



Design of Human-Computer Interaction Experience Platform in Virtual Space Under Scientific Information Technology

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Abstract. With the continuous progress and development of electronic science and information technology and modern information network technology, “virtual reality technology” (VR) has been widely used in various industries. In environmental design, it makes up for the shortcomings of the design scheme when traditional design can only be shown with two D drawings and three D renderings. Virtual reality technology has many application mode, it can simulate the building interior space, real present design characteristics, change the furniture style and interface decoration, let the user get more realistic experience and fun, and it can also timely according to customer demand arbitrary change design, save time cost, avoid the waste of resources.

Keywords: Virtual Reality Technology · Indoor Space Design · Human-computer Interaction Experience

1 Introduction

1.1 Concept of the VR System

The full name of VR is virtual reality technology, which uses a computer to generate an interactive 3 D dynamic view. At present, virtual reality technology can be divided into narrow and broad aspects:

In a narrow sense, the virtual reality:

Virtual reality, also called infinite virtual reality, is the ideal state. This means that computers are used to create a 3-dimensional virtual environment, which the experimenter can invest in using a variety of devices (3D glasses, head-mounted displays, circular projection devices, motion-sensing handles, etc.). In this environment, experiments can observe objects in the environment through natural skills (such as limbs and orbit), obtain multidisciplinary and natural observations, and have huge effects.

Generalized virtual reality:

It is often about creating an interactive environment simulating the real world, focusing on the interaction between humans, which also extends its research and applications.

1.2 Historical Evolution of VR Technology

The research and development of VR technology can be roughly divided into three development stages as show in Table 1.

Table 1. The development stage of VR technology

stage	time	figure	Event impact
Early Period: 1950s–1970s	In 1956	The American photographer, Morton Heilig	Has developed and produced the first photography machine to simulate the simulation environment: Sensorama Simulator
	In 1965	“Father of computer graphics” Lvan Sutherland	At the IFIP conference, The Ultimate Display has for the first time explicitly proposed a 3 D virtual sound system composed of sound devices and virtual sound with powerful audio feedback capabilities
Practical phase: 1970s–1980s	In 1973	Myron Krueger	Artificial reality is presented
	In 1989	“The Father of the VR”, Jaron Lanier	“Virtual Reality” was formally proposed for the term virtual reality
Stage of rapid development: from the 1990s to now	In 1993	Boeing Co	The Boeing 777 aircraft was successfully designed using VR technology
	In 1994	Burdea G and Coiffet	“Virtual Reality Technology” published the book “3I” (Imagination, Interaction, and Immersion) properties
	In 2012	Oculus Rift (Virtual reality device)	Starting a wave of civil VR equipment

1.3 Present Situation of VR Technology

The range of technologies in virtual augmented reality includes modern computer graphics, sensor processing techniques, dynamics, optics, artificial intelligence, and social psychology [1]. And based on information technology and new human-computer interaction. Modern information technology uses it to create realistic virtual environments

by creating visual, auditory, and touch. Users use the necessary devices in a virtual environment to naturally interact with objects to create the same feel and experience as the real environment.

The year 2016 is the first year of China's virtual reality related technology. In recent years, VR technology has developed rapidly and steadily in recent years as show in Fig. 1.

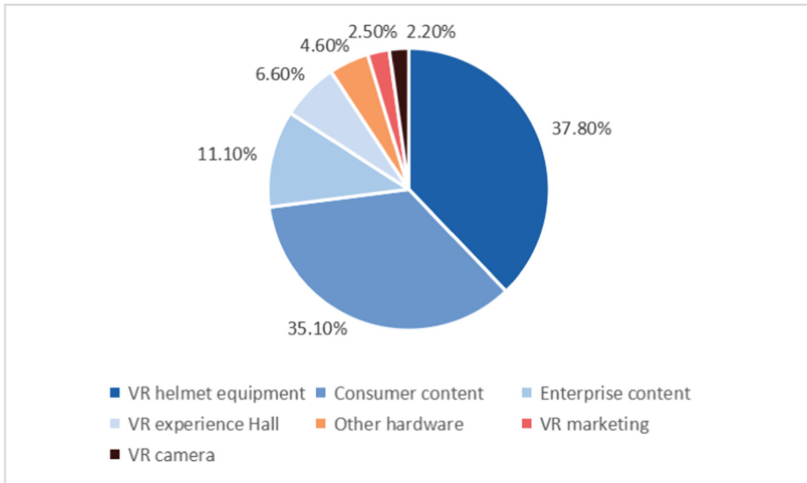


Fig. 1. Estimated proportion of various Chinese VR market segments in 2021 (unit: %)

