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Research Article

Research on Optimization of 3D Tourism Virtual Crossover Scene based on Semantic Perception Analysis

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The objective of this paper is to optimize the scene of tourism virtual perception space. Based on the abstract method of semantic feature points, the computing model of semantic perception of single-cultural landscape and multi-cultural landscape is established. Using the digital elevation model, an empirical study on the semantic perception of cultural landscape in the western Tombs of Qing Dynasty is carried out. Taking the traditional Chinese culture of the site selection of royal tombs and the feudal hierarchy represented as the semantic criteria, eighteen feature points were extracted from two representative tomb cultural landscapes from different landscape perspectives, and the corresponding weight coefficients were assigned to each feature point from different landscape perspectives; based on the results of perceptual degree calculation, the semantic mining of the existing sightseeing routes is carried out and the optimization scheme is designed. From the perspective of tourists' perception of landscape, tourism resources are deeply mined to better reflect the value of landscape and realize the coupling and interaction between virtual tourism and tourism economy.

1. Introduction

Virtual reality technology has been applied in many fields by virtue of its advantages in reproducing the real environment, and tourism is one of them. The application of virtual reality in tourism is becoming more and more widespread. This field has attracted the attention of many scholars and led to a large number of academic researches, the situation of "contention of a hundred schools of thought" has been formed, and many scholars have formed research views from different angles and different fields. These theories and studies have objectively promoted the development of virtual reality and promoted the application of virtual reality technology in tourism. Landscape perception plays a fundamental role in tourism destination planning and design, but there is no microscale research method for the spatial differentiation of landscape perception inside the cultural tourism destination [1]. Most of the planning and design of tourist destinations do not accurately consider tourists' perception of landscape, letting alone the spatial difference of perception. The main reason is the lack of accurate description of landscape perception, which makes tourists' perception of cultural landscape of tourist destinations stay on superficial cognition. How to deeply explore tourism resources from the perspective of tourists' perception of cultural landscape, so as to better reflect the value of landscape, and to realize the coupling and interaction between tourism culture and tourism economy is an important topic to be studied in modern tourism geography.

The research on the combination of quantitative statistical data of landscape perception and spatial modeling method still belongs to the macro description of the overall characteristics of tourist perception, and the spatial differentiation of landscape perceived intensity was not differentiated. Domestic scholars choose Huangshan Mountain, Jiuzhaigou, and other ecological tourism destinations to conduct tourist cognition research, and this study begins to quantitatively describe the intensity of tourists' local perception and examines the spatial differentiation of local residents' perception and attitude towards the local impact of tourism activities. The previous studies have laid a foundation for quantitatively describing the spatial differentiation of tourists' perception, but there is also a lack of research on the landscape perception state of tourists at any site within the tourism destination [2]. The tourism system not only includes landscape but also a community composed of landscape and viewers. Only when the viewers appreciate the landscape and experience the beauty of the landscape from different perspectives, the aesthetic value of the landscape can be realized. View analysis based on terrain features based on the GIS platform is an effective method to realize view analysis of visitors. In recent years, on the basis of the research on the perspective analysis and calculation method itself, this technology has also been applied in landscape planning and landscape design and combined with the research on 3D visualization to build a virtual reality system [3].

Helsel, S.K. Anndroth, and J.P. gave such an explanation for virtual reality that "virtual reality is a specific event in a specific scene, rather than real," emphasizing the "sense of reality" in a specific scene. One common feature of these understandings of virtual reality is that it is basically not limited to computer technology, and any technology that can provide an immersive feeling is called virtual reality [4]. In the 20th century, with the development of computer technology, the definition of virtual reality added more computer technology elements, and Williams, Bryson, and Cotton all agree that VR uses computer technology and human-computer interface technology to create highly realistic three-dimensional scenes that give people a strong sense of presence. These understandings of virtual reality technology are all based on computers. With the rapid development of technology, people's understanding of virtual reality is constantly deepened and the understanding of virtual reality is also constantly developing and improving [5]. Virtual tourism refers to VT, which is a kind of surreal landscape constructed by computer technology on the basis of real landscape, and when users participate in virtual tourism activities, they will have an immersive feeling. Tourism e-commerce is the basis of its development. In essence, tourism is a process of going out to visit, involving a wide range. Internet technology can help the tourism industry to carry out publicity and promotion and reorganize the tourism business. However, tourism e-commerce mainly transmits various tourism information, with few image descriptions of landscapes [6]. Virtual tourism uses Internet technology to display landscape images in a panoramic way, which allows tourists to have a comprehensive perception of the tourism landscape and experience more diversified.

