Virtual Interactive Planning Model of Landscape Architecture in Settlement Area Based on Situational Awareness

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Abstract. In order to realize the visual effect optimization design of landscape virtual interactive planning in the resettlement area, the optimal design method of landscape virtual interactive planning in the resettlement area based on situational awareness is proposed. The feature sampling model of landscape virtual interactive planning optimization is established, the virtual reality simulation in landscape virtual interactive planning design is carried out by MPI visual simulation tool, the virtual interactive planning feature construction of landscape virtual interactive planning is carried out in Vega Prime software, and the virtual interactive planning information sampling model and block information fusion model of landscape virtual interactive planning are established. Create, edit and run virtual interactive planning optimization program of landscape in resettlement area, combine with cross-compiling method to simulate virtual interactive planning information of landscape in resettlement area, create 3D visual environment of virtual interactive planning of landscape in resettlement area in real-time interaction, and realize virtual interactive planning optimization design of landscape in resettlement area in virtual reality simulation environment. The simulation results show that this method can effectively realize the visual optimization design of virtual interactive planning of landscape in resettlement area, improve the visual feature expression effect of virtual interactive planning of landscape in resettlement area, and has good application value in virtual interactive planning design of landscape in resettlement area.

Keywords: Situational awareness · Resettlement area landscape · Virtual interaction · Planning model

1 Introduction

As an expression carrier of cultural connotation, landscape design is closely related to culture itself. Modern landscape pays more attention to professionalism and high quality, and its cultural connotation is richer and has strong emotional color. Through different design methods, different cultures, such as personal philosophy, political ideal, literature revision, art aesthetics and so on, are integrated into the landscape architecture [1]. As a special form of artistic expression, landscape design mainly converts the cultural connotation of garden landscape into the ideology of users, which has an important educational function. Garden art is an integral part of social and cultural

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attributes, and landscape designers interpret their own understanding of the connotation of garden culture through a certain form of landscape art. The cultural inheritance of landscape does not mean the communication between things, but expresses the design creativity of human landscape inheritance with the help of garden art, and the user interprets the creative idea of designer from the point of view of cultural connotation [2]. The inheritance of landscape culture is continuous in time and space, not limited by time and region, and cannot replace other forms of language and culture inheritance. Landscape has the three-dimensional expression of historical and cultural inheritance. The cultural inheritance in landscape design also has certain inheritance and transcendence. Transcendental cultural inheritance is embodied in the fact that according to the rules of human survival and development, we should learn the selective trade-off and innovation by absorbing the cultural essence inherited from the original cultural heritage [3].

With the development of 3D virtual visual simulation technology, the virtual interactive planning and optimization design of landscape in resettlement area is carried out by using 3D virtual reality technology, and the simulation model of virtual interactive planning of landscape in resettlement area is established [4]. Combined with advanced visual simulation software and image processing program, the virtual interactive planning and optimization of landscape in resettlement area is carried out, and the effect of virtual interactive planning of landscape in resettlement area is improved. The optimization design of virtual interactive planning of landscape in resettlement area is based on the advanced visual simulation tool of virtual interactive planning of landscape in resettlement area [5]. Combined with the database of visual simulation, the expert system is constructed, and the optimization construction model of virtual interactive planning effect of landscape in resettlement area is established, so as to improve the simulation ability of virtual interactive planning of landscape in resettlement area [6]. The research on the optimization design method of virtual interactive planning of garden landscape in settlement area is of great significance in advertising design. In the virtual reality simulation scene, the advanced visual simulation function is effectively combined with the image processing program, the optimal design model of the virtual interactive planning of the landscape in the resettlement area is established, the virtual interactive planning of the landscape in the resettlement area is optimized by using the Vega Prime editor, and the scene map system (Vega Scene Graph, VSG) of the virtual interactive planning of the landscape in the resettlement area is designed The visual information analysis model of virtual interactive planning of landscape in resettlement area is established. Combined with the application software, the visual optimization design of virtual interactive planning of landscape in resettlement area is carried out. in this paper, the optimization design method of virtual interactive planning of landscape in resettlement area based on situational perception is proposed. The sampling model of virtual interactive planning feature information of landscape in resettlement area is established [7], and the virtual interactive planning information of landscape in resettlement area is simulated with cross compilation method, and the visual optimization of virtual interactive planning of landscape in resettlement area is realized by combining visual simulation software. Finally, the simulation test and analysis are carried out, which shows the superior performance of

this method in improving the optimization ability of virtual interactive planning of landscape in resettlement area [8].

