Research on the Application of Virtual Reality Technology in the Scenery Park Landscape Design

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Research Article

Keywords: Landscape Architecture, Design, Virtual Reality Technology.

Posted Date: October 6th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-954580/v1>

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Abstract

Virtual reality technology is of great significance in the scenery park landscape design. In order to further improve the related theories and links of this technology, this study is based on a clear concept of reading related information and the author uses the modeling software and through the example analysis to verify that the virtual reality technology has certain feasibility in the scenery park landscape design of our country. By using the method of fuzzy comprehensive evaluation, the author determines the main advantages of virtual reality technology in the scenery park landscape design. The purpose of this study is to provide data and theoretical reference for the improvement of the related theories and techniques of the scenery park landscape design in China.

1. Introduction

Under the background of the development of the times, the world economic level has been greatly promoted and progressed. With the comprehensive promotion of the world economic level, the people are beginning to pay more attention to the pursuit of the spiritual level while the material life is satisfied (Edda et al., 2016). The development of the tourism industry, as the main industrial structure in the modern times industry, has effectively promoted the national comprehensive quality. In the background of this era, many tourist products have been gradually popularized, and landscape architecture is one of the most important tourism products under the background of the times (Chao et al., 2014). In order to better meet the needs of tourist diversification, the design of landscape architecture has become an important trend in the development of tourism industry. However, in the process of landscape architecture design, it may be influenced by many factors such as the local landform, the humanities, traditional culture and so on, so there may be some difficulties (Collier et al., 2016). And the emergence of this new technology has brought a lot of opportunities for the development of many industries. Many industries have also begun to introduce them to industry development, thus providing impetus for the development of the industry as a whole. Nowadays, the tourism industry also starts to talk about the application of virtual reality technology under the computer technology in the actual landscape design, and provides a more perfect development mode for the more diversified landscape design industry (Dupont et al., 2016). In this study, the author will analyze the shortcomings of virtual reality technology in landscape architecture design in China, and explore related theories and technologies. The purpose of this study is to provide some reference for the development of related industries in China, and provide technical support for the design of a more diversified landscape.

2. State Of The Art

Many researchers believe that the development of the tourism industry has a very important positive impact on the development of the overall economic level of the whole era. It can not only effectively promote the improvement of the economic level of the whole country or region, but also make the national spirit level develop greatly, so that the industry can play the superiority of other industries (Ekung et al., 2015). In the process of the development of tourism industry, landscape architecture, as a

landscape that can not only inherit traditional culture, but also promote national spirits, provides a positive impetus for the improvement of the overall level of tourism industry in the modern era (Raymond et al., 2016). Nowadays, a lot of experts from tourism industry put forward that we should attach importance to the design of landscape architecture, so as to design more landscape design products that meet the diversified needs of the nation. And with the emergence of more advanced technology, more perfect landscape also begins to come into the world. Computer technology is emerging as a new technology in the development of today's era. The development of this technology promotes a series of auxiliary technologies, and provides a positive impetus for the development of other industries (Jalali et al., 2015). The development of virtual reality technology has gone through 3 different stages of development, and it has been applied by relevant scholars in landscape architecture design, making the traditional landscape design process more perfect (Karvounidis et al., 2014). The application of virtual reality technology makes the landscape design process more intuitive in front of people, so that we can save the overall construction materials and conduct the overall design of landscape architecture efficiently. Under the influence of computer virtual reality technology, many advanced tourism industry countries have already obtained more advanced design products in the design of landscape architecture (Wise et al., 2014).

3. Methodology

As a result of the historical reasons of the development of Chinese traditional culture, landscape has gradually become an important tourist attraction in the development of China's tourism industry (Figure 1). The development of this kind of scenic spot has provided a positive impetus to the development of the pleasure of national tourism and the development of traditional culture. Therefore, the scenery park landscape design in China has become the trend of the development of the times. However, in the design of landscape architecture, the traditional design process may cause waste of resources to some extent, and may cause serious environmental pollution. In the design of traditional landscape architecture, many designers often lack much proficient design and drawing ability, which, to some extent, causes many errors in the design process. It also makes a series of incongruous phenomena such as increasing the use of resources in the final building process, extending the design cycle and so on (Olatunji and Sher, 2014). Therefore, many researchers have begun to try to apply more advanced technology to the actual landscape design process of the park. With the rapid development of computer technology, a lot of design processes have some ancillary technologies, which makes the traditional design process more simple and efficient. This provides a positive impetus for the development of related technologies of landscape design in China.

