

Retraction

Retracted: Parallel Calculation Method of Patch Area Landscape Art Index Based on Surface Coverage Data

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] Z. Xu, "Parallel Calculation Method of Patch Area Landscape Art Index Based on Surface Coverage Data," *Security and Communication Networks*, vol. 2021, Article ID 9149734, 10 pages, 2021.

Research Article

Parallel Calculation Method of Patch Area Landscape Art Index Based on Surface Coverage Data

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Aiming at the problem of slow convergence in the parallel calculation of patch area landscape art index, a parallel calculation method of patch area landscape art index based on land cover data was proposed. Firstly, patch type area index, patch connectivity index, patch number index, and fragmentation index were selected as patch area landscape art spatial staggered pattern indexes to conduct characteristic analysis and establish a 3D visual reconstruction model with actual colors. Then, the coordinate points of the landscape space staggered pattern are transformed into three-dimensional visual coordinate points to realize the reconstruction of landscape art space staggered pattern in patch area. The aerial landscape image of patch area is preprocessed and input into GPU to build a Gaussian difference pyramid model. The feature points of the patch area in the aerial landscape image are calculated by the parallel computing process, and the patch boundary in the aerial landscape image is determined. The landscape perimeter of the patch area was calculated according to the boundary. The experimental results show that the complete convergence time of the horizontal axis error and the vertical axis error is 2.13 s and 1.81 s, respectively, and the absolute error and relative error of the perimeter measurement are controlled below 0.60 m and 1.00%, respectively.

1. Introduction

Patch area landscape art can be basically divided into two types. One is soft things, such as sky, sunshine, drizzle, wind, water, and trees [1]. The other is hard things, such as railings, walls, landscape architecture, and paving. Soft things are called soft landscape art, which is usually formed naturally, and hard things are called hard landscape art, which is usually constructed manually. Its main attributes also have two kinds. The first one is the natural attribute [2]. As a sensible factor with light, body, color, and shape, it has a certain spatial form [3], which is relatively independent and easy to be separated from the regional background. The second is social attribute [4]. It has a certain social and cultural connotation, has a viewing function, can change the environment and use function, and can use the connotation to trigger human inner reactions such as empathy, association, interest, and emotion, which is the so-called patch area landscape art effect.

The patch area landscape art means in the urban garden landscape is mainly realized through the principles of

rhythm, balance, harmony, and unity skills. Unity is to design the tree type, color, tree state, form, and posture of plants, pay attention to the height, level, and proportion of various plants, whether the layout is reasonable, and so on. A reasonable layout is a unity. If it is disordered, monotonous, and straightforward and has no sense of hierarchy and the layout is unreasonable and loses beauty, it is nonunity. At this stage, it is advocated to build patch area landscape, which can more effectively use the current needs without weakening the resources of future generations and can meet the sustainable development of the city. It also means that, on the basis of reasonable and maintenance use, it can also improve the capacity of natural resources, so as to support economic growth and ecological pressure. The authors of [5] proposed a three-dimensional intelligent calibration method for landscape layout characteristics along the city, simulated the perspective effect produced by the urban landscape, transformed the landscape into the screen coordinate system according to the perspective projection, discussed the geometric transformation of urban three-dimensional landscape graphics by using the geometric transformation

matrix, calculated the binocular physiological parallax, and conducted a three-dimensional visualization research on the landscape along the city by using roaming technology. Enhance the user's visual immersion in the urban three-dimensional landscape, and obtain the rotation matrix of the landscape image. Secondly, by obtaining the spatial coordinates of the urban three-dimensional landscape to analyze and query the urban landscape information and spatial analysis of the three-dimensional landscape topographic map, the ground spatial coordinates of any point in the landscape can be found. Finally, the facet model is constructed to realize the three-dimensional intelligent calibration of the landscape layout characteristics along the city.

The work in [6] puts forward the research on the rock art landscape of Santa Teresa mountain according to the sound landscape of southern Baja California. Through the analysis of the rock painting landscape of Santa Teresa Canyon in southern Baja California, Mexico, it shows the benefits of including the methods developed in acoustic physics, where a great tradition of mural rock painting has been produced. Through a thorough examination of a series of monaural and binaural acoustic parameters, it is concluded that artists have selected the best sound landscape to create rock art, including painting and sculpture, especially the latter. It is proved that part of the canyon is especially concentrated in two colorful caves. In the landscape artistic planning of patch area, specifically speaking, in the plant landscape design, do not use a single plant, but use it with diversity and diversity. It cannot be planted together in disorder, and it needs to have main and auxiliary plants. Parallelism is to accurately calculate the number of plants according to the surrounding environment of the greening site area through the layout method, so as to make them balanced and reasonable. The distance between plants should also be reasonable. It can be planted only after a good point and location are determined. No random planting means no variety. Because some designers are invaded by bad culture or do not innovate, the effect of landscape planning is poor, and it is easy to destroy the local environment, affect the local cities, and consume the next generation of resources. The parallel calculation method of patch area landscape art index based on surface coverage data used in this paper can maintain the landscape through planning and design. Effectively protect the ecological environment. Surface coverage data is widely used in the field of parallel computing of art index and has become one of the main methods in the application of computer data. The main advantages of surface coverage data are its fast operation speed, simultaneous calculation and transmission, high real-time, and so on. The parallel calculation method of patch area landscape art index is verified to provide data support for patch area landscape design in the future. The study in [7] selects landscape pattern acreage, landscape number, patch number rate, patch density, patch average, average patch area, patch change coefficient, patch shape index, diversity index, landscape dominance index, landscape evenness, fractal dimension, and so on, to analyze landscape pattern from landscape pattern structure, landscape pattern patch characteristics, and landscape pattern heterogeneity. The study in

