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Distribution of Landscape Architecture Based on 3D Images and Virtual Reality Rationality Study

RUIYI LI AND DAWEI XU
School of Landscape Architecture, Northeast Forestry University, Harbin 150040, China
Corresponding author: Dawei Xu (dunzushise20083@163.com)

ABSTRACT In order to ensure the rationality of landscape design, it is of great practical significance to simulate the planning effect. Aiming at the problems of traditional garden landscape distribution simulation technology, this paper designs a new garden landscape distribution rationality simulation technology based on three-dimensional image and virtual reality technology. Firstly, a rational analysis method for landscape garden distribution based on three-dimensional images is proposed. Based on the correlation between different coordinate systems under a specific angle of view, a camera pose matrix is constructed, and SURF feature point detection is performed on the landscape garden image and the above feature points are clustered and matched. Secondly, the three-dimensional image reconstruction of the landscape garden image is realized based on the registered image feature points. Based on the three-dimensional image reconstruction results and virtual reality technology, the three-dimensional image analysis of the rationality of landscape distribution is completed. Finally, the case analysis and performance test results illustrate the superiority of the realized landscape garden distribution rationality technology. This method can provide scientific reference and basis for the modern landscape gardening industry to adopt three-dimensional images and other technologies.

INDEX TERMS Landscape distribution, 3D images, virtual reality, cluster matching.

I. INTRODUCTION

With the continuous progress and development of society, the national economy and the quality of life of the public have been greatly improved. People gradually pay attention to environmental protection and pay attention to the construction of landscape architecture [1], [2]. The continuous innovation of computer application technology has made the traditional landscape planning and design that require drawings have been unable to meet the needs of the times. The traditional drawing work of design schemes has begun to rely on VR (Virtual Reality) in the space environment and has gradually become a popular application direction [3]. The computer-aided technology used in the landscape planning and design process can be divided into AutoCAD technology, ArcGIS technology and VR technology. Through the above technologies and software, designers can more quickly and easily carry out landscape planning and design work, especially VR technology [4].

Under this background, landscape architecture majors are also thinking about the research and application of digital auxiliary design methods [5]. However, due to the lack of professional digital software platforms for landscape design majors, the related theoretical research is also relatively lagging. Digital auxiliary design is in landscape garden design Application is still in its infancy. Dr. Zhang *et al.* proposed a three-dimensional image analysis method based on the weighted average theory of rational distribution of landscape gardens [6]. This method first combines the weighted average theoretical grayscale landscape garden image, and uses the Rank transformation result of the partial landscape garden image as the landscape garden image matching primitive to obtain the dense visual difference map of the landscape garden scene. Three-dimensional image analysis of the rationality of landscape distribution. Scholars such as Paul Wheatley proposed a three-dimensional image analysis method for rational distribution of landscape gardens based on grid projection [7]. The method first projects the network onto the surface of the landscape garden image to be analyzed to extract grid projection features of the landscape garden image, thereby achieving feature point matching and three-dimensional image reconstruction of the landscape garden image. Prof. LaPlante *et al.* proposed a three-dimensional image analysis method for rational distribution of landscape

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architecture based on scale-invariant feature conversion [8]. The method first uses scale-invariant feature conversion operators to obtain the feature points of the landscape garden image, and uses the multi-view dense matching theory to achieve the dense reconstruction of the landscape garden scene. The rationality of the three-dimensional image analysis of the rational distribution of landscape in this method is good, but it has the problem of great limitations [9].

In order to promote the organic combination of virtual reality technology and landscape garden planning and design, thereby enhancing the visual and authenticity of designers in spatial vision, in order to better computer-aided design of garden scenes, a three-dimensional combination method is proposed. The second section of the article provides an overview of landscape garden related work. The third section expounds the theoretical basis of the rationality of the landscape garden distribution. Section 4 discusses the principles and architecture of three-bit image analysis technology. Section 5 discusses the reconstruction of three-dimensional landscape images based on SURF feature matching. Section 6 shows the rational structure of landscape architecture distribution and in Section 7 carries out the application test and evaluation of the distribution rationality system. Reconstruct the image through virtual reality technology to realize the digital design application of landscape design planning. Aiming at the above problems in landscape garden digital assistant technology, this subject starts with a reasonable layout and combines key technologies with 3D images and virtual reality technology. Focus on 3D image reconstruction and virtual reality processing of pictures collected by high-definition cameras. This method can provide scientific reference and basis for the modern gardening and horticulture industry to adopt three-dimensional images and other technologies.

II. RELATED WORK

The construction of the landscape information model is inseparable from the support of digital technology, and many problems in the field of landscape architecture have now begun to be optimized and solved by using digital technology [10]. It adopts measurement and remote sensing image processing technology, landscape process simulation, landscape parameterized nonlinear generation technology and landscape environment visualization technology, among which the research proportion of landscape environment visualization is the largest [11]. Several studies in recent years have successfully tested the role of visual or media types used in this planning process.

