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Development of virtual exhibition display system based on mixed reality technology

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ABSTRACT

Virtual Exhibition based on Mixed Reality Technology may greatly enhance the interaction between product and visitor. In this paper, The Virtual Hall roaming and product displaying system is designed, built from the aspects of the design ideas, technical solution, interface, running processes, and hardware and software systems. The method of basic structure of Mixed Reality Technology and its application in the virtual display was proposed。

Key words: Mixed Reality; roaming system; interaction interface; virtual display

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INTRODUCTION

The mix reality (Mixed Reality, is called MR) developed on the virtual reality technology, produces the virtual object which does not exist in the realistic environment through the visualization technology and computer graph technology [1]. and by the sensing technology the virtual objects are placed into the true environment accurately, the virtual object and the true environment are merged into one whole with the aid of the graphic display device and present a real sensory effects to the new environment, the real environment and the virtual object in real-time are superimposed onto the same screen, the mix reality is integrated development of real reality, virtual reality, augmented reality and interactive media .Not only it provides new projects of theoretical study with modern technology but also creates a new world for the development of modern products[2].

The most direct and intuitive way is the product entity demonstration shown in front of the customer .But along with the time development, the information content eruption, and this way cannot meet customer demand for information collection. Now the mainstream optimal way of display is using graphic images and text to show the product. But the products display don't fully reflect the product's appearance and characteristics, basically still stick in two-dimensional static form, Virtual online products have become main stream, which break the traditional display technology limited in time and space. Study on the combination of digital technology to display products includes only two main parts: one is by means of digital design of assistant technology to make and design product. for example, design softwares as CAD, 3d max rendering, Photoshop can render virtual exhibition design effects[3], The second is dominated by virtual reality in digital technology domain. "Mixed Reality" technology as an integrated and extended technology on the basis of the real reality and virtual reality has fewer current application and discussion in domestic product design.

VIRTUAL DISPLAY MODE ADVANTAGE

A. UNRESTRICTED BY THE TIME AND SPACE

It must be restricted by Traditional display in space and time fixed conditions. The same time in the same space within the obtained information quantity is limited by environment, as we want to go to a number of shops, which in the past was impossible. But the virtual display can, because of its real-time and network discovery features, we only need to

open more than a few windows, it is convenient to browse products and access to information, to have a choice to keep the information in a personal computer [4].

B. THE PERSONALIZED INTERACTIVE MODE

Virtual exhibition design is not only real time but also interactive [5]. The interactive ability is mainly reflected in the full range of personalized behavior mode, the user can choose their own way to browse and participate in activities. In the virtual environment, users can give full play to their imagination. Act as their wish without affecting the others. This point with the era of personalized features and virtual display brings renewed perspective to observe the environment and life, to help us create the virtual environment and numerous digital lives.

C. ADVANCED DISPLAY CAPABILITY

Traditional display can display existing goods, and all products only in manufacturer and shelves can be known [6]. Virtual display of scene, can not only from the current reality, can also display products which has not been produced. All the products designers conceived can be the first time for people to understand, and timely feedback, can avoid invalid design. Three dimensional digital life breakthroughs the world's bondage, more freely, more abundantly, only the human imagination can restrict it. The goal of virtual display is to seize this point, increase information transmission mode. Content is more rich and attractive. Virtual display mode completely abandoned the reality show, hoped to complete all the functions through the network .but there still exist many drawbacks of virtual exhibition: pictures, words cannot fully demonstrate the product; [7]3D virtual display cannot achieve the requirement of people, and by the hardware and software and network bandwidth limit, low efficiency.

SUMMARY OF THE TECHNOLOGY OF AUGMENTED REALITY

Virtual reality and Augmented Reality are based on computer simulation. They have both the differences and the links[8], and technologies development have mutual influence, cross-cutting and progress together.