[8] proposed a case study of Haikou, an island city of China, and the selection of ecological source areas is optimized by granularity reverse method and principal component analysis. The minimum cumulative resistance model (MCRM) is used to construct the ecological resistance surface, and ecological corridors and ecological nodes are obtained, so as to optimize the urban ecological network and the connectivity of landscape patches.

Our contribution includes the following three points:

- (1) Aiming at the problem of slow convergence in the parallel calculation of patch area landscape art index, a parallel calculation method of patch area landscape art index based on land cover data was proposed.
- (2) By taking patch type area index, patch connectivity index, patch number index, and fragmentation index as patch area landscape art space staggered pattern index, we analyzed the characteristics and established a three-dimensional visual reconstruction model with actual color.
- (3) The experimental results show that the complete convergence time of the horizontal axis error and the vertical axis error is 2.13 s and 1.81 s, respectively, and the absolute error and relative error of the perimeter measurement are controlled below 0.60 m and 1.00%, respectively.

2. Patch Area Landscape Art Space Staggered Pattern Reconstruction Method Design

2.1. Selecting the Patch Area Landscape Art Space Staggered Pattern Index. Patch area landscape art index can condense the ecological landscape information. It is a quantitative index reflecting the composition and characteristic distribution of patch area landscape art structure. Patch area landscape art index is divided into four parts, namely, patch type area index, patch connectivity [9], patch quantity index, and patch area landscape art space staggered pattern fragmentation index, which are described in detail in the following.

2.1.1. Patch Type Area Index. Patch type area index is the sum of the areas of all patches in a patch type of the staggered pattern of patch area landscape art space, and its calculation formula is as follows:

$$B_{CA} = \sum_{ij=1}^m d_{ij}. \quad (1)$$

In formula (1), i represents plaque type; j represents the number of patches; d_{ij} represents the area of plaque ij ; and m represents plaque density index.

Patch type area index is not only a component of patch area landscape art space staggered pattern but also the basis for calculating other patch area landscape art space staggered pattern index, which can reflect the average level of patch scale in this type of patch area landscape art space staggered pattern. The size of the patch type area restricts the number,

reproduction, and abundance of species in the landscape area. In a patch with the staggered pattern of patch area landscape art space, the total amount of mineral nutrients and energy is directly proportional to the patch type area.

2.1.2. Patch Connectivity. Patch connectivity can reflect the relationship between patch function and ecology of patch area landscape art space staggered pattern. The average distance between patches can be used to describe the connectivity between patches of the same category. The calculation formula of patch connectivity is as follows:

$$R_{PC} = \frac{\sum_{i=1}^m \sum_{j=1}^n H_{ij}}{K}. \quad (2)$$

In formula (2), h_{ij} represents the patch area and the distance between each patch and adjacent patches in the staggered pattern of landscape art space; K represents the total number of adjacent plaques; and n represents patch shape index. The greater the distance between the average patches, the lower the connectivity of the staggered pattern of patch area landscape art space; on the contrary, the smaller the distance, the higher the connectivity.

2.1.3. Plaque Quantity Index. Patch quantity index is the total number of patches in the staggered pattern of patch area landscape art space, and its calculation formula is as follows:

$$Q_{NP} = \sum_{i=1}^M P_i. \quad (3)$$

In formula (3), P_i represents the patch area and the number of patches in the staggered pattern of landscape art space. The plaque number index is usually greater than or equal to 1 and has no upper limit.

Patch quantity index can reflect the fragmentation degree of patch area landscape art space staggered pattern. It is usually used to describe the heterogeneity of patch area landscape art space staggered pattern, which is of great significance at the type level of patch area landscape art space staggered pattern. The size of patch quantity index has a positive correlation with the fragmentation of patch area landscape art space staggered pattern. The greater the value of patch quantity index, the higher the fragmentation of patch area landscape art space staggered pattern and the smaller the value of patch quantity index, the lower the fragmentation of patch area landscape art space staggered pattern. Patch quantity index has a certain impact on the ecological process of patch area landscape art space staggered pattern, which can determine the distribution characteristics of patch area landscape art space staggered pattern, so as to change the stability between patches.