Bishop *et al.* published an experiment using an interactive forest environment, and concluded that people will make different choices when faced with an interactive visual form, rather than a similar static image form [12]. Studies have also shown that interactive 3D landscape models are better than other forms of media visualization. Comparing the perceived difference between the static image and the visual 3D landscape model in the rural scenery, it is easy to imagine that the landscape uses interactive 3D visualization effects, but there is almost no difference between the standard display and the display model projected on the large screen. Salter *et al.* analyzed the GIS-based planning discussion using interactive 3D models combined with sustainability indicators [13]. They found that being able to interact with the visualization was highly rated by the participant's studio. This previous work is useful for establishing interactive 3D visualizations, and participation in the planning process and related fields are highly valued. Feiler compared the model generated by the physical model with real-world video and car travel in a large-scale study in a research site, and asked the respondents to use the basic technology of various adjectives when evaluating the site, but did not establish any significant impact based on the site. The media used [14]. Through surveys: hand-drawn perspectives used for urban development communication, watercolors depicted, digital photo galleries, images rendered from 3D models used for perceived differences in semantic difference scales, and found that the overall computer-generated images are considered more Accurate and realistic. There is evidence that interactive visual display will affect the final decision [15].

At the same time, in the field of virtual reality, many scholars have also carried out related research. Filariae analyzes the application of computer-aided design, three-dimensional imaging, animation and virtual reality technology in industrial design [16]. Jibe explained the construction method of sky, terrain, water, trees and flowers with Unity in 3D, which provides technical support for the application of virtual reality technology in landscape [17]. Santana explored the use of the city model City GML in different levels of detail, enabling researchers, city planners and technicians to explore virtual city environment data in an interactive and immersive way [18]. Based on experimental data, Castro NoVo evaluated different types of virtual immersion systems and concluded that fully immersive systems are considered more suitable for smaller groups, and semi-immersive systems are considered more suitable for larger groups [19]. Orenstein Carmel Forest Natural Landscape in Israel as an example, using immersive visual theater to explore the value of landscape for human ecosystem services [20].

III. THE RATIONALITY OF LANDSCAPE DISTRIBUTION

Virtual reality (VR) technology is considered to be one of the high-tech in the 21st century. It is immersive, interactive, and imaginative. It is a comprehensive technology integrating multiple disciplines and technologies [21]. The application of virtual reality technology in landscape design has restored the two-dimensional and planar information data of the previous landscape design to its original form and transformed it into a three-dimensional data resource, which further expands the expression and content of landscape design. Garden design brings fundamental changes. Research and discussion on the application of virtual reality technology in landscape design, especially in the current three-network integration and Internet of Things construction environment, is very important to promote and promote the rapid development of digital landscape design. Virtual reality technology is an important direction of simulation technology. It is a collection of simulation technology and computer graphics, human-machine interface technology, multimedia technology, sensor technology, network technology and other technologies. It is a challenging cross technology Frontier disciplines and research fields. It combines a variety of technologies: computer technology, multimedia technology, image processing technology, simulation technology, etc., thereby forming a new technology involving the field of simulation and computer.

As one of the categories of design art closely related to people, landscape design has always been closely connected with the politics, economy, culture and people's lifestyles in society. The application of virtual reality technology to the design of landscape architecture has brought convenience to the matching of the design style of landscape architecture design, the use of decorative materials, the configuration of landscape and greening and other external forms and internal structures, etc. The landscape design covers almost everything in the outdoor environment design, from the overall image of a city, squares, parks, to the details of the living environment such as the living environment and the block landscape [22]. It not only highlights the aesthetic concept of space in an era, but also reflects the unique differences of regional culture among small cities. The joining of virtual reality technology has brought many possibilities for landscape design from the completion of the plan to the beginning of the construction, the display and explanation of the design works, and so on.

In fact, landscape design, as a comprehensive discipline unified between traditional architecture and urban planning, not only has its own huge research scope, it can be said that it involves all aspects of the human settlement environment. Virtual reality technology has become an auxiliary link in landscape garden design, bringing unlimited vitality and diverse display environments to landscape garden design: the design space that virtual landscape garden can involve is even more omnipresent in the entire urban environment from macro to micro [23]. The contents covered by its design research theories and forms will not only have an important impact on the design of urban landscapes in our country and the development of urban architectural landscapes in the future, but will also have a significant impact on our society, economy and culture. Outstanding role.

IV. 3D IMAGE ANALYSIS TECHNOLOGY

The first thing image recognition technology does is to obtain important clues and information from the environment and classify objects. That is, the computer can recognize each target category included in the image scene according to different weather and different scenes [12]. To accomplish this goal, a large number of different types of target images need to be used to train the perception model. After training and learning the perception model, the perception model will automatically recognize different types of target information in the scene based on the target features it has learned. The target needs the perception model to have a good recognition function, because even the same scene in the logistics information collection will affect the judgment segment due to the speed of the object, weather changes and other factors.