According to the big data virtual reality in KPMG 2020 Technology Industry Innovation, many domestic people have promoted their online commercial office and consumption during the epidemic period, so domestic enterprises have also begun to increase their

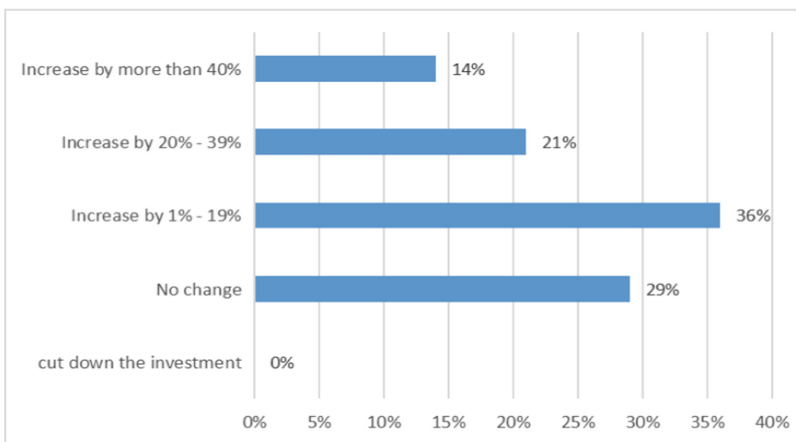


Fig. 2. Changes in enterprise investment in virtual reality technology in 2020 (unit: %)

research and development investment in domestic virtual augmented reality as show in Fig. 2.

1.4 Characteristics of the VR Technique

Virtual reality technology is widely recognized by the public as an interactive experience of a product, contributing to the research of VR technology [2]. It is based on 3D technology, which creates virtual space to experience it. It is divided into three points:

Immersion: now human visual perception of external things especially the visual experience accounted for most of the proportion, so in the virtual real world will pay more attention to the human observation and see the visual authenticity of external things, the virtual world can truly reproduce the participants perceive things, at the same time users can also through hardware equipment, such as data gloves, steering wheel to better perception of the virtual world, so as to achieve a better experience [3].

Interaction: In a virtual environment, users can interact with things in the virtual world with VR devices, such as data gloves, force feedback devices, data head voice recognition, etc. These sensors combine virtual and reality with each other, using the human body's sensory system for various actions, represent real experiences of contact, auditory and visual, and realize interactive feelings between the user and the virtual world.

Lenovo: in the virtual environment, generate rich imagination, meet the user's imagination and opinions of some design, such as changing the wallpaper pattern and color, display furniture and style, can be in VR data transmission control system to quickly complete the user perception setting, more intuitive show the user's preferences also broaden the vision.

2 Link Between VR Technology and Interior Design

Nowadays, VR technology is deeply popular with the public with its real visual effect and simple and convenient operation, so its application has been expanded and widely used in various fields. Combining VR technology and interior design can not only more intuitively express the designer's design scheme, but also let users truly feel it, and put forward change opinions. This saves a lot of time in the design process and enhances the designers.

2.1 Key Points of VR Technology in Interior Design

If you want to speed the model, you can ignore unnecessary information and consider only the location of walls, doors and windows in the condition. It defines arcs through three points in the wall series, and virtual reality can introduce shortcuts to speed the model and subsequently store the modified data in change records to return it to the previous stages and changes. With the fastest design and convenient operation, the design plan can be designed automatically using 3D data. The implementation of the 3D model will reduce worker measurement time and significantly improve efficiency [4]. Virtual reality technology and environmental design art have great artistic value and practical

value, and the two are inseparable. The combination of the two imperceptibly completes the implementation of environmental planning.

In the interior design, it is usually divided into decorative hard decoration and soft decoration. Hard include: inner wall, door, window, etc. Soft decoration includes: lighting, wallpaper, furniture, and decorative furnishings. In the interior space design, in order to realize the virtual placement of indoor soft and hard decoration, virtual visual reality can be used in the design of indoor wall structure, wallpaper and floor pattern [5]. According to the design of priority to watch the indoor layout, through this way, customers can have a three-dimensional visual experience. Secondly, if there are differences, through virtual technology to make users feel the indoor environment and atmosphere, and then benefit users to join their own style aesthetic, and adjust and improve, it will improve the satisfaction with the required space of customers, thus through the VR technology presents the design concept can achieve the planner and consumers want the best demonstration effect [6].

2.2 Phase of VR Technology in Interior Design

Preparatory phase

If VR technology is used to participate in the preliminary design, the specific design evaluation and budget can be made out, which can make up for the gap that the traditional design technique is only based on hand-drawn and three-dimensional renderings. Therefore, designers can better control the specific implementation of the design concept and the smooth progress of the later planning through VR technology, which largely saves time and resources.