Based on the idea of cartographic synthesis in cartography and the abstract method of landscape semantic feature points, the virtual landscape of tourist destination is established on the basis of digital elevation model and HD image data source, and the quantitative calculation and spatial differentiation of tourism landscape semantic perception are studied by using GIS analysis. In order to clearly express the research ideas, the researchers specially chose the tourist destination of the Qing Tombs in Yi County, China as the case area, taking the cultural landscape of royal mausoleum site selection as the research object, a computing model of cultural landscape semantic perception is established, and an empirical study is carried out.

2. Research Methods

The abstract process of feature points of different landscapes varies, and the principle is that the extracted feature points can accurately and comprehensively represent the location features of the landscape [7]. For the road landscape, the road landscape can be first simplified to linear or network graphics, then the obvious intersection points and turning points of linear features can be selected, and the sites are selected for feature points, namely, the obvious turns in the road and the junctions of two or more roads, and concrete abstract mode is shown in Figure 1(a). For the architectural landscape, the geometric center of the landscape can be selected as the feature point, and due to the different shapes of buildings, the buildings can be simplified into geometric figures with similar shapes in the study, to simplify the abstract process of feature points of complex buildings, and the abstract method is shown in Figure 1(b). For the most important features of the building, the feature points cannot be omitted and should be retained. If the scale of the study area is large, the buildings can be further abstracted into a single feature point to conform to the fact that human vision can see within the scale of the study.

2.1. Semantic Perception of Single Landscape. Single landscape semantic perception is used to describe the degree of perception of a landscape by an observer at any location. First of all, the premise of single landscape perception model is landscape visibility. After the cultural landscape is abstracted into feature points, the visual state of the cultural landscape only needs to consider whether the feature points are visible or not. A feature point only represents the cultural connotation of a certain aspect of the cultural landscape, the corresponding weight is assigned to the contribution of the feature point to the representation of the cultural connotation of that aspect, and through visibility and corresponding weight factors, the perception model of a single cultural landscape can be established [8]. For the complex single cultural landscape, the landscape can be decomposed into different cultural perspectives, and different combinations of feature points can be used to represent different cultural perspectives. Due to the different contributions of different cultural perspectives to landscape semantics, cultural perspectives also assign corresponding semantic weights, and the perception degree of the cultural landscape can be described completely by the weighted sum of the perception degree of all cultural perspectives. The formula of single landscape semantic perception is as follows:

$$\mathrm{Pu} = \sum_{j=1}^{m} \mathrm{Wt}_j \times \left(\sum_{i=1}^{n} \mathrm{Wv}_i \times V_i \right), \quad (i = 1, 2, 3, \ldots, n;\ j = 1, 2, 3, \ldots m), \tag{1}$$

where, Pu is the observer's perception of a certain cultural landscape P at any position; m is the number of