A. PRINCIPLES OF THREE-DIMENSIONAL IMAGE ANALYSIS

In the process of analyzing the three-dimensional image of the rational distribution of landscape gardens, firstly obtain the matching images of the newly added landscape garden partial images in the original image set, constitute the landscape garden image set and reconstruct the local point cloud model of the landscape garden [22]. By matching the projection points of the local point cloud models of different landscape gardens in the same image, a consistent set of corresponding points between the landscape cloud point cloud models is obtained. Solve the optimal alignment transformation between point cloud sets, realize the integration of the landscape garden as a whole and the local point cloud model, and complete the three-dimensional image analysis of the rational distribution of the landscape garden based on generating a complete three-dimensional image model of the landscape garden. The specific process is as follows.

The overall and local point cloud models of landscape garden images are represented as P_1'' and P_2, respectively. The images in the landscape garden scene image set D are in P_1'' and P_2.The number of corresponding point clouds. Calculate the pixel positions of the whole and partial point clouds P_1'' and P_2 of the landscape garden image respectively projected on the landscape garden scene image K, and mark the three-dimensional image points to project on the landscape garden scene image plane Point location coordinates.

$$x_i = PX_i \tag{1}$$

In which, X_i represents the three-dimensional image point coordinates of the landscape garden scene image, P represents the camera matrix corresponding to the landscape garden scene image K, and x_i represents the projected onto the landscape garden image K Two-dimensional point coordinates [24].

Suppose that the point pairs of the three-dimensional image point cloud models P_{k1} and P_{k2} of the landscape garden scene image have been obtained. By finding an approximate transformation T, the coordinate alignment of all corresponding point sets in P_{k1} and P_{k2} is completed. The transformation T is composed of a translation vector L, a rotation matrix R, and a scaling factor s, so Solve the objective function problem given by the transformation minimization equation (2).

$$E\left(P_{k1}, P_{k2}\right) = \|P_{k1} - \left(s \cdot P_{k1} \cdot R + L\right)\| \tag{2}$$

Analytical formula (2) shows that the optimization problem of the function is the Procrustes problem. Use the following steps to gradually solve the corresponding transformation, and use formula (3) to calculate the geometric centers of P_{k1}

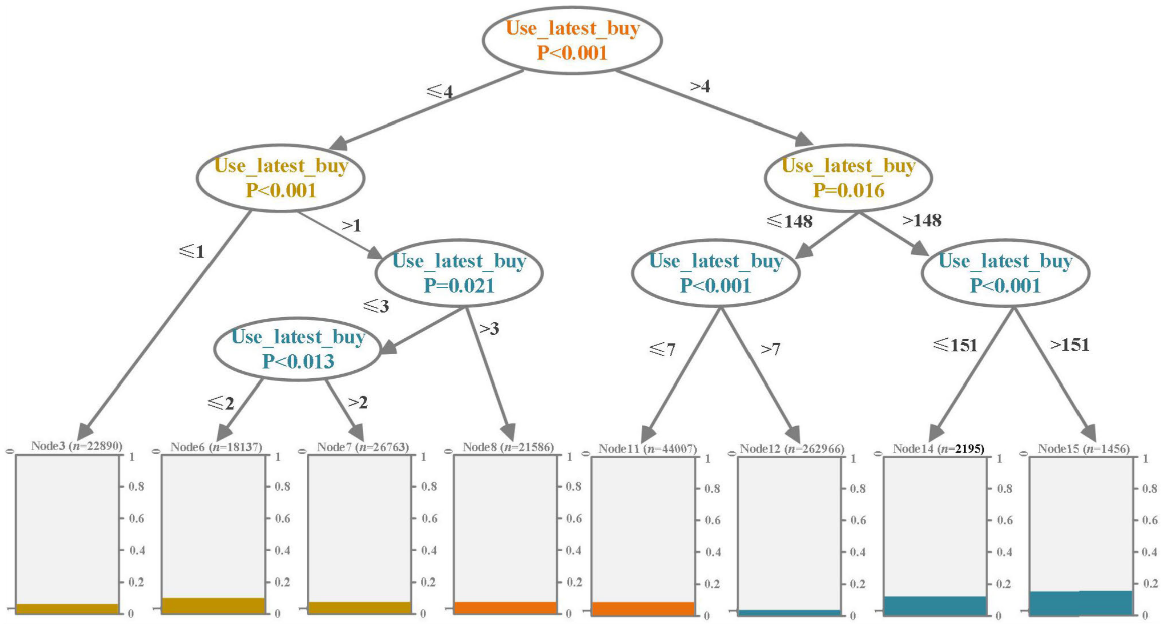

FIGURE 1. Data set is based on a simplified cluster analysis dendrogram of a single feature variable.