2.1.4. Patch Area Landscape Art Space Staggered Pattern Fragmentation Index. Patch area landscape art space staggered pattern fragmentation index is the change process of

patch type caused by the interference of natural factors or human factors. The calculation formula is as follows:

$$L_{FI} = \sum_{i=1}^n \frac{K_i}{E}. \quad (4)$$

In formula (4), SS represents the patch area and the type area of the staggered pattern of landscape art space. The value of fragmentation index is usually between 0 and 1. 0 indicates that there is no fragmentation in the landscape art space crisscross pattern of patch area, and 1 indicates that the landscape art space crisscross pattern of patch area has been broken. The larger the value of fragmentation index, the higher the fragmentation degree of landscape art space crisscross pattern of patch area.

In the above four aspects of patch type area index, patch connectivity, patch quantity index, and fragmentation index, the calculation formula of patch area landscape art space staggered pattern index is given. By selecting patch area landscape art space staggered pattern index and constructing a three-dimensional visual reconstruction model, the characteristics of patch area landscape art space staggered pattern are extracted.

2.2. Constructing the 3D Visual Reconstruction Model.

Based on the selection of patch area landscape art space staggered pattern index, the obtained patch area landscape art space staggered pattern feature points are mapped to the three-dimensional visual reconstruction model [10], so as to establish the three-dimensional visual reconstruction model. Let A points exist in the 3D visual reconstruction model, the spatial coordinate [11] of texture mapping scanning base station is (X, Y, Z) , and the coordinate of a point of A point and patch area landscape art space staggered pattern in the 3D visual reconstruction model is (x, y) . It can be obtained that the mapping relationship between A point in the 3D visual reconstruction model and a point of patch area landscape art space staggered pattern is as follows [12]:

$$\begin{cases} x = h_1(X, Y), \\ y = h_2(X, Y). \end{cases} \quad (5)$$

Due to the characteristic data of the staggered pattern of patch area landscape art space, there will be data transmission error and noise in the transmission process, resulting in two adjacent points in the 3D visual reconstruction model, and the coordinates of x -axis and y -axis are different, but the coordinates of z -axis are the same.

The mapping model includes 24 locations. When the number of staggered patterns between the three-dimensional visual reconstruction model and its corresponding patch area landscape art space is greater than 12, the three-dimensional visual reconstruction models of $h_1(X, Y)$, $h_2(X, Y)$, $\hat{h}_1(\hat{X}_i, \hat{Y}_i)$, and $\hat{h}_2(\hat{X}_i, \hat{Y}_i)$ can be calculated according to the principle of least square method. Select the polynomial corresponding to the smaller distance value to represent the mapping relationship of the three-dimensional visual reconstruction model, map the feature points of the

staggered pattern of patch area landscape art space to the three-dimensional visual reconstruction model in the above way, and use the image library function to add the color attribute of the staggered pattern of patch area landscape art space to the three-dimensional visual reconstruction model, so as to obtain the three-dimensional visual reconstruction model with actual color. Then, through the reconstruction process design of patch area landscape art space staggered pattern, the reconstruction of patch area landscape art space staggered pattern is realized.

2.3. Reconstruction of the Patch Area Landscape Art Space Staggered Pattern. Based on the patch area of landscape art space crisscross pattern index to build three-dimensional visual reconstruction models of fault pattern reconstruction, in the process, with plaque area landscape art space crisscross pattern on the basis of the number of pixels to R'_{weej} and get the plaque area of landscape art space crisscross pattern of the expression vector, three-dimensional coordinates can be converted to visual coordinate points. The sum of three-dimensional visual parameters and landscape art space staggered pattern parameters of patch area was obtained, and the three-dimensional visual parameters were optimized to realize the reconstruction of landscape art space staggered pattern of patch area. The specific steps are as follows:

Step 1. Let θ_{ui1} , θ_{ui2} , and θ_{ui3} represent the rotation parameters of 3D vision, t_{i1} , t_{i2} , and t_{i3} represent the average parameters of 3D vision, and f represent the scanning distance of 3D vision. Based on R'_{weej} , the number of pixels in the staggered pattern of landscape art space in patch area, formula (6) is used to express the parameterized vector of 3D vision:

$$G_{hk} = R'_{weej} - i' \times \frac{f \times \theta'(\dot{h}_1, \dot{h}_2)}{\{\theta_{ui1}, \theta_{ui2}, \theta_{ui3}\} \times \{t_{i1}, t_{i2}, t_{i3}\}}. \quad (6)$$

In formula (6), θ' represents the three-dimensional visual projection matrix corresponding to the staggered pattern of landscape art space with different patch areas [13]. i' indicates the mapping between coordinate systems.

Step 2. Let p''_{θ} represent the mean square error of the three-dimensional visual projection equation and θ_i represent the matching relationship between the landscape art space staggered patterns of different patch areas [14], and use formula (7) to convert the patch area landscape art space staggered pattern coordinate point X into three-dimensional visual coordinate point X' , which is expressed as

$$X' = \frac{p''_{\theta}}{\theta_i} + f(r_{ij}) \times \Phi. \quad (7)$$

In formula (7), $f(r_{ij})$ represents the initial value of 3d visual coordinate points.