2 Overall Framework of the Planning and Optimization Design System for the Virtual Space Planning of the Garden Landscape in the Resettlement Area

In order to realize that optimal design of the virtual environment planning of the garden landscape in the resettlement area, a virtual space planning optimization design of the garden landscape of the resettlement area is carried out in combination with the Vega Prime bottom software framework agreement [9]. In this paper, the design of the program embedded in the process of the planning and optimization of the landscape in the resettlement area is set up by using the OpenGL program, and the three-dimensional rendering of the virtual space planning drawing of the garden landscape in the resettlement area is carried out by using the OpenGL, and the VP class library developed by the MultiGen Co., Ltd. is adopted. The VSG class library software is used for the integration sampling of the virtual landscape planning information of the garden landscape in the resettlement area, and the urban landscape virtual spatial planning optimization control model is established in the three-dimensional space, and the virtual spatial planning optimization of the landscape in the resettlement area is carried out in the three-dimensional space, So as to improve the planning and design effect of the landscape of the garden landscape in the resettlement area [10]. Under the technical support of virtual reality, the planning and optimization design of the landscape of the landscape of the resettlement area is carried out, and the overall framework of the planning and optimization design system of the garden landscape of the resettlement area is shown in Fig. 1.

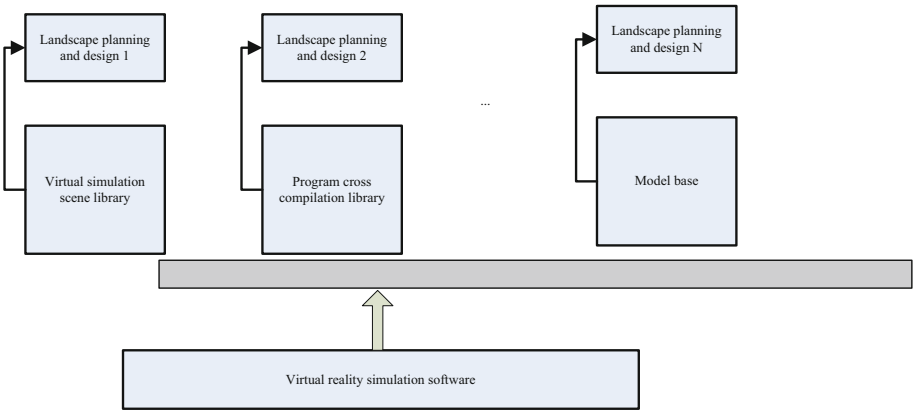


Fig. 1. General framework of the planning and optimization design system of the landscape of the garden landscape in the resettlement area

According to the above analysis, using the MPI visual simulation tool to carry out the virtual reality simulation in the virtual environment planning design of the garden landscape in the resettlement area, the feature structure is constructed in the Vega Prime software for the virtual environment planning of the landscape of the placement area [11].

3 Graphic Processing of Virtual Interactive Planning Optimization of Garden Landscape in Settlement Area

On the basis of the overall structure of the virtual interactive planning and design of the landscape in the resettlement area, the modeling structure of the virtual interactive planning and optimization design system of the landscape in the resettlement area is carried out. Combined with the image processing software, the virtual interactive planning and optimization design of the landscape in the resettlement area is carried out [9], and the sampling model of the feature information of the virtual interactive planning of the landscape in the resettlement area is established. The spatial sampling in the virtual interactive planning design of landscape in resettlement area is carried out by using block feature matching technology, and the block information fusion model of virtual interactive planning effect of landscape in resettlement area is established, as shown in Fig. 2.