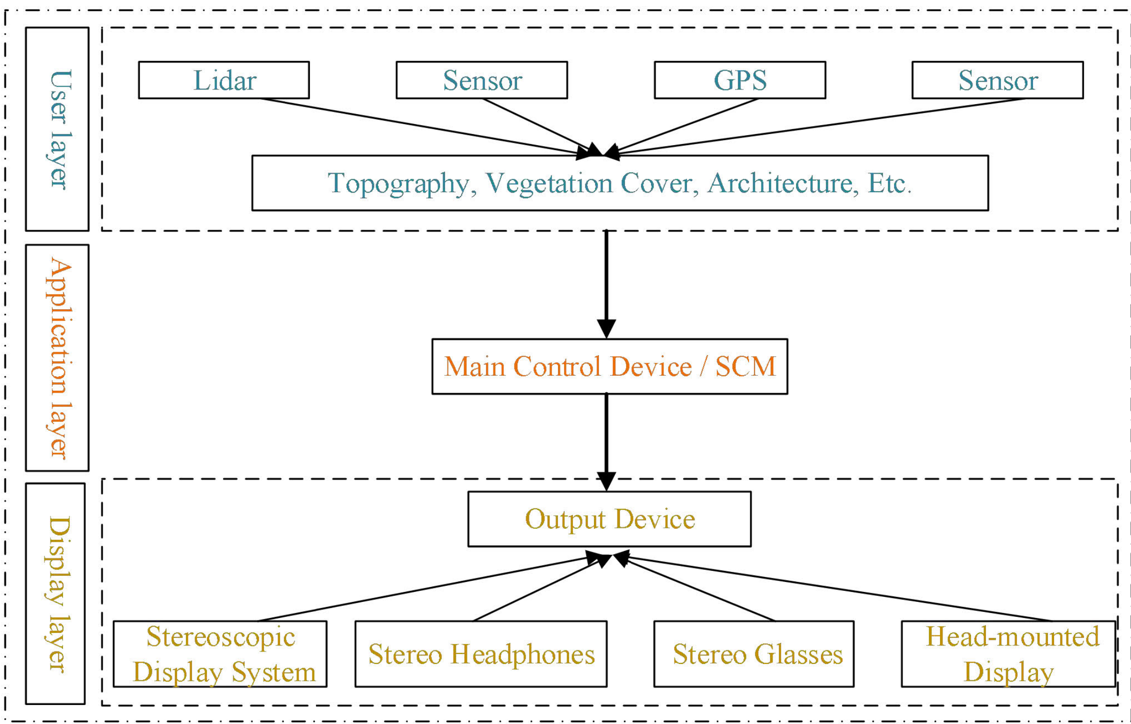

FIGURE 2. VR system-based landscape simulation system framework.

and P_{k2}.

$$O = \sum_{i=1}^{N} X_i/N \tag{3}$$

In which, O represents the geometric center of the three-dimensional image point cloud model of the landscape garden image. X_i represents the coordinate of the ith point in the 3D point cloud model of the landscape garden image. N represents the number of point clouds in the 3D point cloud model of the landscape image. After the geometric centers O_1 and O_2 of P_{k1} and P_{k2} are obtained, the translation vector L is calculated using equation (4).

$$L = (O_1 - O_2) + (O - O_1) \tag{4}$$

The coordinates of P_{k1} and P_{k2} are normalized, without considering the scaling factor, and expressed by equation (5).

$$R = U \cdot V^T \tag{5}$$

In order to meet the invariance of the internal structure during the conversion process of the landscape cloud image point cloud model, the rotation matrix R needs to satisfy det (R) = 1, and the minimization problem is solved using Procrustes orthogonal problem theory The optimal rotation matrix R of the landscape architecture is solved by formula (6).

$$s = tr\left(P_{K1}^T \cdot P_{k2} \cdot R\right) / tr\left(P_{K2}^T \cdot P_{k2}\right) \tag{6}$$

In which, U and V^T are the eigenvector matrix results obtained by singular value decomposition, and the scaling factor is calculated using equation (7)

$$\tilde{P}_2 = s \cdot P_2 \cdot R + L \tag{7}$$

Formula (6) and formula (7) to obtain translation, rotation and scaling After the transformation, the point cloud in P_2 is converted to the coordinate system of P_1.

The above achieves the integration of the overall point cloud and partial point cloud of the landscape garden image $P_1 \cup \tilde{P}_2$, thus completing the reconstruction of the entire landscape garden scene, the three-dimensional image of the landscape garden scene The reconstruction results can accurately represent the distribution of landscape gardens. Based on this, the three-dimensional image analysis of the rationality of landscape garden distribution is completed [25].

B. CAMERA MODEL ESTABLISHMENT

In the process of analyzing the rationality of three-dimensional image distribution of landscape architecture, the camera pose matrix is first constructed based on the correlation between different coordinate systems at a specific angle of view. The reverse projection theory is used to determine the conversion relationship between the perspective projection of the camera and the camera model is formed. The pixel coordinates of the landscape garden image are mapped to the normalized coordinate plane to correct the image distortion by combining the relevant correction model. The specific process is as follows [26].