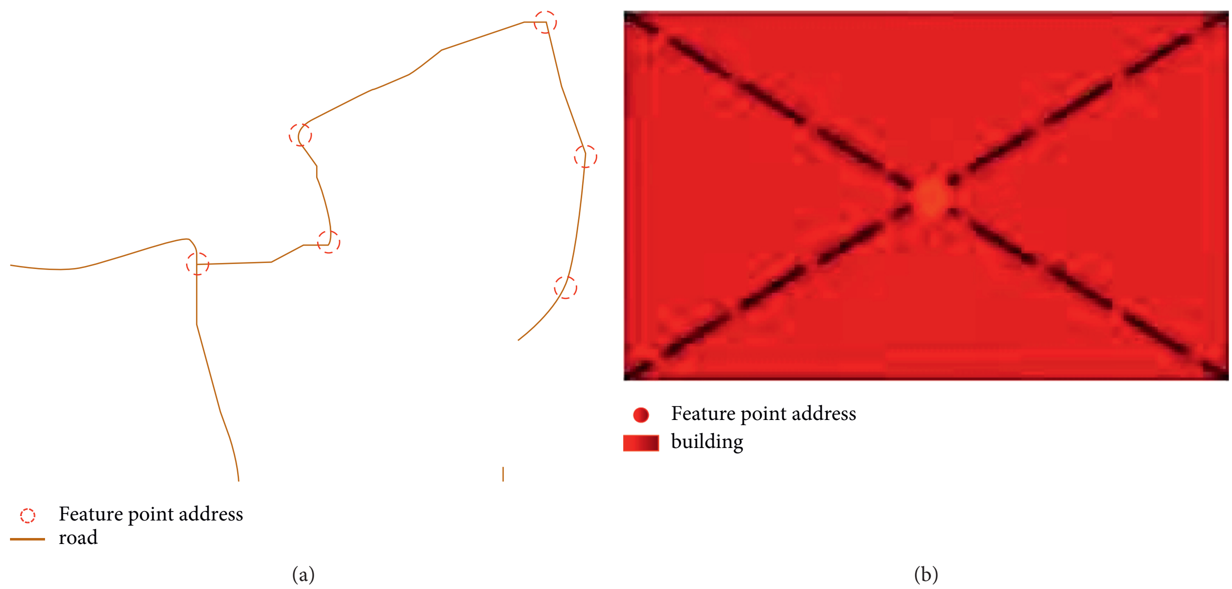

Figure 1: Abstract process of landscape feature points. (a) To be selected site of road landscape feature point. (b) To be selected site of building landscape feature point.

landscape perspectives included in p; n is the number of semantic feature points included in landscape perspective J; V_i is the visibility factor of feature point i, if i is visible, $V_i = 1$; if i is not visible, $V_i = 0$; Wv_i is the weight of point I's semantic contribution to landscape P; Wt_j is the weight of the contribution of landscape perspective J to cultural landscape semantics. The single landscape semantic perception formula can be used to quantitatively calculate the perceived intensity and spatial differentiation of a specific cultural landscape at any location in a tourism destination, and it provides a quantitative description method for the perception analysis of monocultural landscape in tourism site planning. The location or area with high perception can be used as the observation point of the landscape, so that tourists can better perceive the semantic meaning of cultural landscape.

2.2. Perception of Multiple Landscape Semantics. Although specific cultural meanings can be understood through individual cultural landscapes, overall cultural landscape systems or landscape subsystems also contribute significantly to cultural semantics. There are semantic relationships such as correlation, rank, and subordination among multiple single-cultural landscapes, thus forming a cultural landscape system with deeper levels and more perspectives, which is called multi-cultural landscape [9, 10]. The calculation method of multi-cultural landscape perception is based on the calculation of single landscape perception. Firstly, the perception degree of each single cultural landscape that constitutes the multi-cultural landscape system is calculated. Secondly, each single landscape is given corresponding weights according to its semantic contribution to the multi-cultural landscape system. Finally, the multi-landscape semantic perception can be obtained by weighting and accumulating each single landscape semantic perception. The calculation formula is as follows:

$$\mathrm{Pm} == \sum_{i=1}^{n} \left(\mathrm{Wu}_i \times \mathrm{Pu}_i\right), \quad (i = 1, 2, 3, \ldots, n), \qquad (2)$$

where, Pm is the observer's semantic perception of a multi-cultural landscape at any position, and n is the number of single-cultural landscapes that comprise the multi-cultural landscape. Pu_i represents the ith single landscape perception of the multi-cultural landscape. Wu_i is the weight of the semantic contribution of the ith single landscape to the multi-cultural landscape. Multi-landscape semantic perception is used to calculate the overall semantic perception intensity and the spatial differentiation state of tourists to the multi-cultural landscape system within the tourism destination. Multi-landscape perception can provide support for the planning and design of functional areas of tourist destinations and can also provide a reference for the design of sightseeing routes with the combination of single landscape perception, so that tourists can not only feel the semantic connotation of the specific landscape but also have a better perception of the cultural landscape system.

