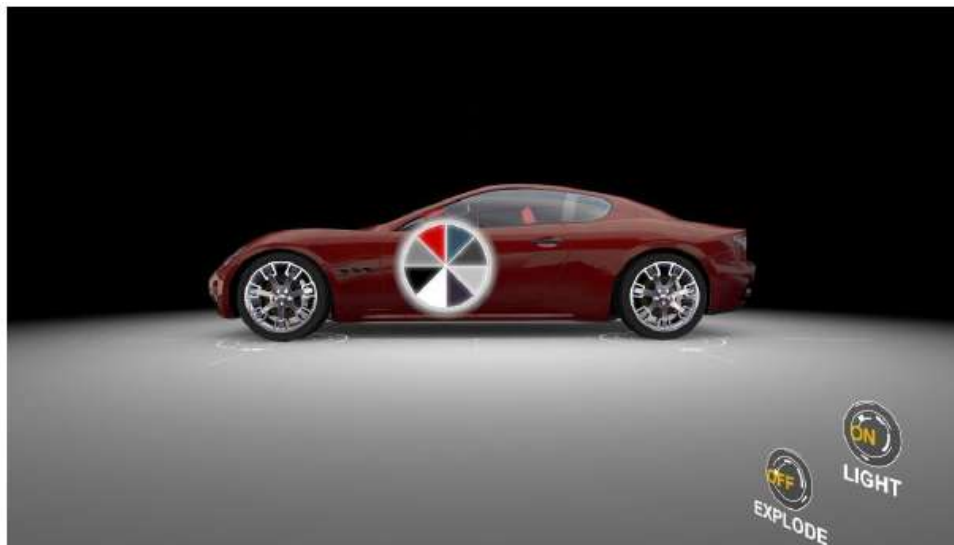


Fig 3. UI interface

The products and displayed works are always displayed in the center of the interface scene. The author uses the interactive mode of mouse to display the products and works. When we press the left mouse button and drag up, down, left and right, the camera will rotate 360 degrees around the middle product. In addition, when we slide the mouse wheel, the lens will be closer and farther. Lighting effect is also a very important link in the car display effect. Usually, self luminous map will be selected to realize it. However, in order to achieve a more realistic effect, the point light source of the lighting system and the coolie mask are used here. At the same time, for better effect, the animation effect of flying in and flying out is added to the light.

3.2 System test

These bugs may be caused by the undetected errors in the development process of the system, and may also be caused by some bugs in the optimization process. Software testing is a review or comparison process between actual output and expected output. The classic definition of software testing is: the process of operating the program under specified conditions to find program errors, measure software quality, and evaluate whether it can meet the design requirements.

The purpose of system testing: (1) testing is the process of executing the program in order to find the errors in the program. (2) A good test plan is a test plan that is likely to find errors that have not been found so far. (3) Testing is not just about finding errors. By analyzing the causes and trends of errors, project managers can find defects in the current software development process for timely improvement. (4) This analysis can also help testers design targeted testing methods and improve the efficiency and effectiveness of testing. (5) Testing without errors is also valuable. Complete testing is a method to evaluate the quality of software. (6) In addition, according to different test purposes, there are regression test, stress test, performance test, etc. to test whether the modification or optimization process causes new problems, whether the software can achieve the processing capacity and whether it can achieve the

expected processing capacity, etc.

Through unremitting efforts, the author finally completed the practical project, encountered many difficulties in the production process, and summarized a lot of experience, which is summarized as follows: (1) face number control. In the 3D software, the number of faces of the model should not be too many. Too many faces will affect the calculation speed, cause jamming, and even cause display errors. This requires reasonable wiring to control the number of faces of the model, do not have redundant points, lines and faces, and use the least faces to achieve the desired effect. (2) Model control. After the model is made, you need to check carefully, delete redundant invisible points, lines and faces, and name the model. After deleting the history and freezing the transformation, bind the bone. (3) File placement. The project needs to unify the project directory, especially in multiple software environments. There are strict requirements on the path of files. If the materials are not placed according to the regulations, the files will be lost. (4) The texture of the object. The texture of objects is mainly realized through three attributes: diffuse reflection, bump map and highlight. Now, the method of connecting normal map to bump attribute is generally used to achieve richer and realistic bump effect. (5) About replication. If it does not affect the large effect, the similar models in the scene should be solved by copying as much as possible. When copying, the associated copy should be used, so that the attributes can be changed uniformly and the efficiency can be improved. If a 500 face model is copied by hundreds, then hundreds and one occupy the same resources.

IV. CONCLUSION

Through this experiment, we can see that virtual reality technology can best reflect its value and use for modern industrial design. In addition, virtual reality in industrial design is not only limited to automobile design, but also to national defense. It can be used in the design of guns, ammunition and arms. At the same time, the preliminary completed weapons and equipment can be evaluated by actual combat simulation, and the defects can also be modified as soon as possible.

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