

Application research of virtual reality technology in environmental art design¹

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Abstract. With the advent of the information age, a great many of modern means of science and technology have changed people 's lives. With regard to environmental art design, the computer technology and virtual reality technology emerging in large numbers has broke the conventional mode of environmental art design and accelerated the environmental art design plan based on virtual reality technology and its application. This paper introduces virtual reality technology and its practical application and probes into the profound impact brought by virtual reality technology in the specific design process of environmental art design so as to provide some inspirations on ideas of environmental art design. The paper suggest the designers to lower the cost of the project design to a certain extent, avoid artificial design error, improve quality and efficiency of environmental art design, and most importantly enhance the resource utilization rate of the environment art design projects and then improve the economical benefits of substantial project in operation process, In addition, it is worthwhile to promote such technology in relative industries.

Key words. Virtual reality technology, environmental art design, application research.

1. Introduction

At present, information technology is rapidly developing and at the same time all sorts of multimedia technologies are coming forth, which brings new development impetus for practical work. In the market under increasingly fierce competition, it has become common concern for experts and scholars in this field to study how to enhance the level of modern environmental art design. In the past, environmental art design schemes were often ceased under limitations from expenditure, site, and other factors. Therefore, the integration of virtual technology technology and environmental art design is put forward for the purpose of improving efficiency

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and economy of environmental art design. In the actual application of virtual reality technology in the design process, technical features such as multi-sensation, interaction and imagination of the technology can make up for the deficiencies in conventional environmental art design.

2. State of the art

Virtual reality technology is essentially a collection of a series of advanced technologies, including multimedia technology, computer network technology and simulation technology and so on. Based on those kinds of technologies, a more realistic three-dimensional virtual environment is created and under the support of hardware devices, building of multi-dimensional information space is realized. Thus, a visualized virtual environment is presented to specific industries (Fig. 1) [1–6]

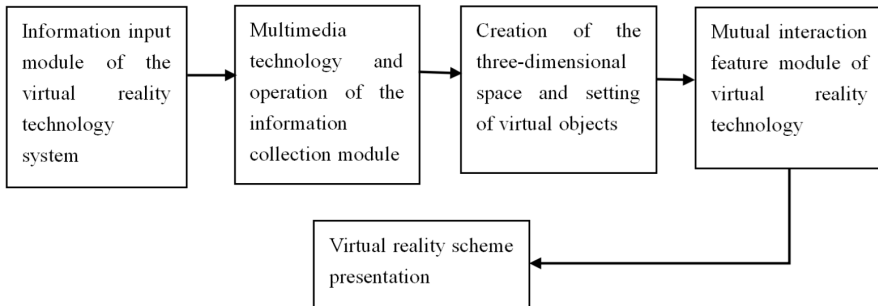


Fig. 1. Visualized virtual environment is presented to specific industries

It is clearly shown in Fig. 1 that, the virtual reality technology is completed step by step under guidance of the requirements designated by customers and different virtual scenes need to be realized by different technology means. In general, application of the overwhelming majority of virtual reality technologies requires an information input module of the virtual reality system. Besides, by means of multimedia technology and through specific operation of the information collection module, a foundation for the virtual environment is laid for the purpose of creation of the three-dimensional space and setting of the specific virtual objects in later period to make the virtual environment more real. Most importantly, it is the operation of mutual inductance feature module in virtual technology allows the interactive experience process between human and the environment in actual application of the virtual reality technology. Finally, the virtual reality scheme is presented to the audience by means of multimedia technology and computer technology etc. Table 2 compares the Traditional Expression Method and VR Technology.

3. Methodology

Scene creation in application of virtual reality technology is to build a realistic simulated environment mainly by computer technology and based on modern high-

tech hardware and software product so as to create a visualized three-dimensional scene. In addition, a series of means is used to arouse vision, hearing, touching and other senses of the audience in the live environment, thus, the audience may think they are in a realistic environment [7–8]. Specifically speaking, the main features of virtual reality technology include the following aspects:

3.1. Multi-sensation feature of virtual reality technology

Under normal conditions, we perceive things usually by the abilities such as visual impression, touching or hearing, however, under operation of the virtual reality technology, the most ideal outcome is to use the sensory abilities of human that can be aroused so as to reach the objective of panoramic view or overall consideration [9–10]. But with the existing technical level, the ideal virtual reality technology fails to reach such peak state and requires further development of multi-sensation feature.

3.2. Interaction feature of virtual reality technology

The interaction feature of virtual reality technology is mainly reflected in its interactive effect, that is to say, within the simulated technical environment, human can interact with the virtual scene and objects. Although such interaction is a specific manifestation of the appreciable scene, it presents extremely high technical practice value and can predicate all the possible outcomes in the real environment.