3. Research Results

An empirical study on the semantic perception of cultural landscape was carried out in the tourist destination of the Western Tombs of Qing Dynasty. The virtual tourism flow of Xiling in different months in 2020 is shown in Figure 2.

3.1. DEM Build. Based on the production methods and application perspectives of DEM data in previous studies, the DEM of the tourist destination of the Western Tombs of Qing Dynasty is established. Firstly, the DEM of the study area was established, the DEM data source provided the local

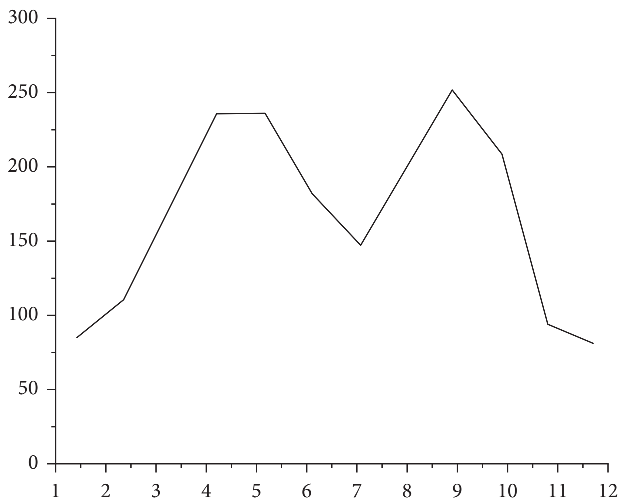

Figure 2: Virtual tourism flow of Xiling in different months in 2020.

surveying and mapping department with the 1:10000 topographic map of the Western Tombs of Qing Dynasty (compiled in 2008), and due to the national protection of cultural heritage projects, the natural terrain data are basically unchanged, so scan vectoring mode is directly adopted to vectoring the contour line, traffic, mausoleum, and other elements. The contour data are used to generate discrete elevation points, which are converted into DEM GRID data to form the basic spatial analysis data needed for perception calculation.

3.2. Weight of Landscape Perspective and Feature Points. Although different landscape perspectives and feature points have important contributions to the interpretation of cultural landscape semantics of site selection, the contribution degree is different. According to the relevant literature description, combined with the survey of local residents and scenic area managers, the significance of the semantic contribution of landscape perspectives and feature points is graded. According to the importance of each landscape perspective in the ideal Feng–Shui model, the corresponding weight value is assigned to each landscape perspective, and due to the slight differences in construction regulations and structures, different tombs contain slightly different landscape perspectives and weight distribution. In the four tombs of Tailing, Changling, Changfei Yuan, and Changxi Mausoleum, the contribution of landscape perspectives and feature points to the cultural landscape semantics of site selection is different, so the weight distribution of landscape perspectives and feature points is carried out for each tomb. Both Tailing and Changling are tombs of emperors. Except that the Shinto way of Tailing is longer than that of Changling, the other building regulations and structures of the tombs are roughly the same. These two mausoleums have six landscape perspectives: "Green Dragon," "White Tiger," "Rosefinch," "Xuanwu," "Architecture," and "Shinto." Since the four perspectives of "Green Dragon," "White Tiger," "Rosefinch" and "Xuanwu" are equally important in the semantic contribution to the siting of cultural landscape, they are given the same weight coefficient. The two perspectives of "Architecture" and "Shinto" also contribute greatly to the semantics of siting cultural landscapes; however, compared with "Green Dragon," "White Tiger," "Rosefinch," and "Xuanwu," the importance of the four landscape perspectives is slightly lower, so it is given a low weight. The weight coefficients of the three feature points in the three landscape perspectives of "Green Dragon," "White Tiger," and "Xuanwu" were assigned according to the principle that the importance of the middle position was higher than that of the two sides. The landscape perspective "Rosefinch" contains three groups of feature points of opposite flow, left flow, and right flow, and the three feature points of each group are also assigned weight coefficients according to the principle that the importance of the middle position is higher than that of the two sides. The two landscape perspectives of "Mausoleum Architecture" and "Shinto" contain feature points that are geographically indistinguishable due to their importance and assign the same weight coefficient to each feature point. According to the above weight distribution principles, the weight of each view angle in Tailing and Chang Ling is as follows: "Dragon" (0.180), "White Tiger" (0.180), "Linnet" (0.180), "Basalt" (0.180), "Building" (0.140), and "Shinto" (0.140). The site description, semantic connotation, weight distribution, and other information of feature points in each landscape perspective of Tailing and Changling are listed in Tables 1 and 2.