Designer's early conception is accurate is also abstract and erratic, the use of VR technology to generate virtual environment can make designers better immersed, receive the environment comprehensive information stimulation, can touch the inspiration to make thinking more active, and make the idea concrete, but also conducive to the design of all stages of the connection and advance thinking.

Improvement stage

When a design scheme is clearly conceived, its further design needs to be considered. At this time, we can sort out and compare between the different main design perspectives presented in the simulation space by using VR technology. At the same time, in the interior design, you can also use VR technology to check the connection of the space structure, ceiling, partition and other fixed factors. Designers can also measure the size of the furniture in the VR virtual world, to generate, copy, zoom and other operations. Whether from the whole to local, macroscopic to micro, it can be observed and deliberated through VR technology.

Display stage

The emergence of VR technology enables designers to intuitively communicate to customer design solutions, communicate with customers, and then to change is not enough to meet customer needs. A good scheme display can play twice the result with half the effort. The comprehensive effect of sound, light and color presented by VR is far beyond the cold drawings of traditional design techniques, It can bring more humanized experience and realize the perfect presentation of human-computer interaction.

2.3 Comparison and Analysis of Various Factors in the Design

Comprehensive simulation of spatial feelings. VR technology uses 3D software to design the interior space, according to the user needs, in the virtual space modeling design requirements, and conduct 3-dimensional stretching or synthesis on the basis of the indoor space modeling technology to show a more three-dimensional overall space design structure. After the establishment of the indoor virtual scene model, the virtual reality technology can be further used to render the model to generate the internal scene atmosphere, display, etc. In order to enable users to achieve a better experience, at the same time, designers can also modify the program content in time and reach a consensus with users, and design designs more suitable for the user experience.

Not limited by the time and site factors. Designers can design anytime and anywhere according to user requirements, VR scene in the overall consistent with the real world, through VR, from the outside can see the impact of the floor on lighting, experience the lighting layout and the impact on space, in the material selection, decoration, green plants and surrounding environment design to achieve liberalization [7]. At the same time, in some complex design, it can be more accurately calculated according to VR technology, and timely correct the insufficient links, so as to improve the design concept and the final ideal effect [8].

Reduce the time and the cost of capital. For interior design, designers can reasonably control the real space through VR technology, reduce human resources, but also achieve the sustainable development of low-carbon and energy saving, and directly convey the design concept to users. For example, from the design of the real estate developers' model room, VR technology can save the early investment cost for enterprises, and create the same effect as the real model room in a short time.

3 Development Trend of VR Technology

The rise of VR technology runs throughout various industries, and it will also be more and more widely used in environmental design.

3.1 The Integration of Various New Technologies

The future trend may be to integrate VR technologies, artificial intelligence technologies and 3D printing technologies and promote each other. As VR technology continues to develop, it breaks not only the limitations of design and creation, it will promote the close connection of various disciplines. Interior design will also be connected with other disciplines, such as digital media and visual communication, so as to create more fresh and dynamic works, constantly satisfying people's operational nature, visual feeling and interactive sense of design works. Under the new mode, it will more promote the expression of artistic expression space and explore new content more suitable for expression [9].

3.2 Common Development of Technology and Art

The design work needs comprehensive technology and art. The good and bad technology cannot unilaterally determine the degree of the work, and the artistic processing and aesthetic embodiment are needed, so as to bring superior visual aesthetic to people. If a work wants to lead people to leave a deep impression, it is bound to combine technology with art, with both the aesthetic feeling of art and the scientific and technological innovation. Future design works will combine VR technology, truly in sound, light and color and other aspects of a good feeling [10].

3.3 Pay More Attention to the “Humanized” Design

The purpose of the designer is to put people first and put the user experience first to consider the implementation of the overall scheme. For example, it is well known as IKEA, its commodity display forms a warm sense of environmental atmosphere, so that different furniture and accessories constitute the display space of functional areas, bringing users operational experience, rather than simple and tidy placement. One of the reasons why IKEA is popular is its user satisfaction, and it focuses more on humanistic care. Environmental design is people-oriented, human survival, and people are also the designer, builder and user of the environment.

4 Conclusions

With the improvement of indoor design level and people’s aesthetic level and demand, the traditional design techniques in some aspects cannot achieve the realistic touch and interactive experience, two-dimensional graphics expression is relatively limited, just from the visual feeling of three-dimensional space, cannot make customers have a sense of immersive. The emergence of VR technology just makes up for this defect. The virtual three-dimensional model of indoor space has the same size as the practical effect, and can render the real scene and display effect, so that the design industry is more technological and diversified, injecting new vitality into the interior design industry.

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