(1) Real reality

From a philosophical point of view, the real Reality has two meanings. the first meaning refers to the true reality of the objects which exist in the physical form that provide human cognition, and human interaction, and provide solid basis for all human activity. In Augmented Reality systems, where the real meaning of reality emphasis on these cond floor, that is, as a form of knowledge of the true reality. they are human cognitive results of the objective world, you can use various types of sensory experience directly, or indirectly through the video window displays

(2)Virtual reality

Virtual Reality(VR for short) is the digital virtual environment similar to the real world generated by computer. In 1965, the American scientist Drivansuther land proposed the ultimate display concept that the observer can watch virtual worlds computer generated beyond the computer screen, and you can have immersive feeling. In the early 1980 of the 20th century, the United States vpl company founder Neil (Joaron Lanier) formally proposed the term virtual reality. Until the end of 20th century, the integrated information technology was truly risen. The virtual reality has three basic features, that is, immersion, interaction and imagination. Users in a variety of sensors and control devices, such as head-mounted and three- dimensional display, data gloves, voice recognition and tracking technology, immersed in the virtual environment which gives users a new way of human-computer interaction. But at present, the computer Related Hardware and graphics processing are not on the level. there is still a certain gap between virtual environment and the complexity and authenticity of the real-world, they cannot achieve the ideal of "being-Interactive-vision" status. How will we integrate the digital virtual world with the real world? How to make the perception of users have the experience only in the virtual world can experience? Thus, the "Augmented Reality" Technology has emerged and became one of the main directions of development and evolution of virtual reality technology.

(3)Augmented reality

Augmented reality produces the virtual object which does not exist in the realistic environment through the visualization technology and computer graph technology [9] and by the sensing technology the virtual objects are placed into the true environment accurately, the virtual object and the true environment are merged into one whole with the aid of the graphic display device and present a real sensory effects to the new environment.

PRINCIPLE OF THE SYSTEM

A. Software and hardware support in the system

There are two kinds of implementations in virtual reality, software and hardware implementation[10]。

There are several main software technologies:

(1) XML technology, construction on the information network display technology.

(2) J2EE development technology, a system architecture using the java 2 platform to simplify the organization

solution development, deployment and management of complex issues.
(3) VRML technology, mainly refers to the Virtual Reality Modeling Language, you can use to create a virtual simulation scene with a real-time roaming features, and watch in your browser, with the technical features such as emphasis on real-time interactive user, multi-user support and Scripting support.
(4) two-dimensional graphics processing software such as Photoshop, AI; three-dimensional software such as May a modeling and 3d max, rendering and obtaining three- dimensional data.

Hardware Implementation of Augmented Reality System Monitor can be divided into main helmet-mounted display (hmd) and non-helmet-mounted display device[11], non-helmet-mounted display device typically include CRT flat LCD monitor, hand held monitors, projection display and display equipment for special occasions, in practical applications, users can select the display device based mainly on the environment and tasks.

The system mainly uses software: 3d Max modeling software, cult 3d designer editing software, dream weaver software, such as artoolkit interactive software. Hardware use flat LCD monitor.

B. Basic Principle of pavilion products

The system achieves interactive control actions to virtual objects through integrating artoolkit and MFC[12],Using real-time trigger on men us and buttons in the MFC, calling trigger function of MFC classes in the framework of the message successfully. It not only successful implement the function but also compensate for the disadvantages of the artoolkit development platform lacking of interactive interface. Fig. 1 illustrates the model of the routing table.

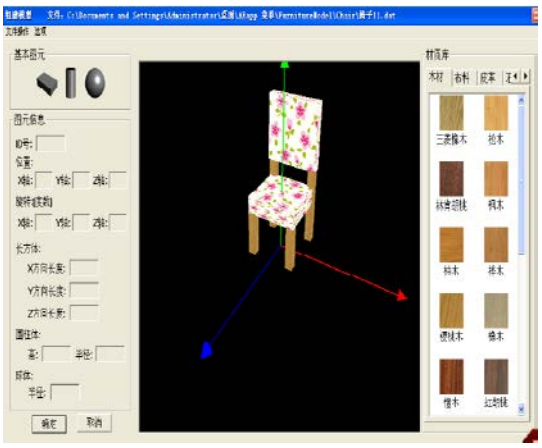

Figure1.Table model in the scene

C. BASIC PRINCIPLE OF PAVILION ROAMING

3D models, animations created in 3D software, need to become C3d file format which Cult 3d Designer can accepted, and then interact in Cult 3d Designer, and derive the webpage available file. Specific development process is shown in Fig 2.