Step 3. It is assumed that Y'_n is used to represent the three-dimensional visual image of landscape art space crisscross pattern of patch area [15, 16], and h'_{mk} is used to represent the feature points of three-dimensional visual image of landscape art space crisscross pattern of patch area. The following formula is used to calculate the position error between the three-dimensional visual coordinate points of landscape art space crisscross pattern of patch area and the measured image:

$$r_{ij} = \frac{\chi(i) + Y'_n}{h'_{mk}} \mp \{m_{ij} + u_{ij}\} \times X'. \quad (8)$$

In formula (8), $\chi(i)$ represents the point set from the three-dimensional visual coordinate points of the patch area landscape art space staggered pattern to the image i and r_{ij} represents the position error between the three-dimensional visual coordinate point m_{ij} and the measured image u_{ij} in the staggered pattern of patch area landscape art space.

Step 4. Let J represent the Jacobian matrix, M represent the number of all feature points of the staggered pattern of patch area landscape art space, q'_{cro} represent the relationship vector between 3D visual translation parameters and scanning distance, λ'_{fv} represent the iteration factor, and C'_{se} represent the covariance matrix of 3D visual parameters. Then, the cross covariance of three-dimensional visual parameters and patch area landscape art space staggered pattern structural parameters is as follows:

$$Q' = \frac{C'_{se} \times D'_{se}}{M \times N} \times q'_{cr} + J \times \lambda'_{fv} - r_{ij}. \quad (9)$$

In formula (9), D'_{se} represents the covariance matrix of the staggered pattern of patch area landscape art space [17].

Step 5. Let e_{dp} represent the homogeneous coordinates of 3D vision and τ'_{er} represent the independence of 3D vision parameters and pattern structure parameters; then, the calculation formula of 3D vision parameter e' is as follows:

$$e' = \frac{e_{dp} + \tau'_{er}}{Q'} + r'_{es} \times (u'_{s,d} + Y'_{bm}). \quad (10)$$

In formula (10), r'_{es} represents the projection matrix; $u'_{s,d}$ represents the linear equation of homogeneous coordinates; and Y'_{bm} represents the direction unit vector.

Step 6. Let ϕ'_{de} be the point with the smallest distance between patch area and landscape art space staggered pattern and P'_{re} be the best estimated value of landscape space point E , and then the optimization formula of three-dimensional visual parameters is

$$w'_{zr} = \frac{P'_{re} \times \phi'_{de} \times Q' \times e'_{fr}}{e'_{dp} \times \vartheta'_{gh} \times X'} \times E. \quad (11)$$

Based on the calculation results of formula (11), the staggered pattern of patch area landscape art space is reconstructed. To sum up, from the four aspects of patch type area index, patch connectivity, patch quantity index, and fragmentation index, select the patch area landscape art space staggered pattern index, extract the characteristics of the patch area landscape art space staggered pattern by using the three-dimensional visual reconstruction model, and optimize the three-dimensional visual parameters. It realizes the reconstruction of the staggered pattern of patch area landscape art space.

3. Parallel Calculation Method of the Patch Area Landscape Art Index

Due to the problem of patch area landscape size, during the parallel calculation of patch area landscape art index, it is necessary to use UAV aerial photography technology to take aerial photos of patch area landscape, preprocess aerial images, and then extract the edge features of patch area landscape in patch area landscape aerial images by using surface coverage data method to determine the patch area landscape edge line. Determine the patch area and landscape perimeter.

3.1. Patch Area Landscape Aerial Image Processing. The process of patch area landscape aerial image processing can be divided into two links: deviation correction processing and Gaussian filtering processing.

3.1.1. Deviation Correction. Patch area landscape aerial image rectification is to determine the window direction of the aerial image by rotating the center point of UAV aerial real-time video image, which is convenient to obtain the visual information of patch area landscape. Aerial photos are based on land coverage data. The patch area landscape is the basis for image correction. The image in the image rotation area is stored and displayed in pixels. Usually, for the patch area landscape image, the center is represented by O . Based on the real-time rotation calculation of the aerial image of the landscape of the O patch area, the aerial image of the patch area after the correction is obtained. Figure 1 shows the rotation mathematical model of aerial landscape image of patch area.