3.3. Imagination feature of virtual reality technology

To put it simply, imagination feature of virtual reality technology is the conception of the virtual environment to meet people's need of exploring the scene that does not exist in the objective world. In spite of the obvious imagination feature of such technology, the scene imagined often comes from people's perception and imagination of the unknown world. Thus, the imagination of virtual reality technology is realized with the aid of operation of assistive technological means. Table 2 contains the application advantages of VR Technology in Environmental art design.

4. Exploration of practical application of the virtual reality technology

The virtual reality technology can not only manifest the condition of environmental art design intuitively but also help increase the accuracy of environmental art design budget so as to enhance the interaction between the two sides in the design process. In addition, virtual reality technology changes the situation where traditional environmental art design is limited by expression of thinking thus makes environmental art design more dynamic [6].

Table 1. Comparison of Traditional Expression Method and VR Technology

	Type performance	Color	Dynamic	Interaction	Information
2D plan	Single plane	single	-	-	-
3D renderings	Three-dimensional	Rich	-	-	-
Animation	Three-dimensional	Rich	dynamic	-	-
VR system	Three-dimensional	Rich	dynamic	real time	Can be checked

Table 2. Application advantages of VR Technology in Environmental Art Design

VR	Basic characteristics	Application advantages
Immersion	People can immerse themselves in the environment created by the computer system	Increase the dimension of architects' exploration space degree
Interactivity	People can interact with the virtual information environment through interactive devices	Form a dynamic experience, to ensure continuous thinking
Conception	From the qualitative and qualitative environment to get emotional and rational knowledge, so as to deepen the concept and germination of new ideas	In the process of roaming to deepen the understanding of space, produce more design inspiration

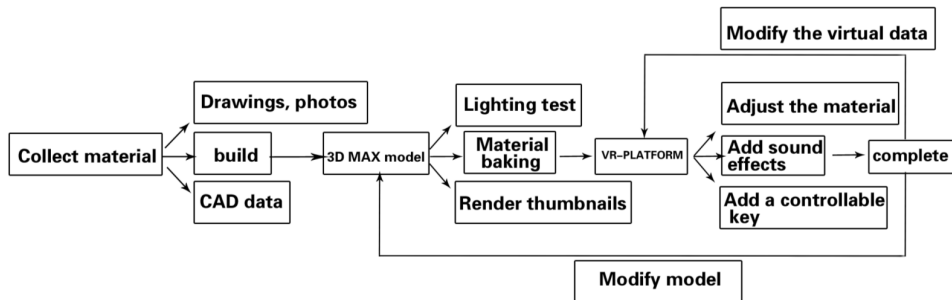


Fig. 2. VR technology in the actual modeling of the flow chart

4.1. VR technology in the actual modeling of the flow chart

On the whole, various kinds of advanced technologies are needed to highlight its embedded value in China's architectural design and environmental design fields, among which, the environmental art design philosophy is to present design schemes with high value at the lowest cost. In the practical process, all feasible measures can be taken to improve quality and efficiency of environmental art design to break through development bottlenecks in environmental art design industry [11-14].

From the point of view of objective analysis, some practical problems that cause unreality of environmental design would occur in the process of application of virtual

reality technology in environmental art design, however, it is decided by the technical features of the technology. Even so, the application of virtual reality technology brings much stronger technical support to environmental art design in that under its effect, expectations on environmental art design schemes are realized and conceptualized colors are given to environmental art design, which is the artistic level beyond reach of substantial project design [15–17].

Table 3. Original data of indexes influencing environmental art design

	X1	X2	X3	X4	X5	X6	X7	X8	X9
X1	1	0.6567	0.7202	-0.3036	0.6551	0.7256	0.6226	0.6515	-0.5633
X2	0.6567	1	0.7235	-0.1762	0.6565	0.7631	0.6436	0.6636	-0.5612
X3	0.7202	0.7235	1	-0.1405	0.5175	0.625	0.5665	0.5705	-0.5567
X4	-0.3036	-0.1762	-0.1405	1	-0.2402	-0.0272	-0.0343	0.0562	0.4363
X5	0.6551	0.6565	0.5175	-0.2402	1	0.7036	0.4434	0.6163	-0.7406
X6	0.7256	0.7631	0.625	-0.0272	0.7036	1	0.4566	0.4753	-0.6605
X7	0.6226	0.6436	0.5665	-0.0343	0.4434	0.4566	1	0.6866	-0.753
X8	0.6515	0.6636	0.5705	0.0562	0.6163	0.4753	0.6666	1	-0.6061
X9	-0.5633	-0.5612	-0.5567	0.4363	-0.7406	-0.6605	-0.753	-0.6061	1