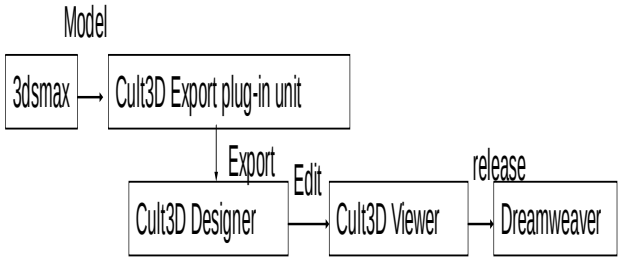

Fig 2. development process

THE SYSTEM IMPLEMENTATION

A. Modeling of Virtual Exhibition Hall and products

Today more widely used Augmented Reality application softwares (such as the artoolkit) generated with the OpenGL graphics render virtual objects so that users do not need to consider the specific implementation details, as long as the parameters for open gl function can be. This is a simple and relatively efficient way to meet the general requirements of Ar System, But in order to make the whole system more vivid, realistic stronger, therefore, high demand is needed to import virtual object model, so just using OpenGL to generate rules model (such as cuboids,

sphere, cylinder) is not enough. The system uses a combination of two kinds of modeling tools[13]. It not only complete virtual household model of real-time interactive modeling operations to enrich the interactive features of the system as a whole, but also directly import 3d models generated from 3d max modeling software. 3d max software have reached a mature stage after years of development, more and more common users can build a virtual model, which can avoid the process by calling Function procedure to draw a complex shape[14]. Therefore, the appearance of the model will not be restricted, this greatly enhances the realistic and vivid entire virtual scene. Fig3 shows modeling of the pavilion and Fig4 illustrates product modeling. For the Obj format model not only supports polygon models, normals and texture coordinates, but also takes up less storage space, so the system will import 3d models in Obj format file.

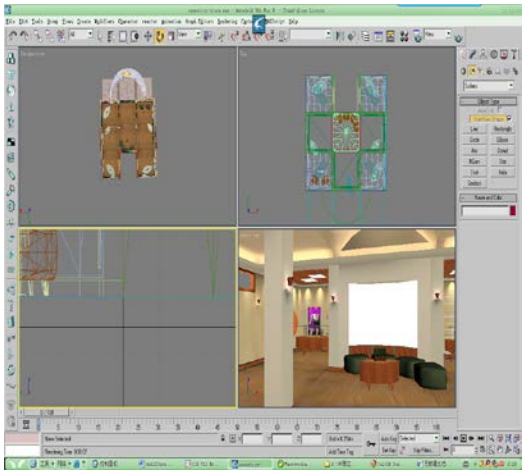

Fig. 3 modeling of the pavilion

Fig. 4 product modeling

B. Set interaction process in Cult3D

The system uses Cult3D as interactive software, first installed three program of Cult3D on computer, and then selected the export command in file menu in 3DS MAX, and derived type as C3d; in this way, the file format of the model and animation can be identified by Cult3D Designer [15]. The C3d files are added to the Cult3D Designer with appropriate interaction, then output into a. Co file format, the specific steps are as follows:

First of all, under the file menu “add Cult3D Designer file” importing m. C3D file. Then in Scene Graph (scene) window all model object will appear in 3ds Max, such as camera, and all views, and all parts, and material, also can group the same of object composed.

Below the Scene Graph (scene) of the window is Action window, this includes all Cult3D perform actions, we often use actions such as motion rotation, zoom, mobile etc. Set the mouse and keyboard interaction as in Fig 5.

After confirming that all interactions are set up by Cult 3D Designer saved under the file menu and then generates a file command which can be used in other software published in m. Co file and a Web page at the same time. At this point, Cult 3D set Designer interaction process is largely over.