3.3. Perception of Cultural Landscape of Multiple Tomb Sites. Tailing is only one of the imperial tombs in the Western Qing Tombs scenic area, and through Tailing, we can clearly perceive the semantic connotation of the cultural landscape of the site selection of the imperial tombs; however, in order to deeply perceive the historical background and hierarchical system contained in the imperial mausoleum landscape, it is necessary to compare other mausoleum landscapes. The four tombs in the study area, Tai Mausoleum, Chang Mausoleum, Chang Imperial Palace, and Changxi Mausoleum, form a representative multi-cultural landscape system. The calculation process of multi-landscape semantic perception is as follows: first, the four mausoleums were given weight coefficients by experts based on information such as the owner, social relations, and size of the mausoleums: Tai Mausoleum (0.4), Chang Mausoleum (0.3), Chang Imperial Palace (0.15), and Changxi Mausoleum (0.15), and the same weight coefficient is given to Changfei Garden and Changxi Mausoleum. Secondly, according to formula (1), the semantic perception of a single mausoleum cultural landscape is calculated, and four grid layers of the semantic perception of a single landscape are obtained; then according to formula (2), the grid layers of single landscape semantic awareness are weighted respectively. Finally, the weighted single landscape awareness layer is summed up to obtain the multi-landscape semantic awareness grid layer.

Table 1: Feature point information and weight coefficient of single cultural landscape (tailing).

Serial number	Address of a feature point	Feature point semantics	Feature point weight	Landscape perspective	Weight of landscape view
1	Mountains behind the mausoleum (right)	Mountain	0.050	Basaltic	0.180
2	Mountains behind the mausoleum (middle)	Mountain	0.070		
3	Mountains behind the mausoleum (left)	Mountain	0.050		
4	Mountains to the right of the mausoleum (top)	"To protect the mountain"	0.050	White Tiger	0.180
5	Mountains to the right of the mausoleum (middle)	To protect the mountain	0.070		
6	Mountains to the right of the mausoleum (bottom)	To protect the mountain	0.050		
7	Mountains to the left of the mausoleum (top)	To protect the mountain	0.050	Tsing Lung	0.180
8	Mountain range left of mausoleum (middle)	To protect the mountain	0.070		
9	Mountain range left of mausoleum (bottom)	To protect the mountain	0.050		
10	Mausoleum towards the river (right)	Water	0.010	Rosefinch	0.180
11	Mausoleum to river (middle)	Water	0.030		
12	Mausoleum towards the river (left)	Water	0.010		
13	Mausoleum right river (top)	Water	0.020		
14	Mausoleum right river (middle)	Water	0.040		
15	Mausoleum right river (bottom)	Water	0.020		
16	Mausoleum left river (top)	Water	0.010		
17	Mausoleum left river (middle)	Water	0.030		
18	Mausoleum left river (bottom)	Water	0.010		

Table 2: Feature point information and weight coefficient of single cultural landscape (Changling).

Serial number	Address of a feature point	Feature point semantics	Feature point weight	Landscape perspective	Weight of landscape view
1	Mountains behind the mausoleum (right)	Mountain	0.050	Basaltic	0.180
2	Mountains behind the mausoleum (middle)	Mountain	0.070		
3	Mountains behind the mausoleum (left)	Mountain	0.050		
4	Mountains to the right of the mausoleum (top)	To protect the mountain	0.050	White Tiger	0.180
5	Mountains to the right of the mausoleum (middle)	To protect the mountain	0.070		
6	Mountains to the right of the mausoleum (bottom)	To protect the mountain	0.050		
7	Mountains to the left of the mausoleum (top)	To protect the mountain	0.050	Tsing Lung	0.180
8	Mountain range left of mausoleum (middle)	To protect the mountain	0.070		
9	Mountain range left of mausoleum (bottom)	To protect the mountain	0.050		
10	Mausoleum towards the river (right)	Water	0.010	Rosefinch	0.180
11	Mausoleum to river (middle)	Water	0.030		
12	Mausoleum towards the river (left)	Water	0.010		
13	Mausoleum right river (top)	Water	0.020		
14	Mausoleum right river (middle)	Water	0.040		
15	Mausoleum right river (bottom)	Water	0.020		
16	Mausoleum left river (top)	Water	0.010		
17	Mausoleum left river (middle)	Water	0.030		
18	Mausoleum left river (bottom)	Water	0.010		