In Figure 1, the dot line diagram and the implementation block diagram represent the initial window position and the corrected window position of the patch area landscape aerial image, respectively. x -axis and y -axis represent the horizontal and vertical directions, respectively, (x, y) and (X, Y) represent the pixel coordinates in the initial patch area landscape aerial image and the target pixel coordinates after deviation correction transformation, respectively, and δ represents the deviation

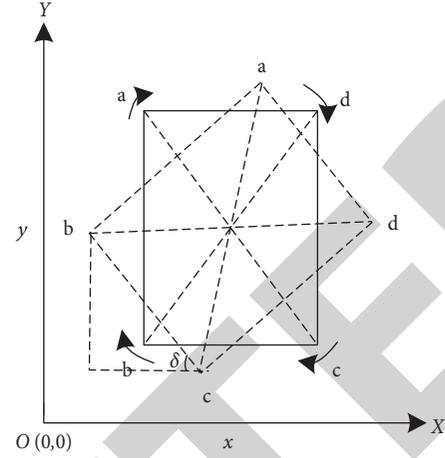


FIGURE 1: Mathematical model of patch area landscape aerial image rotation.

correction angle. Therefore, the deviation correction transformation expression is as follows:

$$\begin{bmatrix} X \\ Y \end{bmatrix} = \begin{bmatrix} \cos \delta & -\sin \delta & 0 \\ \sin \delta & \cos \delta & 0 \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix}. \quad (12)$$

Based on land cover data, under the condition that (x, y) is directly used to obtain (X, Y) , the coordinates of pixel points are considered to be integers. After the rectification is completed, some target pixels with no corresponding pixel value in the image region have a large probability of error; that is, under this condition, a large number of empty pixels are generated. In order to ensure that each target pixel in the aerial landscape image of patch area can obtain the correct pixel value, a reverse mapping method is selected based on the land cover data, and the corresponding pixel coordinates of each pixel in the aerial landscape image of patch area are determined according to the corresponding mapping relationship. The mapping relation is expressed as follows:

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \cos \delta & \sin \delta & 0 \\ -\sin \delta & \cos \delta & 0 \end{bmatrix} \times \begin{bmatrix} X \\ Y \end{bmatrix}. \quad (13)$$

3.1.2. Gaussian Filter Processing. In view of the collected aerial landscape images of patch area, according to the continuous characteristics of the aerial landscape images of patch area, a pixel in the aerial landscape image of patch area has a close correlation with the nearby pixels. The closer the pixel is to the pixel, the higher the similarity is between the two. In order to improve the image accuracy, based on the surface of the cover data, in determining the plaques at some point within the area of landscape images pixel values in the process, first determine plaque area landscape images within the pixels corresponding pixel location; in the location of the initial image pixels as a specification, the weighted calculation process is used to determine the neighborhood pixels. The pixel value obtained from this method is the pixel value

after the rotation of aerial image of landscape patch area. Set the standard pixel value as m ; that is, m is the corresponding pixel value of a pixel in the initial image after the landscape aerial image of patch area is rotated. This pixel is selected to carry out weighting operation together with eight nearby pixels to obtain a 3×3 matrix:

$$M_{3 \times 3} = \begin{bmatrix} m_3 & m_2 & m_1 \\ m_4 & m_8 & m_0 \\ m_5 & m_6 & m_7 \end{bmatrix}. \quad (14)$$

The Gaussian template is introduced in the process of pixel weighting calculation. The Gaussian template is a 3×3 module, and the formula is described as follows:

$$\frac{1}{s} = \begin{bmatrix} m_3 & m_2 & m_1 \\ m_4 & m_8 & m_0 \\ m_5 & m_6 & m_7 \end{bmatrix} \left(s = m + \sum_{i=0}^8 m_i \right). \quad (15)$$

Equation (16) can describe the pixel values corresponding to the rotating image:

$$r' = \frac{1}{s} \left(r_m + \sum_{i=0}^8 m_i r_i \right). \quad (16)$$

For patch area landscape aerial image boundary pixels, there are no eight pixels near them. There are only five pixels near the pixels in the above boundary, while there are only three pixels around the pixels in the junction area of the two boundaries. In this case, the pixels whose position cannot be determined in the template are cleared, and the template coefficient is corrected accordingly.

3.2. Edge Feature Extraction of the Patch Area Landscape Aerial Image. Input the patch area landscape aerial image processed by Gaussian filter into GPU, build the Gaussian difference pyramid model of patch area landscape aerial image through computer GPU fragment program, and build the Gaussian difference pyramid model, as shown in Figure 2.

Using the Gaussian difference pyramid model, based on the surface coverage data, the Gaussian difference pyramid model of patch area landscape aerial image is implemented in the GPU fragment program by using Hessian matrix to determine the principal curvature of patch area landscape aerial image, determine whether the pixels in the model are boundary points, and obtain the feature points and their gradient information.