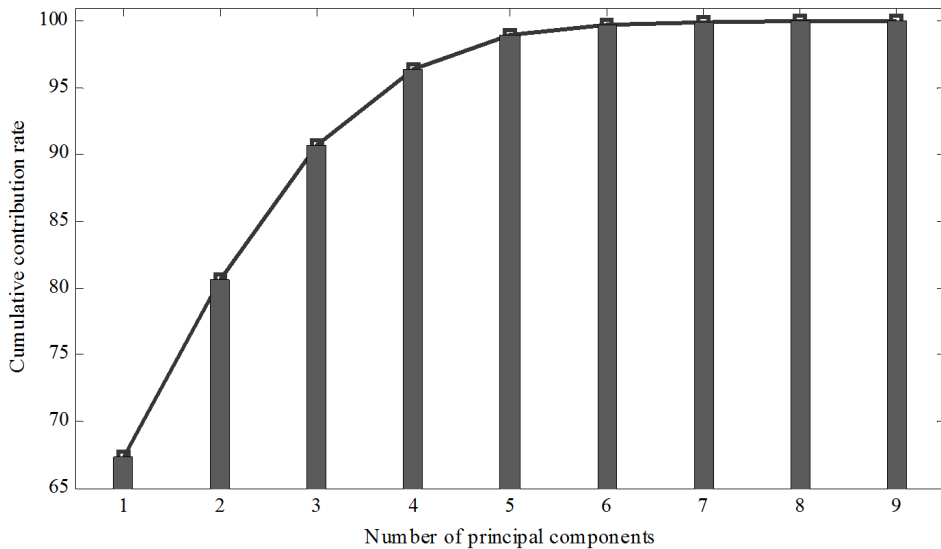


Fig. 3. Results of the cumulative contribution rate along with the number of principal components

4.2. Connection between virtual reality technology and environmental art design

Virtual reality technology needs to break limitations from space and even time. Under such technical support, environmental art design can expand into any physical

environment that can be realized by imagination. With powerful and unconstrained artistic ideas, content of environmental art design scheme is further adjusted to develop higher artistic value or practical value. In essence, there are inextricable professional relations between virtual reality technology and environmental art design for they both involve in creation of specific environment. Thus, application of virtual reality technology into environmental art design gives prominence to advantages of virtual reality technology. On this ground, much more outstanding outcomes can be gained through application of virtual reality technology into environmental art design [18–19]. On a smaller scale, environmental art design project is the large-scale fusion display engineering, which is aimed at stimulating various human experience with the dynamic atmosphere created by high-tech scenes so as to get a more intuitive and specific understanding of the conception of environmental design.

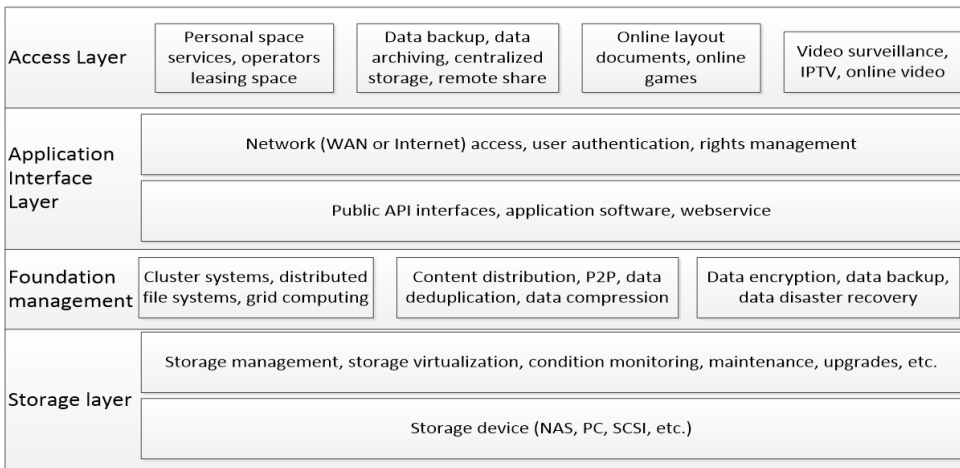


Fig. 4. Model of virtual reality technology and environmental art design structure

5. Result analysis and discussion

It is found out in practice that, the actual application of virtual reality technology has profound impacts on environmental art design for it can not only make up for the deficiencies and push limitations in space design conception of conventional environmental art design, but also avoid many potential problems in actual operation, such as coordination between human and the environment and design of the dynamic environment. What is more, under the strong support of virtual reality technology, the cost of previous repetitive design is saved in that only the computer technology and multimedia technology are used in creation of the virtue space for realization of overall environment design. On this ground, practical application of virtual reality technology improves to a certain extent the economic and social benefits of project construction.