Table 3: Semantic analysis of typical scenic spots of new and existing sightseeing routes.

Serial number	Type of view point	Perception	Landscape semantic representation	Visible feature point
1	Single mausoleum landscape (existing line points)	0.940	Tailing "back mountain," left and right "mountain protection," "surface water" (part)	TaiLing (1–14, 16–18)
2	Single mausoleum landscape (existing line points)	1	Luling "back mountain," "surface water," "mountain protection"	Lv Ling (1–25)
3	Multiple mausoleum landscape (existing line points)	0.883	Tai Ling, Lu Ling, Lu Imperial Concubine's garden, Lu Xiling: "back mountain" (part), "surface water" (part), "mountain protection" (part); space order	TaiLing (1–15, 18); Lv Ling (1–7, 9–17); Lv Feiyuan lay (2–7, 11, 12); Lu Xiling (4, 7–12)
4	Multiple mausoleum landscape (existing line points)	0.773	Tai Ling, Lu Ling, Lu Imperial concubine's garden, Lu Xiling: "back mountain" (part), "surface water" (part), "mountain protection" (part); space order	Tai Ling (1, 2, 4–7, 11–14, 16–18); Lv Ling (1–2, 4–6, 8–11, 13–18); Lv Feiyuan lay (1–3, 6–8, 10–12); Lu Xiling (3, 5–9, 11, 12)
5	Multiple mausoleum landscape (new line points)	0.963	Lu Ling, Lu Xiling: "back mountain," "surface water," "mountain protection"; Tai Ling: "back mountain," "mountain protection," "surface water" (part); Lv Fei's garden: "back the mountain" (part), "protecting the mountain," "surface water"; space order	TaiLing (1–11, 13–18); Lv Ling (1–18); Lv Feiyuan lay (1, 2, 4–14); Lu Xiling (1–14)
6	Multiple mausoleum landscape (new line points)	0.972	Tai ling, Lu Fei garden: "back mountain," "surface water," "mountain protection"; Lv Ling: "back mountain," "surface water" (part), "mountain protection"; Lu Xiling: "back mountain" (part), "surface water," "mountain protection"; space order	TaiLing (1–18); Lv Ling (1–25); Lv Feiyuan lay (1–12); Lu Xiling (2–12)

3.4. Semantic Analysis of Scenic Spot Mining and Route Correction. According to the analysis of the existing sightseeing routes in the Western Tombs of Qing Dynasty, many sections with high perception can be excavated on the routes, and if tourists are properly guided, the better landscape perception can be obtained in tourism activities. In addition, the appropriate fine-tuning of sightseeing routes can make the tourists' perception of the cultural landscape of the whole tourist destination reach the best effect. Based on the analysis of landscape semantic perception and field investigation, six observation points were designed and the routes were fine-tuned, of which four were located on the existing routes and two were located on the fine-tuned sections (Table 3). Observation points 1 and 2 are single mausoleum cultural landscape observation points located on the existing route, which can view the selected cultural landscape of Tailing and Chang Ling respectively. These two points are located near the Shinto road and close to the main architectural landscape of the mausoleum, which is convenient for viewing the aesthetic characteristics, grade, and scale of the mausoleum complex at the same time, so as to obtain the best perception effect of the landscape of Tailing and Changling. Sites 3 and 4 have a high perception of multi-mausoleum landscape on the existing route, but the perception is only about 0.8, which can partially perceive the semantic meaning such as spatial order and hierarchical relationship among multi-landscape. Sites 5 and 6 are the observation points added after local route correction according to the route correction principle and perception calculation results. The vertical distance from the existing line is 120 m and 135 m, respectively, and are located on the hilly edge of the gentle slope zone, suitable for simple design after use. Sites 5 and 6 have a very high perception of multi-mausoleum cultural landscape, and the perception effect is better than that of sites 3 and 4. Not only the single mausoleum landscape can be well perceived, but also the site selection features such as the spatial order between tombs can be fully perceived, such as the hierarchy reflected in the size of mausoleum buildings, architectural appearance and color, and the length of Shinto. In the field investigation of the study area, the field observation of the mausoleum at the site of each view point is basically consistent with the results of theoretical analysis.

