

# Design on Interactive Virtual Display Based on User Experience

Yanmin Wang<sup>1,\*</sup>, Peihan Song<sup>2</sup>

<sup>1</sup>University College London, London, United Kingdom

<sup>2</sup>University of Glasgow, Glasgow, United Kingdom

\*Corresponding author: 15940260897@163.com

**Abstract:** In the course of the continuous development of science and technology, enterprises are giving increasing priority to the virtual display of products as a result that the way of picture display, text description, plane publicity posters, and others have been unable to meet the growing cultural needs of consumers. Most enterprises have realized that only by selecting the way of product display from the perspective of user experience can the communication and interaction between enterprises and users be realized so that users can better experience the features and functions of enterprise products. In this way, this paper realizes the design of interactive virtual displays based on user experience.

**Keywords:** User experience; Interaction design; Virtual display

In the development of post-industrial society, consumers are no longer satisfied with the pursuit of needs in material and food, and clothing, rather they pay more attention to the consumption process, that is, the experiential consumption mode. At present, most designers gradually come to realize that they should not only pay attention to product modeling and function but also pay attention to the physiological and psychological system research of consumer groups so that consumers can resonate with the design to meet the personalized needs of consumers. Therefore, the product virtual display experience arises at a historic moment [1].

## 1. User experience and interactive virtual display design

### 1.1. User Experience

User experience refers to the psychological feelings created by users in the process of using products or enjoying services, which is also the interaction between designers and programs, products, and systems. User experience runs through the whole production practice and design activities, and all the activities that users participate in enjoy the user experience. Since the early use of ergonomics for usability design, most designers also pay more and more attention to user experience, which plays an important role in the design field.

### 1.2. Design of interactive virtual display

There is no unified concept of interactive virtual display design, and interactive virtual display in this article refers to virtual reality technology as a means of display technology. Based on the two-way interaction between exhibits and audiences in the exhibition space, the virtual technology platform is used as the display presentation mode. Two-way interactive display design and interactive virtual display refer to the way of cross-art expression, which has a close relationship with display design, involving display design, but also integrating video art, new media art, and other contemporary art. Interactive virtual display design is more abundant than traditional display design. Media diversification and all-around sense enable interactive virtual display design to be endowed with high commercial and cultural value [2].

## 2. Design case Interactive virtual display system

Take the reference shape and size of a refrigerator picture as a case to model and restore the display shape and size of the refrigerator:

### 2.1. Creating a virtual model

3D software is widely used in the design. 3D virtual modeling is a kind of 3D animation and modeling software. In this paper, the modeling software is 3DS MAX, which can be run openly through a PC and can integrate a large number of third-party plug-ins. Therefore, it can make 3D animation and special effects and conduct modeling according to product imaging attributes. Figure 1 shows the process of creating virtual models.

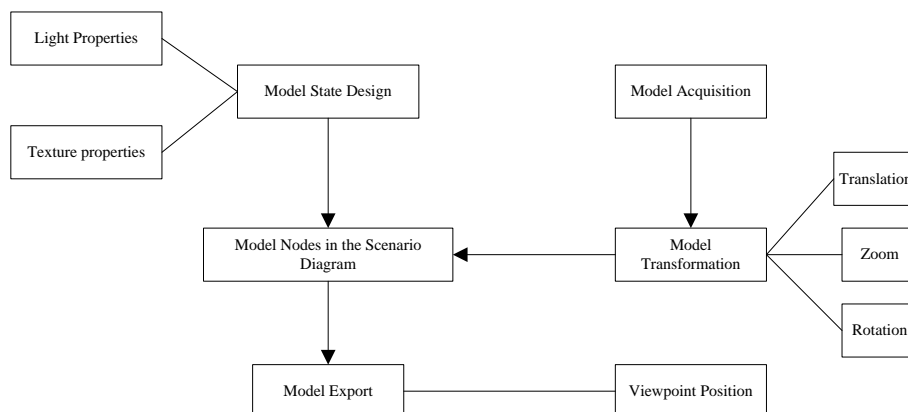


Figure 1: The virtual model creation process

Creating the model using the OSG development platform, which refers to the cross-platform C++ library. To realize the virtual display of products in the OSG development platform, it is necessary to realize the placement and collocation of products in a specific environment and to fully show the aesthetic feeling of architecture in the display process. In the process of modeling, different house types are regarded as specific environments, and wallpaper lamps and lanterns are used as model devices.