The gradient information of image feature points is accumulated and stored in the GPU fragment program, and the patch area landscape aerial image feature vector is obtained through CPU output. The patch area landscape aerial image data in the CPU is read through the GPU, and the pixel coordinates, initial patch area landscape aerial image, and patch area landscape aerial image scale coordinates of patch area landscape aerial image are represented by (x', y') , $I(x', y')$, and λ , respectively. The

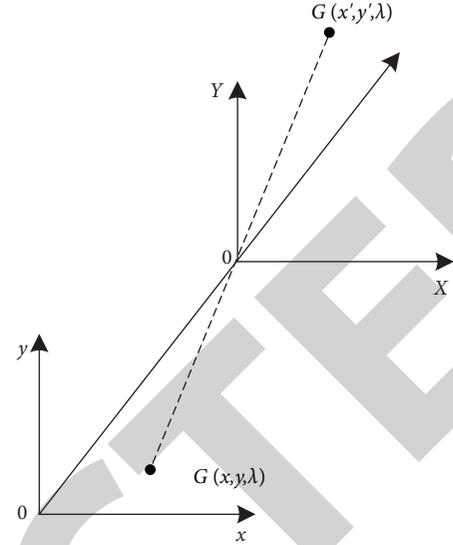


FIGURE 2: Gaussian difference pyramid model.

calculation formula of patch area landscape aerial image height $G(x', y', \lambda)$ is as follows:

$$G(x', y', \lambda) = \frac{1}{2\pi\lambda^2} e^{-(x'^2 + y'^2)/2\lambda^2}. \quad (17)$$

According to the above patch area landscape aerial image Gauss degree, obtain the patch area landscape aerial image scale space after Gaussian filter filtering. The process can be described by the following formula:

$$L(x', y', \lambda) = G(x', y', \lambda) \times I(x', y'). \quad (18)$$

The Gaussian difference pyramid model of patch area landscape aerial image is constructed in the scale space shown in formula (18). The process can be described by the following formula:

$$J(x', y', \lambda) = (G(x', y', p\lambda) - G(x', y', \lambda)). \quad (19)$$

In formula (19), p represents the scale coefficient of aerial landscape image of patch area. Based on the Gaussian difference pyramid model $J(x', y', \lambda)$ of landscape aerial images of patch area shown in formula (19), excluding points and boundary points with weak contrast in the pyramid model, the detailed locations of feature points of landscape aerial images of patch area were obtained, and the Hessian matrix was selected to determine the main curvature of landscape aerial images of patch area. Formula (20) is used to determine whether the pixel point (x', y') in the pyramid model is a boundary point:

$$K = \begin{bmatrix} D_{xx} & D_{xy} \\ D_{xy} & D_{yy} \end{bmatrix}. \quad (20)$$

In formula (9), D_{xx} , D_{xy} , and D_{yy} are partial derivatives at feature points of aerial landscape image of patch area. Thus, the trace $T_r(K)$ and determinant $D_{et}(K)$ of the Hessian matrix are determined. This process can be described by formula (21) and formula (22):

$$T_r(K) = D_{xx} + D_{xy}, \quad (21)$$

$$D_{et}(K) = D_{xx} \times D_{xy} - (D_{xy})^2. \quad (22)$$

S_1 is used to represent the preset threshold value. If the condition shown in formula (12) is satisfied, the pixel point can be determined to be a nonboundary point and can be retained. Instead, the pixel is identified as a boundary point and deleted.

$$\frac{T_r(K)^2}{D_{et}(K)} < \frac{(S_1 + 1)^2}{S_1}. \quad (23)$$

Feature points of aerial images based on the patch area landscape need to be feature selection; according to the adjacent pixel gradient direction distribution characteristics, determine the key points corresponding to the direction of the patch area landscape aerial image feature points, and then use the two spots $m(x', y')$ and $\mu(x', y')$ in the aerial image. Then, using the gradient magnitude and direction of the gradient (x', y') , the aerial images of the landscape of the two patches of $m(x', y')$ and $\mu(x', y')$ are determined. According to the feature description vector of patch area landscape aerial image, the boundary of patch area landscape in patch area landscape aerial image was determined. On this basis, the patch area landscape perimeter model was measured.

3.3. Calculation of the Patch Area and Landscape Perimeter. Based on the surface coverage data, L is used to represent the perimeter of patch area landscape art index, which is expressed as follows:

$$L = \int_0^x U(\chi) d\chi. \quad (24)$$

In formula (24), U represents the closed area of the boundary line of the patch area landscape art index in the patch area landscape aerial image, and $U(\chi)$ represents the generalized direction diameter.

Formula (24) is discretized to obtain the calculation formula of patch area and landscape perimeter. After U discretization, the point set X is generated. Assuming that n_i and d_i represent the intersection times of parallel line family θ_i in the same direction of X and the spacing of line family $\{\Delta\theta_i\}$, respectively, the generalized direction diameter can be expressed by the following formula:

$$D(\theta_i) = n_i d_i. \quad (25)$$

The calculation formula of discrete perimeter of patch area landscape art index is obtained according to formula (25):

$$\begin{aligned} L_N &= \pi \times \frac{1}{N} \sum_{i=1}^N D(\theta_i) \\ &= \pi \times \frac{1}{N} \sum_{i=1}^N n_i d_i. \end{aligned} \quad (26)$$

In formula (26), θ_i represents N discrete samples of $[0, 2\pi]$. Formula (26) can be used to determine the perimeter

of the closed area of the boundary line of the art index in the patch area landscape aerial image. According to the above research, the parallel calculation of patch area landscape art index based on surface coverage data is completed.