4. Conclusions

By subdividing cultural landscape into two types, single cultural landscape and multi-cultural landscape, a computational model of semantic perception of cultural landscape is established. Landscape classification guarantees the semantic integrity of independent landscape and the unity of landscape system in the quantitative description. In order to reduce the semantic distortion of landscape representation, weight factors were assigned to landscape feature points, landscape perspectives, and different cultural landscapes. The empirical study on the Western Tombs of Qing Dynasty proves that the perception model can accurately describe the internal landscape perception intensity and the spatial pattern of the tourism destination; moreover, it can deeply excavate the landscape semantic connotation of sightseeing routes and then carry out the work of landscape planning, route design, and optimization. This study provides ideas for the introduction of quantitative technology in the study of tourist destinations and has certain theoretical and methodological reference value for the study of cultural landscapes in human geography. In addition, this study focuses on the discussion of methods and has shortcomings in the following aspects: (1) the number of selected cultural feature points is relatively small, and the understanding of site selection culture may also be biased; (2) the influence of vegetation factors on view analysis is not considered in the perception calculation, which needs further improvement.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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References

[1] L. Ye, T. Duan, and J. Zhu, "Neural network-based semantic segmentation model for robot perception of driverless vision," *IET Cyber-Systems and Robotics*, vol. 2, no. 4, pp. 190–196, 2020.

[2] S. Guediche, Y. Zhu, D. Minicucci, and S. E. Blumstein, "Written sentence context effects on acoustic-phonetic perception: FMRI reveals cross-modal semantic-perceptual interactions," *Brain and Language*, vol. 199, Article ID 104698, 2019.

[3] B. Huynh, A. Ibrahim, Y. S. Chang, T. Hllerer, and J. O'Donovan, "User perception of situated product recommendations in augmented reality," *International Journal of Semantic Computing*, vol. 13, no. 3, pp. 289–310, 2019.

[4] X. Wang, Y. Pang, and X. Ma, "Real distorted images quality assessment based on multi-layer visual perception mechanism and high-level semantics," *Multimedia Tools and Applications*, vol. 79, no. 35, pp. 25905–25920, 2020.

[5] M. Avneon and D. Lamy, "Do semantic priming and retrieval of stimulus-response associations depend on conscious perception?" *Consciousness and Cognition*, vol. 69, pp. 36–51, 2019.

[6] M. Maier and A. R. Rasha, "No matter how: top-down effects of verbal and semantic category knowledge on early visual perception," *Cognitive, Affective & Behavioral Neuroscience*, vol. 19, no. 4, pp. 859–876, 2019.

[7] T. Cervera and J. Álvarez, "Speech perception: phonological neighborhood effects on word recognition persist despite semantic sentence context," *Perceptual & Motor Skills*, vol. 126, no. 6, pp. 1047–1057, 2019.

[8] Á. G. F. Mendoza, M. R. Mateos, and N. G. Reinoso, "Perception and rating of tourism entrepreneurs in the recovery of travel destinations affected by social-natural disasters: case study from the april 16th earthquake in Ecuador," *International Journal of Disaster Risk Reduction*, vol. 11, Article ID 102488, 2021.

[9] J. Wang, B. Liu-Lastres, B. W. Ritchie, and D. Z. Pan, "Risk reduction and adventure tourism safety: an extension of the risk perception attitude framework (RPAF)," *Tourism Management*, vol. 74, pp. 247–257, 2019.

[10] A. Srivastav and S. Agrawal, "Multi-objective optimization of mixture inventory system experiencing order crossover," *Annals of Operations Research*, vol. 290, no. 1, pp. 943–960, 2020.