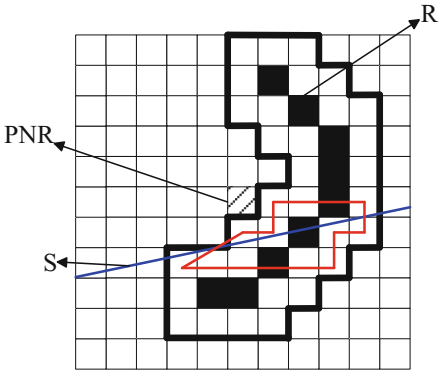


Fig. 2. Block model of virtual interactive planning effect of landscape in resettlement area

According to the landscape virtual space planning effect expression blocking model of the placement area shown in Fig. 2, the visual characteristic rendering of the landscape virtual space planning design of the placement area is carried out by using

the method of the blocking information fusion [12], and the image expression of the landscape virtual space planning image of the placement area is as follows:

$$c(x,y) = \sum\nolimits_W [I(x_i,y_i) - I(x_i+\Delta x, y_i+\Delta y)]^2 \tag{1}$$

Wherein, $(\Delta x, \Delta y)^T$ is the displacement of virtual interactive planning distribution of landscape in resettlement area, and (x_i, y_i) is the point in window W. By using the method of multi-scale feature decomposition, the virtual interactive planning and rendering of landscape in resettlement area is carried out, and the image block feature matching model is established. The approximate value of virtual interactive planning displacement of landscape in resettlement area is obtained as:

$$I(x_i+\Delta x, y_i+\Delta y) \approx I(x_i,y_i) + [\, I_x(x_i,y_i) \quad I_y(x_i,y_i)\,] \begin{bmatrix} \Delta x \\ \Delta y \end{bmatrix} \tag{2}$$

The $\nabla I = [\, I_x \quad I_y\,]^T$ is the spatial gradient of the layout information distribution of the landscape of the landscape in the resettlement area. The visual database is used for the integration of the virtual space planning information of the landscape of the placement area and the space undersampling technique, and the visual optimization control in the planning and design process of the garden landscape of the resettlement area is carried out, and the control function is as follows:

$$c(x,y) = [\, \Delta x \quad \Delta y\,] \begin{bmatrix} \sum_W I_x^2 & \sum_W I_x I_y \\ \sum_W I_x I_y & \sum_W I_y^2 \end{bmatrix} \begin{bmatrix} \Delta x \\ \Delta y \end{bmatrix} \tag{3}$$

In the virtual space planning image *I (x, y)* of the garden landscape of the resettlement area, the point scanning technique is adopted to obtain the Hessian matrix of the detected characteristic point x at the scale.

$$H = \begin{bmatrix} L_{xx}(x,\sigma) & L_{xy}(x,\sigma) \\ L_{xy}(x,\sigma) & L_{yy}(x,\sigma) \end{bmatrix} \tag{4}$$

Where: $L_{xx}(x,\sigma)$ is the spatial distribution joint function of the landscape virtual interactive programming image in the resettlement area, and the autocorrelation function of L_{xy} and L_{yy}. the optimal scanning of the landscape virtual interactive planning of the resettlement area is carried out in the three-dimensional neighborhood of 3 × 3×3, as shown in Fig. 3.

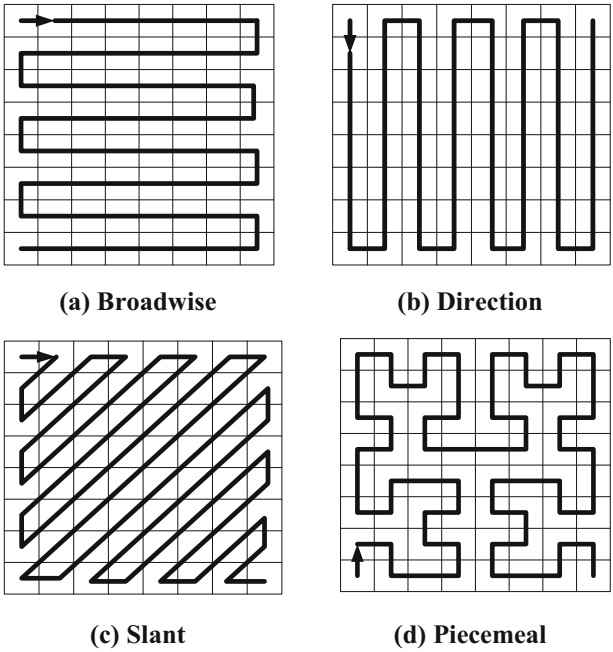


Fig. 3. Optimization scanning of Virtual Interactive Planning of Landscape in settlement area