4. Experimental Analysis

In order to verify the practical application performance of the parallel calculation method of patch area landscape art index based on surface coverage data studied in this paper, a natural landscape leisure area in a famous tourism city is selected as the research object. The planning goal of the research object is to build the garden as the ecological core of the city and organically integrate development, sustainable development, and environmental protection. Build a comprehensive urban landscape park. In the process of planning, attention should be paid to the principles of natural ecology and diversity. Design the evaluation method of urban landscape planning. The evaluation content mainly includes landscape evaluation, service evaluation, environmental evaluation, and investment evaluation. There are 70 patches of different sizes in the park, numbered 1–70, respectively. Using this method, the patch area landscape in the research object is simulated, measured, and tested.

The specific simulation environment is as follows: the graphics card and memory are iGame GeForce RTX 3080 Vulcan 10g and 16 GB, respectively, the main frequency processor and operating system are Intel (R) Core (TM) i7-2430m @ 2.41 GHz and windows, respectively, and MATLAB 2017A is selected to complete the software programming.

4.1. Calculation of Feature Points of the Patch Area Landscape Aerial Image. The calculation efficiency of patch area landscape aerial image feature point art index directly affects the final perimeter calculation efficiency of this method. The error convergence in the calculation efficiency of patch area landscape aerial image feature point art index can be analyzed from two aspects: horizontal axis and vertical axis. Generally, the convergence time of horizontal axis coordinate error of feature points is usually between 2.10 s and 4.22 s in the process of feature point calculation. The convergence time of feature point ordinate error is usually between 1.75 s and 2.80 s. The error convergence in the calculation of the artistic index of the feature points of the patch area landscape aerial image extracted by this method is simulated from the horizontal axis and the vertical axis. The results are shown in Table 1.

According to the analysis of Table 1, when the patch area landscape aerial image feature points are calculated by this method, the horizontal axis and vertical axis coordinate errors of the feature points are greater than 14 mm, respectively. In the calculation of characteristic points, the horizontal axis error converges completely at 2.13 s and the vertical axis error converges completely at 1.81 s. Compared with the convergence time of feature point coordinate error in the data display, the coordinate

TABLE 1: Error convergence during characteristic point calculation.

Horizontal axis		Longitudinal axis	
Characteristic point error (mm)	Simulation time (s)	Characteristic point error (mm)	Simulation time (s)
14	0.01	14	0.01
12	0.02	12	0.04
10	0.16	10	0.13
8	0.29	8	0.25
6	0.20	6	0.60
4	0.75	4	0.88
2	1.18	2	1.27
0	2.13	0	1.81

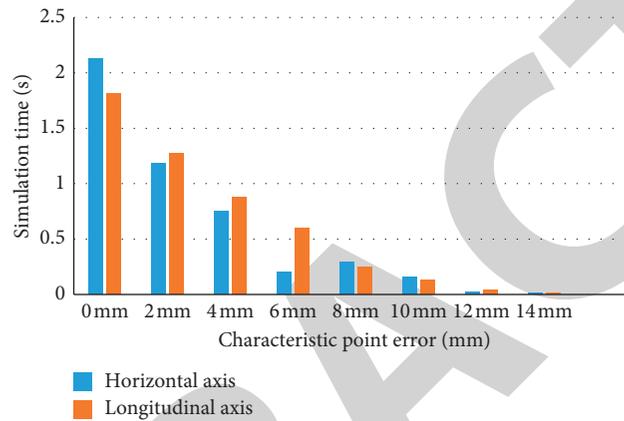


FIGURE 3: Error convergence during characteristic point calculation.

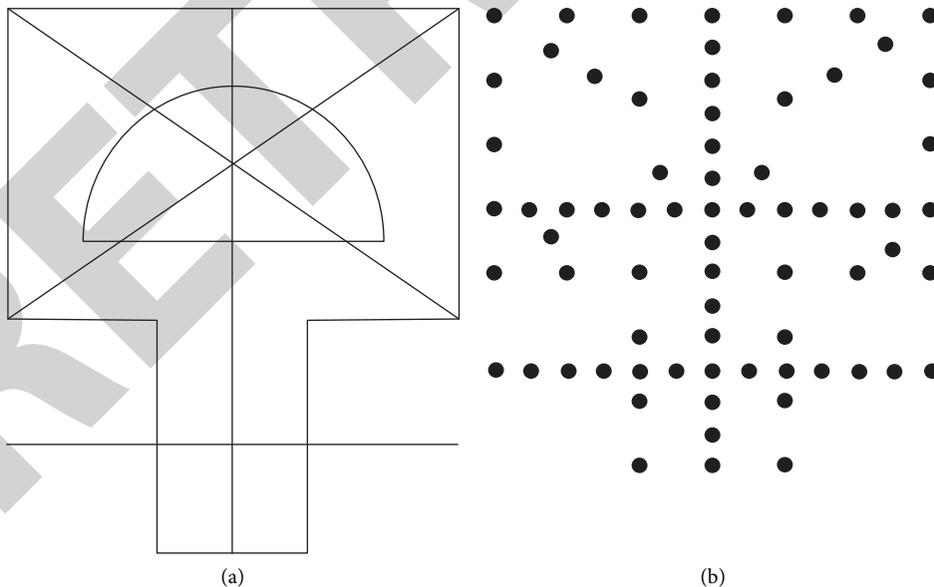


FIGURE 4: Selected patch area landscape object. (a) Abstract graphics. (b) Discrete sampling diagram.