The composition of space refers to the arrangement of directions and specific positions in 3D space. In graphic space, the conventional 3D coordinate system is used, and the point coordinates are  $(x, y, z)$ . Each point in the virtual space is defined. To properly set up the product in the virtual space, create a relationship between the furniture and the OSG platform. Therefore, simple spatial relations are used to describe the spatial relations of two objects in 3D space. The relationship between the two is rotation and translation, expressed as:

$$X' = RSX + T \quad (1)$$

In the equation,  $X = (x, y, z)^T$  refers to the placement point of the 3D virtual model of furniture.  $X' = (x', y', z')^T$  refers to points in the OSG platform. Besides, R, S, and T respectively refer to the transformation matrix of rotation, proportion, translation, and other products in the OSG platform. A 3D virtual model is created by defining the relationship between products through specific meaning words in life [3].

### 2.2. Design of display of interface structure

#### 2.2.1. Product structure design

Product structure design refers to the skeleton of interface design. A good interface architecture can enable users to understand the theme of the displayed product for the first time when browsing the interface. In addition, it keeps the interface simple, and clear with highlights. In the process of designing the structure of the refrigerator display interface, different steps of browsing should be reduced and the commonly used horizontal navigation bar should be used to avoid the top-heavy interface [4]. Figure 2 shows the structure of the refrigerator display interface.

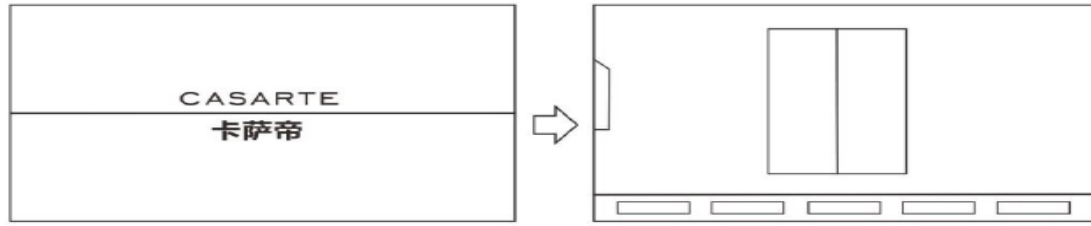


Figure 2: Structure of refrigerator display interface

### 2.2.2. Interaction design

Users can use the interface functions conveniently and effectively. For example, users will choose the functions and features in the interface design process based on their habits or preferences, regardless of which tool to use. Users should keep thinking clearly and make clear their position in the web interface. The main purpose of interaction design is to design users to browse the interface pleasantly with a purpose to improve their satisfaction with the display interface and avoid falling into the operator interface with complex interaction and various functions and enable users to view information content easily.

Unity3D can maximize the user's requirements close to the product, to show it lifelike. Unity3D is a multi-platform game development tool with realistic effects and a lot of room for expansion. Unity3D supports most file formats, and complex scenes can run on low-end computers. To meet the needs of users, this paper takes Unity3D as the development platform [5]. Figure 3 shows the process of virtual display of products.