In the world coordinate system, the camera pose of the landscape garden scene is expressed by the matrix given by equation (9)

$$T_{cw} = [R_{cw}\ t_{cw}] \tag{8}$$

In the formula, cw represents the conversion from the world coordinate system to the current camera coordinate system. T_{cw} represents the pose of the camera, R_{cw} represents the rotation parameter matrix, t_{cw} represents the translation vector, R_{cw}, t_{cw} can be expressed by the hexagram e^{ξ}.

$$\begin{bmatrix} R_{cw} & t_{cw} \\ 0 & 1 \end{bmatrix} = e^{\xi}, \quad \xi = (u_1, u_1, \cdots, u_6) \tag{9}$$

The pose parameters of the camera T_{cw} construct the landscape garden space under the camera coordinate system. Using the above camera model, the pixel coordinates of the landscape garden image are mapped to the normalized coordinate plane, and the distortion of the landscape garden image is corrected by combining the internal parameter matrix K of the camera.

V. 3D IMAGE RECONSTRUCTION OF LANDSCAPE ARCHITECTURE BASED ON SURF FEATURE MATCHING

The first thing image recognition technology does is to obtain important clues and information from the environment and classify objects. That is, the computer can recognize each target category included in the image scene according to different weather and different scenes. To accomplish this goal, a large number of different types of target images need to be used to train the perception model. After training and learning the perception model, the perception model will automatically recognize different types of target information in the scene based on the target features it has learned. The target needs the perception model to have a good recognition function, because even the same scene in the logistics information collection will affect the judgment segment due to the speed of the object, weather changes and other factors.

In the process of analyzing the three-dimensional image of the rational distribution of landscape gardens, based on the distortion correction results of the landscape garden images obtained in the above link section, combined with the K-means clustering theory, SURF feature point detection was performed on the landscape garden images and these feature points were analyzed. Cluster matching, based on the registered image feature points, realizes the reconstruction of the three-dimensional image of the landscape garden image, and completes the analysis of the rational three-dimensional image of the landscape garden distribution. The specific process is as follows [27].

The K-means clustering method is used to cluster the image data of each landscape and garden. K-means clustering algorithm is to randomly select K objects as the initial clustering center, then calculate the distance between each object and each seed clustering center, and assign each object to the clustering center nearest to it. Then, the non-representative object data is repeatedly used to replace the representative object data, thereby improving the quality of clustering and the quality of clustering results.

$$D_p = \sqrt{(x_i - x_i)^2 + (y_i - y_i)^2 + \sum (a_{ik} - a_{ji})^2} \tag{10}$$

Let x be the input n-dimensional feature variable, and set $y \in \{c_1, c_2, \cdots, c_n\}$ as input, X is a random variable on the input space, Y is a random variable on the output space, the joint probability distribution of X and Y is P (X, Y), and P (X, Y) independently generates the training data set with the same distribution.

$$T = \{(x_1, y_1), (x_2, y_2), \cdots (x_N, y_N)\} \tag{11}$$

$$P(Y = c_k/X = x) = \frac{P(X = x/Y = c_k)\,P(Y = c_k)}{\sum_{k=1}^{K} P(X = x/Y = c_k)P(Y = c_k)} \tag{12}$$

Conditional independence has been constructed for conditional probability, namely:

$$\begin{aligned} &\mathrm{P}(\mathrm{X} = \mathrm{x}/\mathrm{Y} = \mathrm{c_k}) \\ &= \mathrm{P}\left(\mathrm{X}^{(1)} = \mathrm{x}^{(1)}, \mathrm{X}^{(2)} = \mathrm{x}^{(2)}, \cdots \mathrm{X}^{(n)} = \mathrm{x}^{(n)}\right)/\mathrm{Y} = \mathrm{c_k}) \quad (13) \\ &= \prod_{j=1}^{n} P(X^{(j)} = x^{(j)}/Y = c_k) \quad (14) \end{aligned}$$

In practical applications, when classifying feature instances, we select the final category with the largest probability value.

$$y = f(x) = argmax \frac{\prod_{j=1}^{n} P(X^{(j)} = x^{(j)}/Y = c_k)P(Y = c_k)}{\sum_{k=1}^{K}(Y = c_k)\prod_{j=1}^{n} P(X^{(j)} = x^{(j)}/Y = c_k)} \tag{15}$$

It is estimated by a cost function, and the center point of each cluster is updated according to the principle of decreasing the value of the square difference function. The average difference between the measurement object of this function and the object it refers to. The distance used in this paper is the distance metric with added attributes [28].

VI. REASONABLE STRUCTURE OF LANDSCAPE ARCHITECTURE DISTRIBUTION

In the process of digital auxiliary design of landscape architecture, it is necessary to adopt a parametric construction-based design method supplemented by traditional design. In the process of scheme design, new technologies and methods must also be applied, and good technology can be combined to complete the design scheme [29]. In the design, it is necessary to carry out digital auxiliary analysis and construct a parameterized model. It is necessary to keep the parameterized model of buildings and buildings synchronized with the digital model of landscape architecture.

