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Application of Virtual Reality Technology in Landscape Design

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Abstract: This paper first describes the characteristics of virtual reality technology and its realization in landscape design. Secondly, this paper analyzes the practical significance of virtual reality technology in landscape design and discusses the practical application of virtual reality technology in landscape design. In a word, the application of virtual reality technology in landscape design is helpful to the development and improvement of landscape design.

Keywords: Virtual reality; Landscape design; Haptics; Application

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1. Introduction

With the development of computer technology, its application has penetrated the field of landscape design, especially the application of virtual reality technology in Landscape design, which has achieved more remarkable results [1]. With the help of virtual reality technology, people can intuitively experience the effect of landscape design [2], which further displays the embodiment of landscape design on the design concept of people-oriented. Therefore, it is of great practical significance to study the application of virtual reality technology in landscape design and combine modern landscape design with virtual reality technology so as to improve the ability of modern landscape design [3].

2. Overview of virtual reality technology

2.1. Application characteristics of virtual reality technology

Virtual reality technology plays an important role in landscape design. The application features of virtual reality technology mainly include efficiency, interactivity, artistry, invasion, and multi-perception, as shown in **Figure 1**.

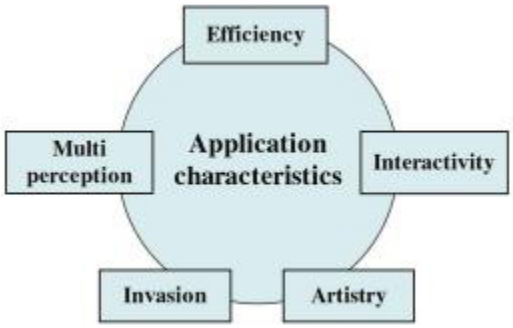

Figure 1. Application characteristics of virtual reality technology

2.2. The realization of virtual reality technology in landscape design

Virtual reality technology can be customized according to the needs of customers. Through three-dimensional dynamic modeling technology, different virtual scenes can be built and set up [4]. The main steps and implementation flow of the application of virtual reality technology in landscape design are shown in **Figure 2**.

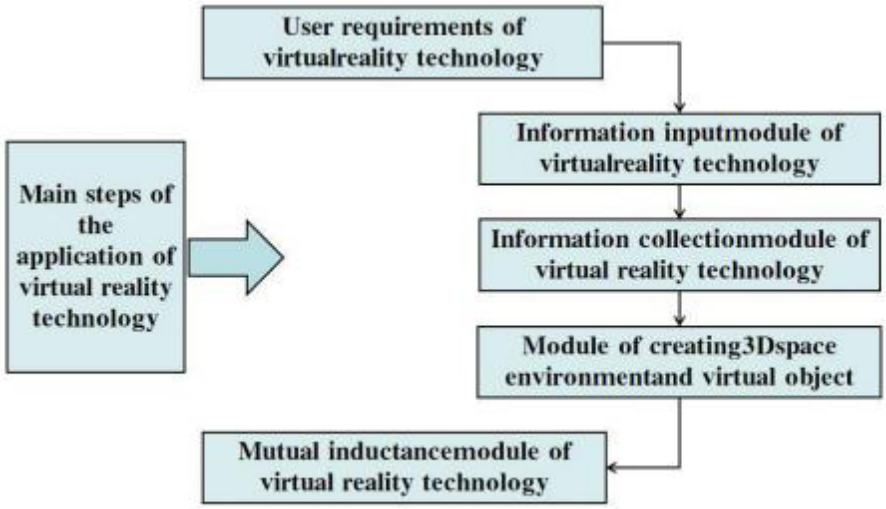

Figure 2. The main steps of the application of virtual reality technology

3. The practical significance of virtual reality technology in landscape design

3.1. Meeting the actual needs of landscape design

The application of virtual reality technology in landscape design constructs a three-dimensional virtual environment with interactive characteristics [5], which enables users and products to interact and communicate in the virtual environment and helps to tap the depth of creation and design. In landscape design, the design scheme can be improved according to the design requirements and objectives [6]. Using virtual reality technology, the real object or the original nonexistent model is displayed in the virtual form. According to the design work scheme, the design model is presented, which is convenient for the designer to modify and adjust, and improves the efficiency and accuracy of the design scheme. This process is simple and low-cost, which can make the construction party or customers feel the feasibility of the scheme through virtual technology [7].

3.2. Visual display of environmental and design works

Virtual reality technology creates a lifelike and vivid virtual environment by building a software and hardware platform, which enables users to experience the all-round stimulation of touch, hearing, and vision, activate the brain activity, enable users to have an insight into the design works in a highly concentrated state, deepen memory, and greatly enhance the screen sense of the virtual environment.