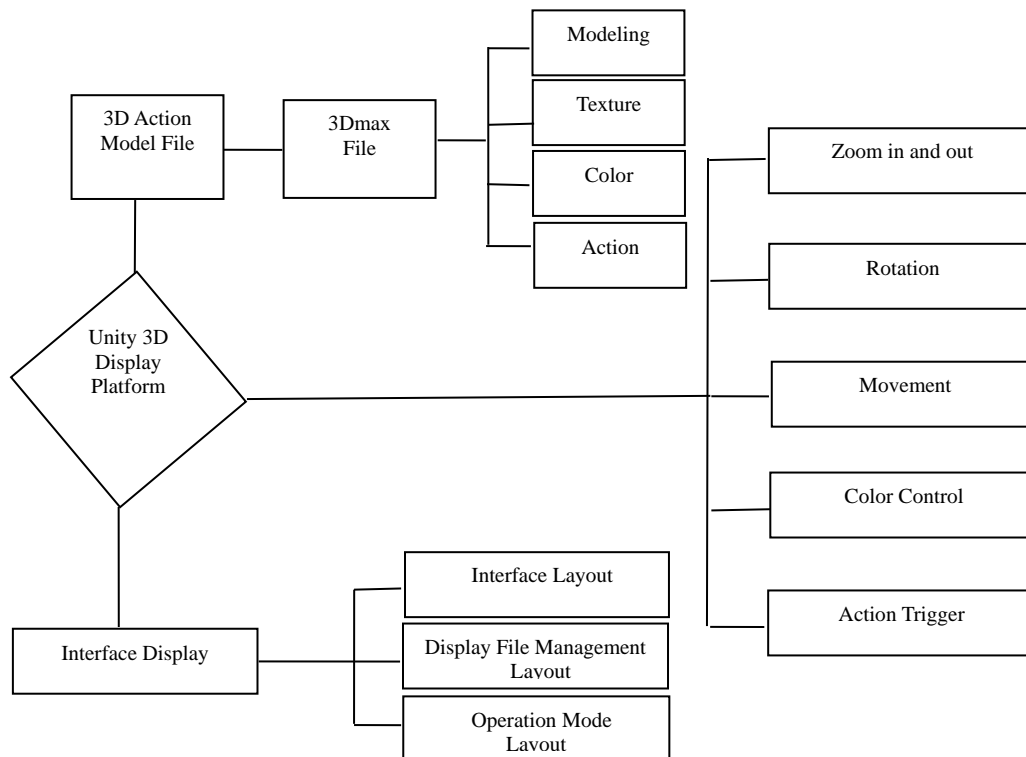


Figure 3: Process of virtual display of products

### 2.3. Visual design

Display design should be conducted with more emphasis on design elements, such as font size, interface layout, and main colors. Excellent display interface design is conducted by making full use of the layout and arrangement of various design elements, which can meet the user's visual flow and guide the user's browsing. In this paper, the refrigerator is taken as an example to design the main interface. LOGO is marked in the middle of the main interface so that users can know what they are experiencing.

The additional, mass tone is particularly important. The main color of the refrigerator display interface design is blue and black elements. In the process of interface design, the gradient of black, deep-sea blue, and sky blue are extracted as the main color. Based on this, the dynamic aperture with the sense of technology came into being. After determining the visual style of the main interface, the second interface is designed. To make the user know what to do next, the color of the second interface is used as the background of the main interface. With the continuous development of the Internet, people's living habits have changed, and consumers are accustomed to shopping online, so the product display and picture display of online shopping is used to guide users' self-experience [6]. Figure 4 shows the display and guidance page of the interactive virtual system.



Figure 4: Display boot page for interactive virtual system

#### 2.4. Virtual interaction scene design

The 3D scene is represented by 3D virtual model data, so a 3DS MAX plug-in is developed to calibrate digital elevation data and superimpose digital orthoimage data so that DEM data after calibration is processed with superimposed DOM data, and FBX format files in the OSG platform are obtained. Space Furniture 3D model database can be used to set FBX files, including location, color, etc., and achieve overall effect rendering. The left and right eye orientation is realized by the stereo vision of the human eyes so that the virtual scene has a three-dimensional sense.

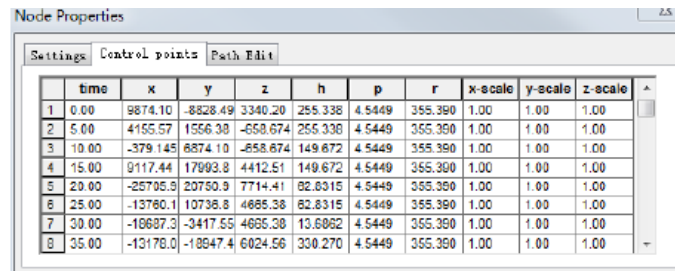
##### 2.4.1. Roaming and walking

In the user presentation environment, the common interaction is roaming through the virtual environment. In the design process, the camera simulates the user's eyes, and the Walk interface is set in the camera node to simulate the user's sense of motion and space in high and low places such as stairs. The rotation speed is set to 500m/s and 20deg/s. The mouse is used as a roaming tool to improve user familiarity. The simulation of real physical space is used to eliminate the strangeness of users and improve the attractiveness of virtual displays to users. Figure 5 shows the walking node.