In addition, parametric components should be used as the main part of the design, and also combined with traditional design methods. In the design method where parametric construction is the main supplement to the traditional design, the excellent part of the traditional design is absorbed as a reference and reference value, so that the continuity of the landscape design and the unity of the effect can be maintained. Good reflection of the modernization of landscape architecture and cultural inheritance, better highlight the characteristics of landscape garden design, highlight the scientific and rationality of landscape garden digital auxiliary design. High-quality virtual reality systems require the participation of various technologies. The simulation system of garden landscape planning effect based on VR technology in this study is mainly composed of three-layer structure [30].

The user layer provides the user with an input instruction window, and transmits the instruction to the computer, obtains data through various data collection methods, and directs the computer to simulate the garden landscape. The application layer uses the image recognition technology to collect massive unprocessed data according to the instructions and transmits it to the data layer through the optical fiber network cable. The data is processed and classified into different databases for storage management. In addition, the use of data exchange technology to achieve data exchange and sharing, and then enrich the database data accumulation to generate three-dimensional garden landscape images. The display layer feeds back the generated landscape image to the user to analyze the rationality of landscape distribution.

VII. SYSTEM APPLICATION TESTING AND EVALUATION

The above describes the design and implementation of the rationality study of landscape architecture based on three-dimensional images and virtual reality. In order to verify the feasibility and efficiency of the landscape garden rationality technology proposed in this article. We will conduct functional tests on the system to analyze and verify the practicability and efficiency of the system.

A. SYSTEM TEST ENVIRONMENT

In order to prove the validity of the proposed three-dimensional vision-based landscape garden distribution rationality, the three-dimensional image analysis method requires a simulation. Under the Windows10 environment, a three-dimensional image analysis simulation platform for rational distribution of landscape gardens is built. The camera used was Point Grey Flea2, with a resolution of 640pi × 520pi, and 50 frames of images provided by the Association of Landscape Architecture were selected as the experimental data set. This article takes "a city's landscape and garden landscape planning and design" as a practical case for specific experiments. The hardware configuration of the experimental PC host is: Intel Core i5-8500 quad-core CPU, clocked at 3.0GHz; 8GB memory; Nvidia GTX970 graphics card (4GB video memory); 500GB hard drive. The software platforms used include: Auto CAD 3D drawing software; SketchUp 3D modeling software; Adobe photoshop CS6.

B. SYSTEM PERFORMANCE TEST

During the system design, multiple data security mechanisms are adopted to ensure reliable data transmission. On the one hand, while the logistics information data is transmitted in real time, the data is stored locally for a short period of time. On the other hand, when a small amount of data loss occurs, the instant retransmission mode can be started. That is, when data packet loss occurs, the system starts the instant data retransmission mechanism. Without affecting the real-time data transmission, the real-time transmission gap will be lost the data is sent back to the data server. When the network is disconnected for a long time or the network signal is poor resulting in a large amount of lost data that cannot be transferred in real time, the system will issue an alarm prompt.

In the process of system performance testing, the two indicators of system response time and packet loss rate are

TABLE 1. Data transmission reliability test results.

Serial number	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Device ID	3	4	5	6	7	8	9	10	11	12
Running time / h	25	24	23	26	27	23	25	26	28	22
Total number of packages	48313	47895	48923	48766	48788	47570	46036	46786	47591	48136
Number of lost packets	73	89	65	95	85	18	88	127	76	83
Successful retransmission packets	73	89	65	95	84	18	88	127	76	83
Retransmission failed packets	0	0	0	0	1	0	0	0	0	0
Packet loss rate	0.15%	0.19%	0.13%	0.19%	0.16%	0.04%	0.19%	0.27%	0.16%	0.17%
Retransmission success rate	100%	100%	100%	100%	99.90%	100%	100%	100%	100%	100%
Maximum number of										

used to test the concurrent performance of the system and the performance of responding to customers. Limited to the network environment and server performance have a greater impact on performance indicators, the network environment during the test is selected as the internal network, the server is a stand-alone server with a new system and a cluster with two stand-alone servers. It can be seen from the test results that the packet loss rate of wireless data transmission is <0.1%, and 99% of the packet loss data can be retransmitted successfully. After the device is turned on next time, the data can still be retransmitted successfully, thereby ensuring the integrity of the data.

C. SYSTEM TRIAL FEEDBACK

In the project task of ''Planning and Designing a City's Landscape Architecture Landscape'', the main three-dimensional objects of landscape garden scenes are slope grassland, rockery and wide area, which is shown in Figure 3 and Figure 5 [31]. The performance curve of VR scene optimization is shown in Figure 4 and Figure 6. It can be seen that as the number of meshes increases, the number of triangular cracks gradually decreases, thereby effectively optimizing the visual display effect. Select the Indexed Face Set node to draw the graphics of the grass and wide areas. After the calculation and mapping of the points on all coordinate points, the resulting slope and surrounding grassland effect are shown in Figs.3-6.