4 Optimization Design and Implementation of Virtual Interactive Planning of Landscape in Settlement Area

The virtual interactive planning and design of landscape in resettlement area is carried out in Vega Prime, the analysis model of virtual interactive planning of landscape in resettlement area is established, the graphic rendering model of virtual interactive planning of landscape in resettlement area is established in Lynx Prime [13], and the virtual visual simulation design of virtual interactive planning of landscape in resettlement area is carried out according to the virtual effect. Firstly, the plane distribution structure model of virtual interactive planning and design of landscape in resettlement area is constructed as shown in Fig. 4.

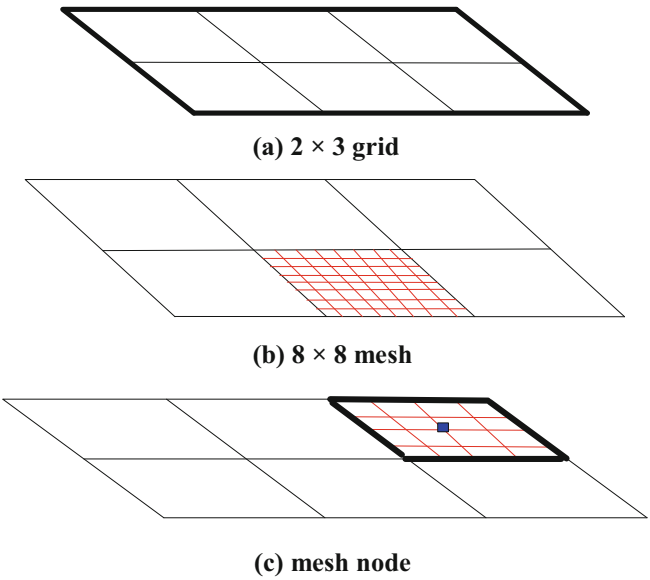


Fig. 4. Plane distribution structure model of virtual interactive planning and design of garden landscape in settlement area

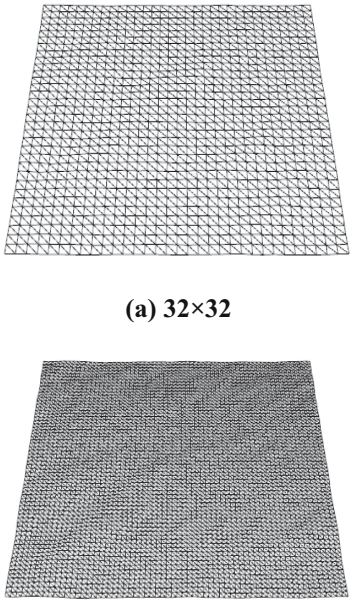


Fig. 5. 3D rendering model of virtual interactive planning of landscape in settlement area

According to the plane template design of the virtual interactive planning of the landscape in the resettlement area, the virtual interactive planning optimization program of the landscape in the resettlement area is created [14], edited and run in the 3D simulation scene, and the virtual interactive planning information of the landscape in the resettlement area is simulated with the cross-compilation method. The three-dimensional rendering model of the virtual interactive planning of the landscape in the resettlement area is established in the complex model as shown in Fig. 5.

The grid resolution is determined in conjunction with Fig. 5, and the optimal design of the virtual space planning of the landscape of the resettlement area is realized.

5 Simulation Test Analysis

The application performance of this method in realizing virtual interactive planning of landscape in resettlement area is tested by simulation experiment. According to the design scope and grid size of virtual interactive planning of landscape in resettlement area, the number of distributed grid of virtual interactive planning of landscape in resettlement area is determined, and the 3D visual environment of virtual interactive planning of landscape in resettlement area is created. The virtual interactive planning and optimization design of garden landscape in the virtual reality simulation environment is realized, and the virtual visual simulation results are shown in Fig. 6.