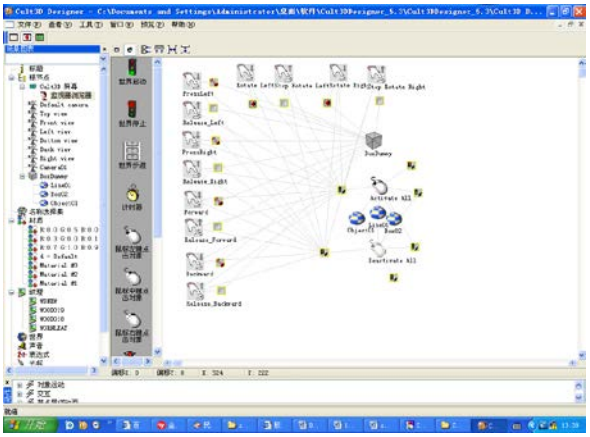

Fig. 5 Interactive interface

C. Set interactions in Artool Kit

The system take identified objects changes in the horizontal direction for example, pick the x -axis direction vector trans[0][0] in transformed matrix, and amplify to be a certain multiple (the purpose is to make the effect more obvious), and then define a self plus (or reduced) variables, In this way, as the rotation of the markers, rotating vectors in the X direction will change in the real environment. virtual objects by a plus (or reduced) variable control will Zoom in (or Out). The design is easy to understand and implement. This procedure is illustrated in Fig. 6. But this interaction has certain disadvantages, that is, the less stable, more accurate to identify the location of the place requested, require a certain amount of secondary menu interaction. Detailed code execution is as follows:

```
Void CA Rapp View::Fang Xiang (double trans [3][4])
{
int tran=0;
tran=int(trans[0][0]*50); //rotates vectors in the X direction will be magnified 50 times, and forced into integer
int k=tran-fangxiang; //Judge whether the rotation occurs
fangxiang=tran;
if (k !=0&&Control) //Identify the round and trigger message
{
angle-=0.005; //Variable reduction, the model reduced
}
}
```

Fig. 6 Virtual objects display after rotating markers many times

C. The program interface display

Users can use the arrow keys on the keyboard or the A. S. D. W. key to control the direction of view visit. The two buttons of Page Up and Page Down can look up and down; keyboard button C can simulate the squat effect, Z. X respectively adjusting the walking speed whether it is fast or slow. Using keyboard W control in advance, the S control back, the A control to the left, D control right, Z control forward, X to slow down, R back.

The pavilion virtual products display interact through the menu choice to achieve rotate, move, scale, material change,

lighting effects[16]. As shown in Fig 8.

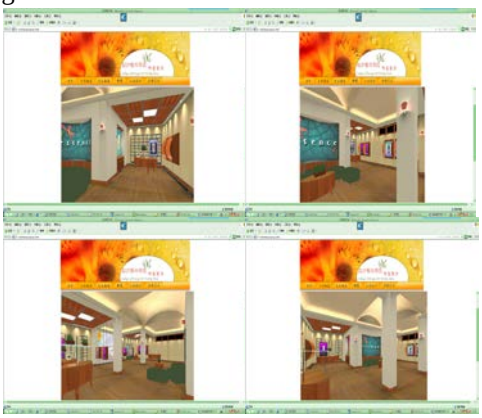

Fig. 7 Hall running multi-angle roaming

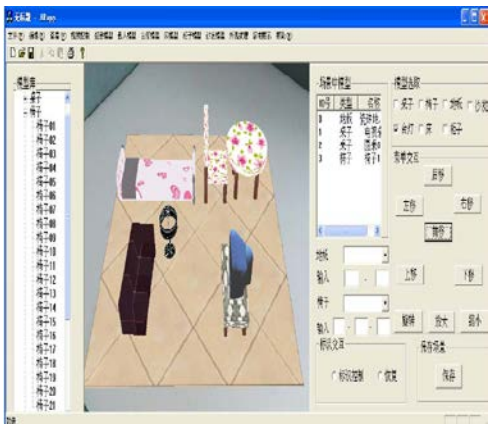

Fig. 8 Exhibition halls products interactively interface

CONCLUSION

Mixed Reality Technology combines with other computer technologies such as graphics technology, Simulation Technology, multimedia technology, artificial intelligence, parallel processing technology and multi-sensor technology etc. [17]. Application of Mixed Reality Technology, not only deny the traditional way of real show, but also give better display to the product features, speed up product information, broad the width of the product information dissemination and enhance the accuracy of product information delivery. This system successfully Applied Mixed Reality Technology into the exhibition hall show, providing successful cases for high technology applications in the pavilions.

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