The three-dimensional image analysis experiment of the rationality of landscape distribution was carried out by using three-dimensional visual method and depth estimation method respectively. The number of feature points extracted from the landscape garden image can measure the

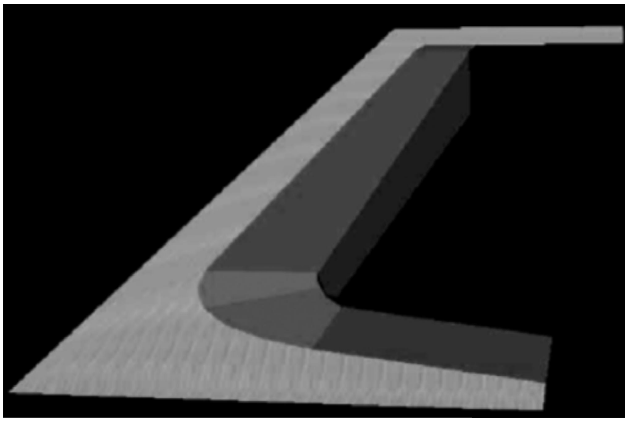

FIGURE 3. Sketch of 3D landscape reproduction in grassland area.

performance of the three-dimensional image reconstruction accuracy of the landscape garden image, but the key factor is the exact matching of the corresponding feature point pairs of the two landscape garden images. The two methods are used to match the feature points of the landscape garden image. Number and matching rate comparison.

As shown in Figures 7 and 8, by comparing with other image recognition technologies, the three-dimensional images and virtual reality technology adopted in this paper have leading advantages in performance stability and efficiency. After the trial of the rationality of landscape architecture distribution technology, the rationality indicators of related landscape architectures have been improved. This shows that the technology can help improve the credibility and sales of related products. Through the investigation of user satisfaction, due to the intuitive and efficient

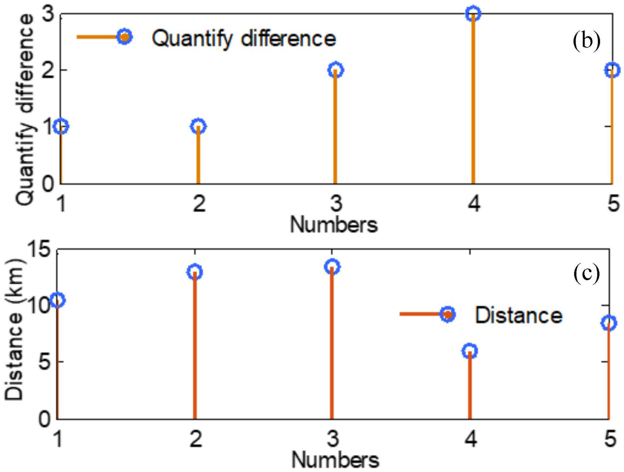

FIGURE 4. Grassland area 3D reproduction performance index.

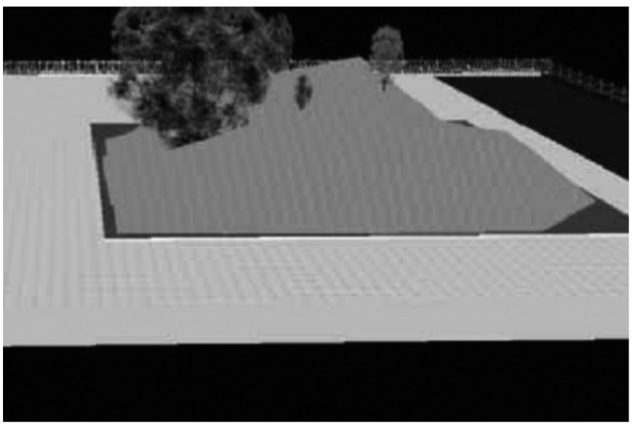

FIGURE 5. Schematic representation of 3D reproduction in a wide area.

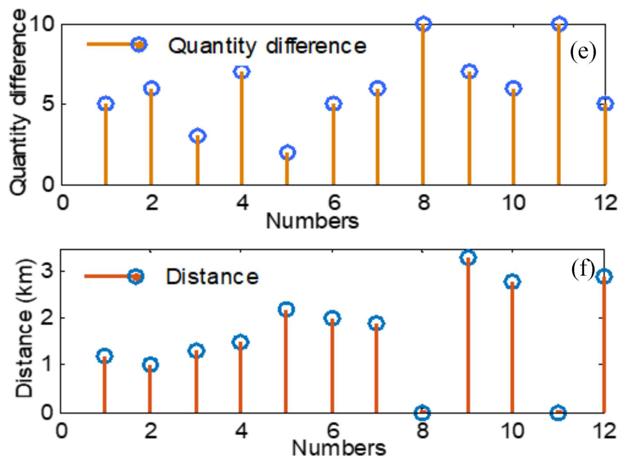

FIGURE 6. Wide area 3D reproduction performance optimization index.

characteristics of the technology, user satisfaction has been improved in a short time, which is conducive to the further development of the landscape garden industry informatization process.