The rapid development of computer technology can provide data for the whole industry to collect information, which provides information basis for the development of the industry. With the development of this technology, a variety of branch technologies have been studied and used. Virtual reality technology is a new technology built on the basis of computer technology in the 60s of last century. This technology has gone through the stages of simple visual system, 3D visualization system and virtual simulation system, so that the application of this technology in various industries is gradually enhanced

(Ommani, 2011). With the continuous improvement of the theory of virtual reality, more and more scholars in tourism industry began to apply this technology to the landscape design process in China. And more systems and desktop software are gradually being developed (Canciani et al., 2016). Under the cooperation of all kinds of research systems and universities in China, more and more modeling soft wares of landscape architecture have begun to prefer operation, easy operation, low cost and high efficiency. This provides a technical support for the design of landscape architecture in China, which is more close to the design of real virtual reality scene (Kersten and Lindstaedt, 2012). The development of virtual reality technology provides a certain technical support for the scenery park landscape design for our country. However, due to the development of computer technology in China is relatively late, it cannot make more perfect theory being studied and applied in the actual landscape architecture design process. To a certain extent, it has caused obstacles in the process of landscape design in China, thus making the development of the overall tourism industry in our country restricted. Therefore, in order to make the virtual reality technology in the landscape design in our country gets more perfect development. In this study, the landscape designer based on the idea of using computer virtual reality software related to the practical needs of our country no longer exists some historical sites based on the people's real recovery, and the advantages of computer aided technology is analyzed, in order to determine the feasibility of using this kind of technology in China's landscape design process. The detailed research scheme of this study is shown below:

(1) First, the author through reading and overview of the relevant information, and based on an overview of the application of virtual reality technology for China's lack of landscape in landscape design. The author further analyzes and explores the advantages of landscape design and virtual reality technology from the point of design of landscape architecture. And the use of software based on the provided theoretical and technical support for the follow-up research and virtual reality technology. In this study, the author first contrasts the performance of the 5 popular soft wares, which are now popular, and the comparison analysis is shown in Table 1, as shown in Table 1.

Table 1
comparison between five commonly used modeling software

Software	Modeling Speed	Modeling Ability	Amending The Convenience	Whether It Is Oriented To Design
3ds Max	Fast	High	More Convenient	Not Oriented To Design
Maya	Fast	Much Higher	More Convenient	Not Oriented To Design
Sketch up	Much Faster	Higher	Very Convenient	Design-Oriented
Cinema4d	Much Faster	High	More Convenient	Not Oriented To Design
Rhino	Much Faster	Much Higher	More Convenient	Not Oriented To Design

(2) Based on the understanding of related theory, the author introduces the virtual display technology involved in the various design aspects, so as to use modeling software related (through the comparative

analysis, the author in this study selected Sketch Up software as the actual use of software) for the overall design of an actual landscape. By reading and analyzing the relevant information (Amirhossein et al., 2013), the application of virtual reality technology in the actual scenery park landscape design scenic spots in this study is shown in Figure 2.

(3) The author studies the virtual reality technology and applies it to the design of the actual landscape design. Then the author uses the traditional design method to make overall planning for the landscape rendering and post production process, and gives the landscape design results of the two different technologies to the more reliable designers in the related industries. By comparing with the traditional landscape architecture design technology, the sense of the senses is compared. Then, the author compares and analyses many other indexes, such as resource utilization rate, completion efficiency, late operation cost and environmental pollution status, and then clears up the feasibility of virtual reality technology in landscape architecture design in China.

(4) Through the introduction of the above theories and technologies, the author further determines the feasibility of the application of virtual reality technology in practical applications. On the basis of the common analysis of relevant data and practical applications, the author then determines the main advantages and properties of virtual reality technology. On this basis, the author introduced fuzzy comprehensive evaluation and analysis theory to analyze the main advantage factors of the application of virtual reality technology, so as to provide data reference for later improvement of the technology. The fuzzy comprehensive evaluation analysis model introduced in this study is as follows:

$$u(x) = \begin{cases} 1, x < S_1 \\ (S_2 - x)/(S_2 - S_1), S_1 < x < S_2 \\ 0, x > S_2 \end{cases} \quad (1)$$

Among them, $u(x)$ represents the degree of membership of an advantage index; S_1 and S_2 represents the maximum and minimum value given by a judge, and the x is assessment average.

$$R_{ij} = \begin{bmatrix} r_{11} & r_{12} & \Lambda & r_{1m} \\ r_{21} & r_{22} & \Lambda & r_{2m} \\ M & M & M & M \\ r_{m1} & r_{m2} & \Lambda & r_{mm} \end{bmatrix} \quad (2)$$

Among them, R_{ij} is a matrix for final assessment of membership degree by all factors; r_{mm} represents a degree of membership belonging to a certain degree of membership.

4. Result Analysis And Discussion

4.1 The Statistical Results of Tourist in China's the Scenery Park Landscape

Since China's entry into reform and opening up, the comprehensive strength of the country has been greatly improved, and the material life of the people has been greatly improved. At the same time, the state has begun to attach importance to the cultivation of national spiritual civilization. The development of the tourism industry, which includes the inheritance of traditional culture, and makes many people feel the pleasure of their hearts, has begun to urge people to pay more attention to the tourism industry (Pujol and Lorente, 2013). During the development of ancient civilization in China, many landscapes were presented in people's perspective. These gardens are outstanding tourism products of excellent traditional culture in China. They provide a certain material basis for the improvement of our national comprehensive quality. With the continuous improvement of the national economic level in China, the people began to continue to increase the scenery of the landscape. It is believed that the number of tourists in the tourist landscape is increasing year by year in China's tourism (Figure 3). To a certain extent, this shows the growing cultural and spiritual needs of Chinese tourists, and shows the necessity of China's landscape design for landscape architecture.