convergence time in the process of feature point calculation in this method is close to the lower limit, which shows that this method has high convergence efficiency of feature point coordinate error and can significantly

improve the efficiency of patch area landscape perimeter calculation. In order to analyze the results more intuitively, corresponding bar charts are presented, and the results are shown in Figure 3.

TABLE 2: Perimeter calculation results.

Patch area landscape number	Actual perimeter (m)	Calculated perimeter (m)	Absolute error (m)	Relative error (%)
2	6.25	6.20	0.05	0.8
5	18.96	19.10	0.14	0.74
11	52.56	52.31	0.25	0.48
16	37.42	37.54	0.12	0.32
23	40.09	39.8	0.21	0.52
25	51.39	50.90	0.49	0.95
34	22.57	22.45	0.12	0.53
45	33.48	33.72	0.24	0.72
52	43.61	44.03	0.42	0.96
67	29.80	30.06	0.26	0.87

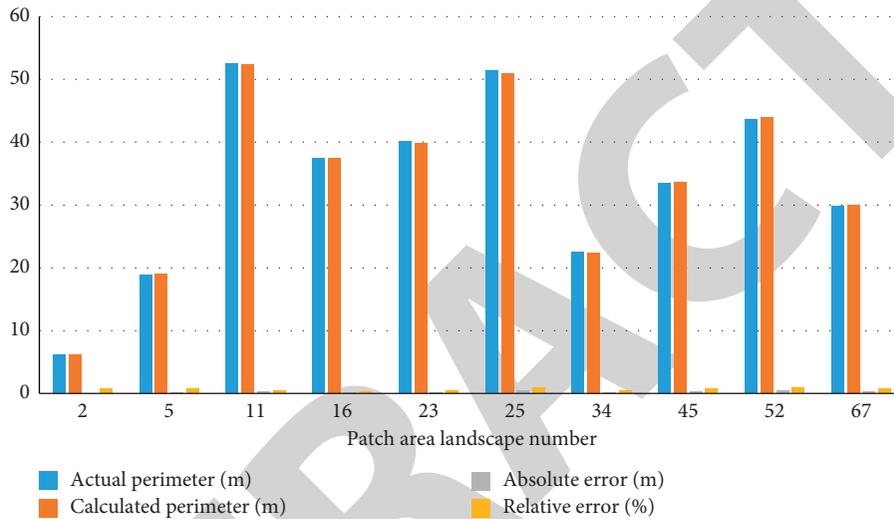


FIGURE 5: Perimeter calculation results.

4.2. *Perimeter Calculation Simulation.* Ten patch area landscape objects were randomly selected in the research object, and ten patch area landscape actual perimeters were selected. Figure 4(a) shows one of the patch area landscape abstract graphics, and Figure 4(b) shows the discrete sampling diagram of the patch area landscape abstract graphics.

The perimeter of the landscape of ten randomly selected patch areas is calculated by this method and compared with the actual perimeter. The results are shown in Table 2.

By analyzing Table 2, the landscape image perimeter of each patch area in the research object is calculated by this method. Compared with the actual landscape perimeter of each patch area, the absolute error and relative error are controlled below 0.60 m and 1.00%, respectively. The simulation results show that the actual perimeter calculation result of this method is more accurate. In order to analyze the results more intuitively, the corresponding bar charts are presented, and the results are shown in Figure 5.

5. Conclusion

The accurate measurement of patch area landscape perimeter is particularly important for patch area landscape design. This paper studies the parallel calculation method of patch area landscape art index based on surface coverage

data. After preprocessing the collected patch area landscape aerial image, the feature points in the image are calculated, and the perimeter of patch area landscape art index is calculated based on the feature points. The experimental results show that this method can significantly improve the efficiency of calculating the artistic index of feature points in patch area landscape aerial images and accurately calculate the landscape perimeter of patch area. In the subsequent optimization process, it mainly improves the anti-interference performance of parallel calculation of patch area landscape art index of surface coverage data, improves the calculation accuracy of feature points of patch area landscape image aerial image art index, and optimizes the calculation results of patch area landscape perimeter. However, in plant landscape design, do not use a single plant but use diversity and diversity. As some designers are invaded by bad culture or do not innovate, the effect of landscape planning is poor, which can easily damage the local environment, affect the local city, and consume the next generation of resources.

Data Availability

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

Conflicts of Interest

The author declares no conflicts of interest.

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