3.3. Realizing the communication of landscape design

Virtual reality technology can realize intercommunication, construct a virtual environment and space, and realize communication between man and machine without obstacles. Imitating all kinds of application behaviors in the real world in the computer system is of great benefit to the improvement and optimization of construction works [8]. In addition, users can perceive the practicability and effect of the design works in advance through the virtual world, predict and deal with the possible problems after the completion in advance, so as to make up for the deficiencies in the design of works and give full play to the forward-looking advantages of landscape design.

4. Application of virtual reality technology in landscape design

4.1. Application of virtual reality technology in the construction of environment space model

Compared with traditional landscape design tools, using virtual reality technology to build an environment space model can complete a large number of original models in a short time [9]. The advantages and disadvantages of the two are shown in **Figure 3**.

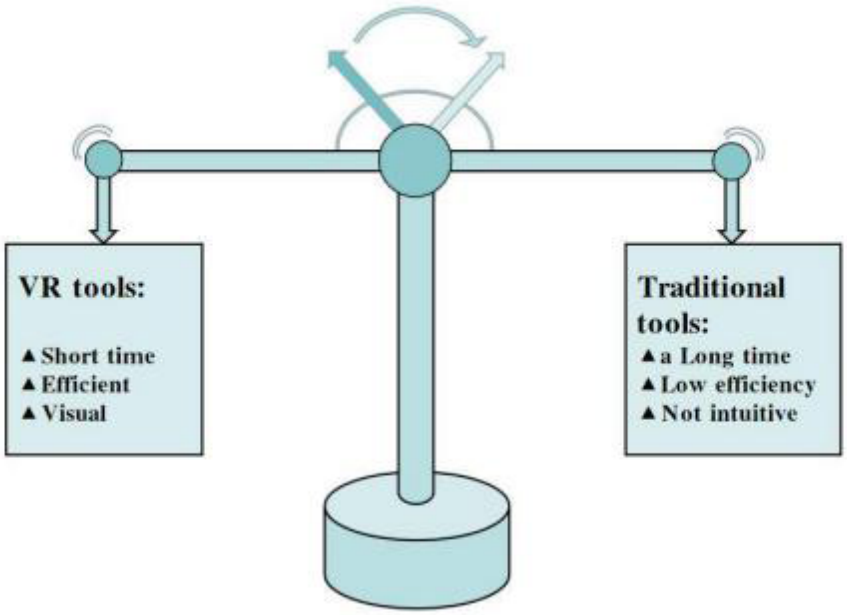

Figure 3. Advantages and disadvantages comparison

In the process of building an environment space building model based on virtual reality technology, by inputting the corresponding building size data [10], we can quickly build the required building model. For example, the import of various formats of materials to simulate object files, to improve the efficiency of landscape design, and effectively save the design cost of environmental art [11]. The main steps of spatial model construction in landscape design are shown in **Figure 4**.

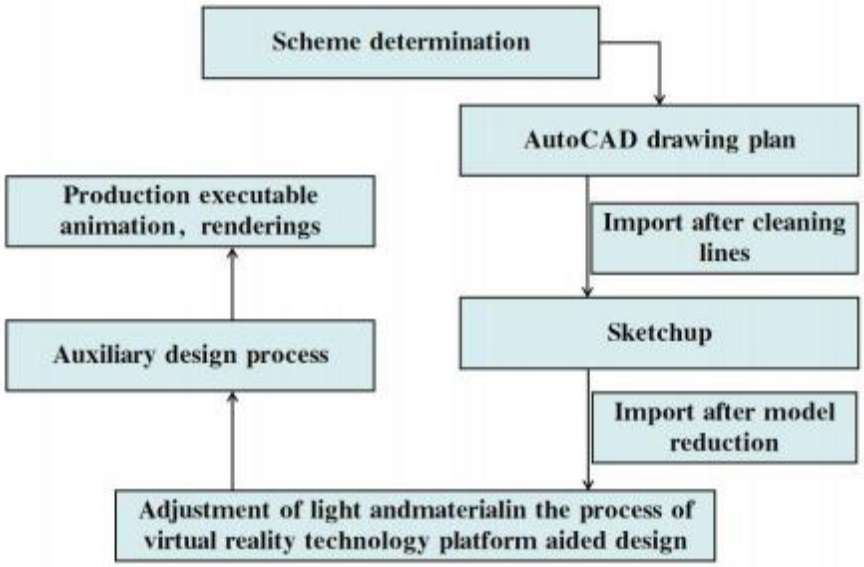

Figure 4. The main steps of spatial model construction in landscape design

4.2. The application of virtual reality regional positioning technology in landscape design

In landscape design, it is necessary to solve the problem of regional positioning and modeling of indoor and outdoor landscape design [12]. The first important problem to be solved by virtual reality technology is the positioning and modeling of indoor and landscape projects. The virtual reality technology can locate the project, create a two-dimensional plan of a certain area location, then according to the scene planning in the two-dimensional plan, build the three-dimensional spatial structure and build the model according to the corresponding data standards, and finally render the video frequency or static frame map that meets the needs [13]. Therefore, in the design of landscape, using the regional positioning of virtual reality can quickly complete the accurate positioning of three-dimensional scenes and realize the design of scene and object in space [14].