5.1. Advent of virtual reality technology makes up for the deficiencies

In the past, environmental art design in conventional form used to be limited by space factors, for example, if the design scheme went beyond the specific spatial range, high incompatibility would occur and cause failure of the environmental art design. But at present, that situation can be completely avoided by application of the virtual reality technology, under the support of which, environmental art design breaks through limitations from spatial range and even time. The independent art design space created thereby is of certain realistic value and enables the audience personally on the scene to enjoy the unique connotations of environmental art design. The virtual reality system is characterized with multi-sensation, immersion, interaction and imagination, and it is the virtual reality technology that brings the audience into a simulated real environment true to nature. The application of virtual reality technology is a new mode of practice for human to realize visualized operation and interaction of the complex data via computer. Compared with traditional man-machine interface and the popular windows operation, the virtual reality technology has a qualitative leap in technological thoughts and presents unprecedented real effects.

5.2. The application of virtual reality technology can effectively avoid potential problems

In view of the special technical requirements of environmental art design, integration of multiple knowledge systems is required to complete the design scheme. If any technical oversight is found, the entire environmental art design scheme may be overthrown. It is shown in the practice process that application of virtual reality technology can effectively avoid potential problems in environmental art design schemes. On a smaller scale, the three-dimensional modeling technology in the virtual reality system is to represent the abstract statistical data or concept in forms, curves and legends. On average, the virtual reality system can be divided into the foreground simulation presentation and background technological processing, which jointly complete construction of the simulation system model. As a matter of fact, the virtual reality system itself is an integration of a series of technologies and plays the biggest role of every single module by orderly operation of simulation system platform so as to realize virtual reality of a certain scene. As thus, application of the virtual reality technology integrates advantages of the simulation system, multimedia technology system, and avoids the previous problems in design efficiency. In addition, practical application of the virtual reality technology can effectively avert information asymmetry effect among all departments in the environmental art design process. In short, formulation of the environmental art design scheme requires integration of the knowledge systems of all professionals, that is to say, if the key points of environmental art design are laid on the unified design platform, information exchange can be improved, which also avoids design errors. At the present, scientific integration operation has been realized in many industry fields for the purpose of improving industrial benefits. During the actual simulation operation, scene setting

is completed with the aid of projector equipment and physical programming model. In addition, through combined utilization of the database system and relevant technologies, various kinds of information resources, geographical location resources, and media stockpile resources are input in the core system so as to invoke different types of the information resources. Thus, actual effects of application of the virtual reality technology in field of environmental art design are fully manifested.

The most important function of the virtual reality technology adopted in environmental art design process is mainly reflected in its interaction, which is different from implementation of large-scale fusion display project alone. In the man-machine virtual environment, the experienter can interact and communicate with the central system via some of the simulation function modules of the system, thus, the high-tech fusion performance of the interactive three-dimensional environment model is realized. In this way, once any unreasonable and inconsistent problems occurs in the environmental art design scheme, it is reflected by the virtual scene, which is good for the technical designer to adjust or revise the design scheme so as to avoid problems in actual environmental construction. Besides, other unwanted troubles including waste of resources are avoided to some extent. Figure 5 depicts a typical example—scene division modeling.

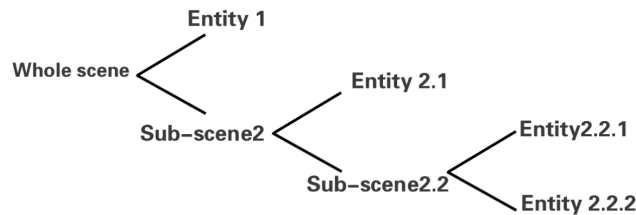


Fig. 5. Scene division modeling

6. Conclusion

From the past experience, the virtual reality technology has been widely used in many practical projects such as architecture engineering design, environmental art design and simulation operation platform and shown outstanding advantages. Via computer software, the virtual reality technology can build framework of the three-dimensional simulation model within a remarkably short period of time, which greatly reduces the design period of substantial project. Meanwhile, if any adjustment is to be made during the design process, it is not necessary to overthrow the design content and redesign objects, which usually take place in the conventional environmental design but only to revise the part to be adjusted in the design scheme via the corresponding design software. Thus, we can lower the cost of the project design to a certain extent, avoid artificial design error, improve quality and efficiency of environmental art design, and most importantly enhance the resource utilization rate of the environment art design projects and then improve the economic benefits

of substantial project in operation process.

The integrated application of electronic information technology and other modern technologies has brought new experience to human and vivid virtual real scene has offered us better multiple sensory feelings. The practical application of virtual reality technology in the field of environmental art design makes up the deficiencies of conventional environmental art design, effectively avoids the potential problems in actual operation, and improves the economic benefits of substantial project construction. Therefore, it is worthwhile to promote such technology in relative industries.

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