4.2 Landscape architecture example landscape design results of landscape architecture based on Virtual Reality Technology

In this study, the author based on a clear understanding of the relevant theories of landscape design method of virtual reality technology and based on the technology, and then, the author uses Sketch Up software as the actual case of the software, which is used to design the actual virtual reality design of the scenery park landscape. First of all, when we get the plan of a landscape area, the author builds the model of garden, building, water and plant by Sketch Up software. After completing the modeling, the author used Lumion3D software to import time, weather and other factors into the built model. The final result of this landscape garden is shown in Figure 4. From the graph, we can see that the final design effect diagram can clearly set different scenic spots for people, so that the whole area can be displayed in front of people more simply and clearly.

4.3 Contrast results of landscape design and traditional landscape design based on Virtual Reality Technology

Based on the design of landscape architecture with computer virtual reality technology, the author uses the traditional design method to make overall planning for the landscape rendering and post production process. The completion of the foundation of the landscape design in the use of two different methods, the author through the questionnaire on two different design of the senses, landscape design renderings of utilization of resources, complete the operation cost and efficiency and the late in the surrounding environment influence factors were analyzed. The analysis results are shown in Table 2 shown. The

results show that compared to the design based on virtual reality technology, the scenery park landscape of traditional technology, in addition to the use of computer technology have resulted in higher operating costs and other factors were superior to the traditional landscape design technology.

Table 2

landscape design of landscape architecture based on virtual reality technology and comparison of traditional landscape design

	Effect Sense	Resource Utilization	Completion Efficiency	Running Cost	Influence On The Surrounding Environment
Virtual Reality Technology	Clear Expression	72.14±5.11%	13.49±2.22h	24533¥	The design process is considered synthetically, and the influence is small.
Traditional Design Technology	The Expression Is Clearer	45.27±7.29%	27.52±3.14h	21327¥	The design process is more thoughtful and influential.

4.4 Analyses of the Dominant Factors of the Scenery Park Landscape Design Technology Based On Fuzzy Comprehensive Evaluation Analysis Model for Virtual Reality Technology

The author further verified by an example of virtual reality technology in landscape design process. There are a large amount of data and information resources (X1); simple operation (X2), clear effect diagram (X3), the design process of high accuracy (X4) and high efficiency (X5) were the 5 dominant factors. The author uses the fuzzy comprehensive evaluation analysis model to analyze the factors which are the main advantages of the technology, and the results are shown in Table 3.

Table 3
analysis of advantages of virtual reality technology based on fuzzy comprehensive evaluation analysis model

Calculation Parameters		X1	X2	X3	X4	X5	Evaluation Results
Aqua Density Average Value C_i		0.41	0.88	0.97	0.36	0.15	The effect diagram is clear and clear
Standard Means S_i		0.42	0.70	0.73	0.36	0.23	
Weight W_i		0.31	0.79	0.87	0.26	0.02	
Normalization Weight A_i		0.47	0.63	0.87	0.11	0.01	
Degree Of Membership	X1	0.05	0.37	0.34	0.62	0.01	0.11
	X2	0.17	0.44	0.56	0.53	0.20	0.24
	X3	0.73	0.26	0.19	0.10	0.07	0.57
	X4	0.00	0.02	0.03	0.29	0.30	0.06
	X5	0.00	0.07	0.00	0.53	0.81	0.01

5. Conclusion

With the development of the times and the improvement of the national economy in China, while more material life has been satisfied, more citizens have begun to strengthen their pursuit of spiritual level. The tourism industry can not only meet the needs of the national spirit and culture, but also effectively promote the heritage of traditional culture, so as to get the result of killing two birds with one stone. Landscape architecture is one of the most important traditional tourist attractions in China, and the more perfect design plays a very important role in the development of China's tourism industry and the comprehensive strength of the industry. Virtual reality technology is an important extension of computer technology in the process of development, the development of this new technology because of related aspects of the design process can be on the landscape in a more intuitive expression, so as to gradually be applied to landscape design in the actual process of our country. Therefore, the author of this study on the basis of analyzing the related data, so as to determine the problems of landscape design, and in the actual case and the application of this technique to determine the feasibility of this technology in China's actual in landscape design by the author. The research result is limited due to the limited theoretical level of the author. However, the data and theory of this study can still provide a reference for future research.

Declarations

Acknowledgement

The authors are thankful to the higher authorities for the facilities provided.

Conflict of interest

The author declares that no conflict of interest is associated with this study.

Authors' contribution

This study was done by the authors named in this article, and the authors accept all liabilities resulting from claims which relate to this article and its contents.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Figures

Figure 1

the development of the scenery park landscape

Figure 2

The application of virtual reality technology in the actual landscape scenic spots

Figure 3

the statistical results of the number of tourists visiting landscape gardens in China

Figure 4

The actual use of landscape architecture based on Virtual Reality Technology