Figure 5: Roaming node

### 2.4.2. Automatic viewing



	time	x	y	z	h	p	r	x-scale	y-scale	z-scale
1	0.00	9874.10	-8828.49	3340.20	255.338	4.5449	355.390	1.00	1.00	1.00
2	5.00	4155.57	1556.38	-658.674	255.338	4.5449	355.390	1.00	1.00	1.00
3	10.00	-379.145	6874.10	-858.674	149.672	4.5449	355.390	1.00	1.00	1.00
4	15.00	9117.44	17993.8	4412.51	149.672	4.5449	355.390	1.00	1.00	1.00
5	20.00	-25795.9	20750.9	7714.41	82.8315	4.5449	355.390	1.00	1.00	1.00
6	25.00	-13760.1	10738.8	4685.38	82.8315	4.5449	355.390	1.00	1.00	1.00
7	30.00	-10687.3	-3417.55	4685.38	13.6862	4.5449	355.390	1.00	1.00	1.00
8	35.00	-13178.0	-18947.4	6024.56	330.270	4.5449	355.390	1.00	1.00	1.00

Figure 6: Key nodes

If the user is not familiar with a virtual display, then in large space roaming is not used. To quickly attract the user's attention, it is necessary to carry out interactive operations on the virtual. In the initial stage of the virtual display, virtual display information can be easily accepted by automatic viewing. ViewMaker node is used to set different perspectives, and through XYZ's three position coordinates and direction coordinates, users can return to a set perspective according to 0-9 in the virtual display process. A certain regular connection is used in the perspective to provide continuous viewing paths for users so that users can watch them automatically. Figure 6 is the key node.

### 2.4.3. Structure display

To enable users to clearly understand the internal structure of the object to achieve the purpose of the virtual display. Deepening users' impression of the display, meeting users' demand for virtual display emotional experience and showing the internal structure of the product. The structure of the refrigerator is complex, so it should be preliminarily divided. Virtual display model classification is realized in model tree species. Different nodes can be programmed based on a certain logical relationship. In the virtual display process, the keyboard or navigation control should be used to design the product model. This process is reversible, which can improve the security of users. Users can view the detailed structure of the model with the help of rotation so that the sense of accomplishment and operation can be satisfied.

## 3. Virtual display test

After the design is completed, a usability test is carried out to verify the effectiveness of the design virtual display method. To eliminate the errors caused by insufficient equipment configuration during the test, the same high-configuration computer was configured for both tests to support the virtual display running smoothly. During the experiment, the tester used traditional methods and design methods to realize the multi-angle display of refrigerator rotation. The test results show that the interactive virtual display designed in this paper can realize the roaming of product display space and shorten the distance between consumers and enterprises. This kind of virtual experience meets the needs of users and considers consumers from their perspective of users [7].

## 4. Conclusion

Due to the complexity of the display process of traditional virtual furniture and the low success rate of users in the experience process, this paper proposes a virtual display design based on user experience. The virtual display system designed in this paper can meet the needs of users from the perspective of consumers as users.

## References

- [1] Cheng Xiaoxiao. Research on furniture virtual display design based on user experience [J]. *Modern Electronics Technique*, 2020, 43(5):4.
- [2] Wang Haizhi, Peng Xin. Research on user experience innovation of Norwegian Petroleum Museum from the perspective of service design [J]. *Design*, 2020, 33(1):3.
- [3] Su Ke, Xu Luqing. Research on user experience evaluation model based on DBN in game design [J]. *Packaging Engineering*, 2020, 41(2):7.
- [4] Hu Yan. Design of effective information feedback fusion model for interactive virtual system based

*on user experience [J]. Modern Electronic Technology, 2020, 43(22):4.*

[5] Liao Tianhui, Zhang Sen, Wen Limei, et al. *Research on vehicle human-computer interaction emotional design strategy based on user experience[J].Modern Industrial Economy and Informationization, 2022, 12(1):3.*

[6] Zhao Tingting, Zhang Jie. *Research on interactive design strategy of the panoramic virtual exhibition of museum based on situational cognition [J].Art Science and Technology, 2022, 35(1):5.*

[7] Yu Guowei, Luo Ying. *Research on interactive design of Mobile software of Xiangxi Miao embroidery based on user experience [J]. Green Packaging, 2021(3):7.*