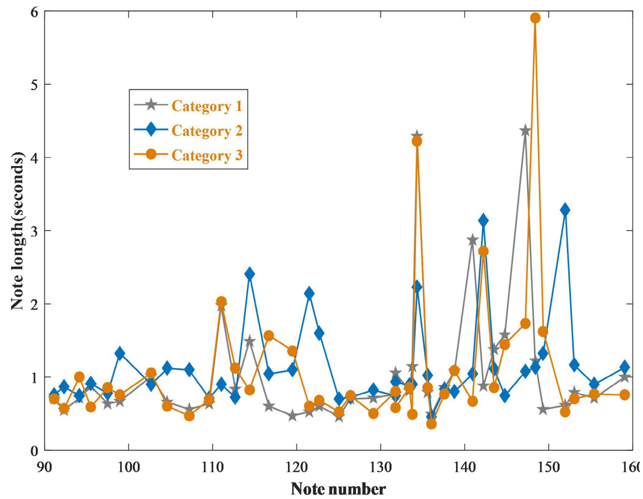

FIGURE 7. Technical differences in rational distribution of landscape architecture under the same index system.

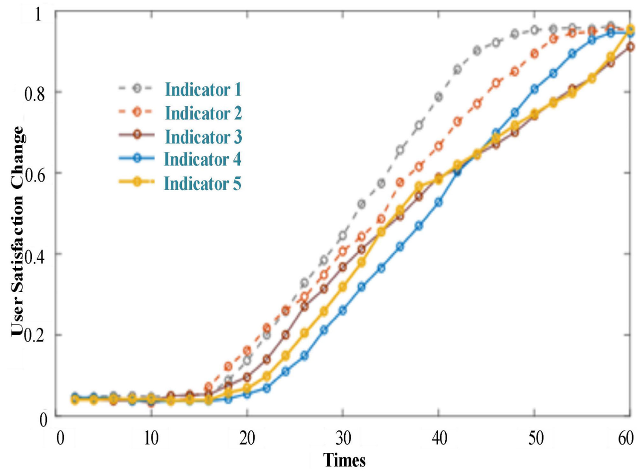

FIGURE 8. The rationality of landscape architecture distribution under different index systems.

After testing and analysis of the results in the above stages, it is found that the system meets the needs of business and users in terms of functions, and meets the conditions of server clusters in performance. From the overall observation, it is found that the system has achieved very good results in stability, which can basically guarantee the accuracy of image recognition and precision. However, the system's access speed can obviously feel the loading is too slow. On the one hand, with regard to the requirements of the image recognition function, due to the variety of image recognition functions, the specific implementation of each function is different. In the end, the data of all functions need to be integrated and displayed together, and certain slower processing functions will inevitably slow down the overall progress. On the other hand, for the indicators of the servers, the differences between the servers themselves and the network conditions in different regions lead to certain differences in certain indexes of the server cluster. Although these differences are currently in a stable and better range, there are still aspects that can be optimized. In summary, the various modules of this system can still be targeted for improvement.

VIII. CONCLUSION

This paper studies the rationality of landscape garden distribution based on 3D images and virtual reality. The system uses three-dimensional images for image recognition, collects landscape images in real time, and uses SURF feature matching to reconstruct three-dimensional landscape images. The actual case test and analysis show the good effect of distributed rationality technology, which can provide a scientific reference model and basis for the establishment of real-time landscape and garden distribution rationality research based on 3D image technology. In addition, due to the complexity and diversity of landscape garden scenes, the technology proposed in this article has certain deficiencies and deficiencies in the versatility and practicability. The exploration of the rationality of coniferous distribution in landscape gardens needs to be deepened, and the level of data mining research Should also be improved. In the future, on the basis of the existing technology, we will further carry out the analysis of the rationality of the distribution of multiple types of landscape gardening scenes based on the growing and deepening needs of the future social development of the gardening industry. We will continue to excavate and improve existing landscape architecture assessment techniques to provide scientific assistance for improving the development level of the landscape industry.

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RUIYI LI received the B.Sc. degree from Northeast Agricultural University, China, in 2012, and the M.Sc. degree in landscape architecture from Northeast Forestry University, China, in 2015, where she is currently pursuing the Ph.D. degree in landscape architecture. Her current research interest includes the history and theory of landscape architecture.

DAWEI XU received the B.Sc. degree from Northeast Forestry University, China, in 1985, the M.Sc. degree in landscape architecture from Beijing Forestry University, China, in 1994, and the Ph.D. degree in landscape architecture from Northeast Forestry University, China, in 2013. He is currently a Professor, a Doctoral Supervisor, and an Academic Leader of landscape architecture at Northeast Forestry University. His current research interest includes the landscape architecture planning and design.