5. Conclusions

The application of virtual reality technology shows more intuitive content and better effects. Virtual reality technology will bring new impetus to the rapid development of landscape design, make the design products of the environment more humanized, and fully show the charm of landscape design [15]. With the further development of technology, the effective integration of modern landscape design and virtual reality technology will further realize the visual management of modern landscape design, improve the overall level of design, and provide continuous impetus for the development of modern landscape [16].

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Disclosure statement

The authors declare no conflict of interest.

References

[1] Coburn JQ, Freeman I, Salmon JL, 2017, A Review of the Capabilities of Current Low Cost Virtual Reality Technology and Its Potential to Enhance the Design Process. Journal of Computing and Information Science in Engineering, 17(3): 13–31.

[2] Hei M, 1993, The Metaphysics of Virtual Reality, Oxford University Press, Oxford, 3.

[3] Anthes C, García-Hernández RJ, 2016, State of the Art of Virtual Reality Technology. IEEE Aerospace Conference, March 5–12, 2016 Big Sky, MT, USA.

[4] Gan L, 2018, Application Strategy of Virtual Reality Technology in Landscape Design. Journal of Guangxi Normal University of Science and Technology, 33(2): 133, 137–139.

[5] Huang FC, Chen K, Wetzstein G, 2015, The Light Field Stereoscope: Immersive Computer Graphics Via Factored Near-Eye Light-Field Displays with Focus Cues. ACM Trans. Graph, 34(60): 1–12.

[6] Yong L, Zhang H, 2018, Simulation Assistive Technology Analysis in Volleyball Sports Based on VR (Virtual Reality). Journal of Advanced Oxidation Technologies, 2018(21): 60–64.

[7] Zhang Y, 2020, Innovative Application of VR Virtual Reality Technology in the Practice Teaching of Landscape Design Courses in Universities. Construction and Budget, 2020(10): 35–37.

[8] Liu G, Liu X, Gou Z, 2022, Future Architectural Space Scene Design Based on Virtual Reality (VR) / Augmented Reality (AR) technology: Take the Simon Kim Teaching Works of Penn University as an Example. Architecture and Culture, 2022(8): 34–36.

[9] Wei B, Han J, 2020, Research on the Application of Virtual Reality Technology in Teaching. Wireless Internet Technology, 2020(14): 84–85.

[10] Wang S, Wu D, 2019, Application of Virtual Reality Technology in the Course Teaching of "Landscape Architecture Design." Forestry Education in China, 2019(5): 51–53.

[11] Sun Y, Zhao X, Wang Y, et al., 2016, Research on the Visual Evaluation Preference of Rural Landscape Based on VR Panorama Technology. Journal of Beijing Forestry University, 38(12): 104–112.

[12] Joshi PK, Paul SK, Chakraborti S, et al., 2019, Evaluating Landscape Capacity to Provide Spatially Explicit Valued Ecosystem Services for Sustainable Coastal Resource Management. Ocean & Coastal Management, 2019(182): 104918.

[13] Laurent MABC, Florence MB, Shinya SD, et al., 2020, Reply to Theuerkauf and Couwenberg (2020) Comment on: "Pollen-Based Reconstruction of Holocene Land-cover in Mountain Regions: Evaluation of the Landscape Reconstruction Algorithm in the Vicdessos Valley, Northern Pyrenees, France." Quaternary Science Reviews, 2020(244): 106462.

[14] Vaca RA, Rodiles-Hernandez R, Ochoa-Gaona S, et al., 2018, Evaluating and Supporting Conservation Action in Agricultural Landscapes of the Usumacinta River Basin. Journal of Environmental Management, 2018(230): 392–404.

[15] Shen Y, 2020, The Practice of Virtual Reality Technology (VR Technology) in the Course Teaching of "Landscape Architecture Design." Rural Practical Technology, 2020(6): 155.

[16] Wang D, Dong L, 2019, Conception and Practice of Design Basic Teaching Reform Based on VR Immersive Cognition. Landscape Architecture, 26(S2): 45–50.