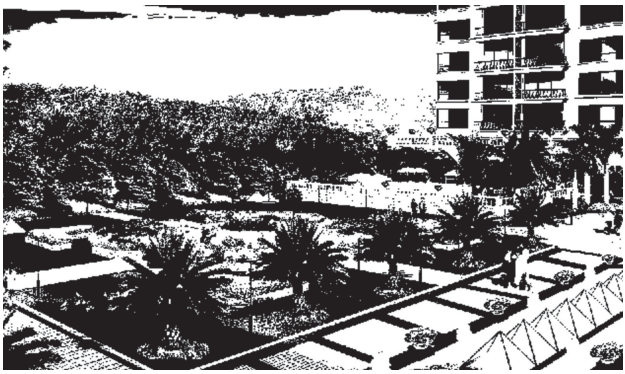


Fig. 6. Virtual scene simulation results of the virtual space planning design of the garden landscape in the resettlement area

According to the virtual scene simulation result of Fig. 6, the optimal visual design of the virtual space planning of the landscape of the resettlement area is carried out, and the gray scale is obtained as shown in Fig. 7.

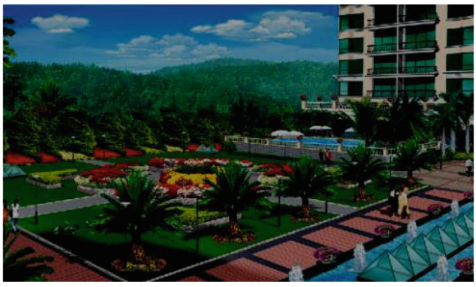
Fig. 7. Grayscale map of garden landscape in settlement area

The 3D rendering of the virtual space planning pattern of the garden landscape in the resettlement area is carried out by using OpenGL, and the virtual spatial planning optimization control model of the garden landscape in the resettlement area is established, and the virtual spatial planning optimization of the landscape landscape in the resettlement area is carried out in the three-dimensional space, so that the visual optimization result is shown in Fig. 8.

Figure 8 shows that the virtual interactive planning and optimization design of landscape in resettlement area can be effectively realized by using this method, and the spatial visual effect is good. Taking the output signal-to-noise ratio as the index, the comparison results are shown in Table 1. The analysis Table 1 shows that the output signal-to-noise ratio (SNR) of virtual interactive planning and design of landscape in resettlement area is high, which shows that the quality of the design is better.

(a) The optimization results of this method

(b) Optimization results of literature [3] method



(c) Optimization results of literature [4] method

Fig. 8. Optimization effect of virtual interactive planning of landscape in resettlement area

Table 1. Comparison of output signal-to-noise ratio (dB)

Iterations	Proposed method	Reference [3]	Reference [4]
100	34.3	20.3	12.4
200	38.4	23.6	14.3
300	41.3	28.1	18.4
400	48.5	30.4	20.1

6 Conclusions

In this paper, a virtual interactive planning optimization design method for landscape architecture in settlement area based on situational perception is proposed. The sampling model of virtual interactive planning optimization feature information of landscape in resettlement area is established, the 3D rendering of virtual interactive planning graphics of landscape in resettlement area is carried out by using OpenGL, the optimization control model of virtual interactive planning of landscape in resettlement area is established, the virtual interactive planning and optimization of landscape in resettlement area is carried out in three dimensional space, and the effect of virtual interactive planning of landscape in resettlement area is improved. The analysis shows that this method can effectively realize the visual optimization design of virtual interactive planning of landscape in resettlement area, improve the visual feature expression effect of virtual interactive planning of landscape in resettlement area, and the output signal-to-noise ratio of virtual interactive planning image of landscape in resettlement area is high, which indicates that the design quality is good. This method has good application value in landscape planning and design of resettlement area.

7 Fund Projects

2019 top talents in Colleges and Universities GXYQZD2019089.

Key projects of Humanities and social sciences of Anhui Provincial Department of Education SK2018A0640.

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