Research Article

Planning and Design Method of Multiangle Ecological Building Edge Space under the Background of Rural Revitalization

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Under the background of rural revitalization, in order to realize the planning and design of ecological building edge space, a multi-perspective ecological building edge space planning and design method based on remote sensing image edge segmentation is proposed. The remote sensing visual detection of ecological buildings is realized by fusing multiscale features and multisource scene remote sensing images, and the extracted remote sensing image feature points are calibrated to extract the location information, texture features, super-resolution edge information features, and different levels of change features of the spatial distribution of the edge of ecological buildings. The background difference detection model of an ecological building remote sensing image is established, and the distance of the centroid of the corresponding level is calculated through frame dynamic planning and differential image clustering. Combined with the edge contour detection method of ecological building remote sensing image, the edge space planning and design are realized. The simulation results show that this method has higher accuracy in planning and better accuracy in detecting the contour of ecological building edge space and improves the dynamic planning and positioning ability of multi-perspective ecological building edge space distribution.

1. Introduction

With the development of rural revitalization, people pay more attention to the study of multi-perspective ecological building edge space planning under the background of rural revitalization. In the past, the concept of public space was defined as the design of traffic organization space combining corridors, squares, atriums, etc. Under the background of rural revitalization, the design of multiperspective ecological architecture fringe space planning model focuses on the mutual organization and wearing of point line plane space, large space, and small space. Through multiview tracking and recognition, the multiview ecological building edge space detection under the background of rural revitalization is realized, and the remote sensing image recognition technology is adopted to improve the rural revitalization background [1, 2].

Focusing on the geometric level of multiangle ecological architecture under the background of rural revitalization, this paper studies the spatial combination of multiangle ecological architecture aesthetics under the background of rural revitalization [3, 4]. Under the background of rural revitalization, the complex design of public space under the integration of multiview ecological buildings needs to stand on the demand of people and discuss the role and influence of the complex design of multiview ecological buildings in the integration under the background of rural revitalization. Starting with the development process of multi-perspective ecological architecture design and the related theories of architectural integration under the background of rural revitalization, this paper combines them and analyzes the driving mechanism of multi-perspective ecological architecture design under the background of rural revitalization and
studies the spatial planning and design methods of multi-perspective ecological architecture under the background of rural revitalization, which is of great significance in promoting the improvement of the ecological structure and the optimization of architectural design aesthetics [5–7].

In reference [8], a study on a building edge space planning method based on symmetric inverse layout merging is proposed. UAV remote sensing equipment is used to obtain the image of building edge space, and the feature information of building edge space is extracted based on ICA threshold optimization coupling information entropy. The function of building edge space is analyzed. Based on the obtained feature information and function information of building edge space, the feature and function of building edge space are matched based on the symmetric inverse layout merging algorithm, and the initial building edge space planning is obtained. Based on the initial building edge space planning, the particle swarm optimization algorithm is used to optimize the building edge space planning and get the best building edge space planning and realize the building edge space planning based on symmetric inverse layout merging. In reference [9], the research summarizes the characteristics of urban fringe from the perspective of urban renewal and discusses the planning and design strategies of urban fringe from four aspects: industrial function upgrading, spatial structure remodeling, ecological network improvement, and cultural context inheritance, combined with the relevant practice of urban design in Linhuai area of Fengyang County, in order to provide a reference for other planning. In reference [10], a multiview eco-building planning method under the background of rural revitalization based on the joint analysis of six characteristics of contrast, brightness, smoothness, information content, third-order moment, and entropy was proposed, and new feature vectors were generated to compare the features before and after, so as to achieve multiview eco-building edge space positioning. However, the dynamic planning performance of multiview eco-building edge space positioning by this method was poor. In reference [11], a multiview ecological building edge space positioning technology based on an efficient and scalable improved residual neural network is proposed, which can realize the multiview ecological building planning under the background of rural revitalization through complex ecological planning and design, but this method has poor feature clustering and convergence.

To solve the above problems, this paper proposes a multiview ecological building edge space planning and design method based on edge segmentation of remote sensing images. Firstly, the multiview ecological building edge space is detected by fusing multi-scale features and multi-source scene remote sensing images. Then, the distance between the corresponding level centroid of multiview ecological building edge space is calculated. According to parameter estimation and pixel gray value detection, combined with edge contour detection of ecological building remote sensing images, the multiview ecological building edge space planning and design under the rural revitalization background is realized. Finally, the experimental test analysis shows the superior performance of this method in improving the planning and design ability of multi-perspective ecological building edge space under the background of rural revitalization.

2. Remote Sensing Image Edge Segmentation Theory and Method

Image segmentation refers to the technology of dividing the image into non-overlapping areas and extracting the interested objects. Remote sensing image has gradually played a great role in all fields of national life with its good timing, abundant information, and gradually improved resolution. Therefore, it is of great significance to use image segmentation technology to conduct in-depth research on it and discover the hidden information. At the same time, remote sensing images are usually characterized by low contrast, great changes in regional features due to different shooting conditions, blurred boundaries between different regions, complex and diverse distribution of shapes, structures, and fine structures, and large information capacity of images, which increase the difficulty of image segmentation. Therefore, remote sensing image segmentation is the technology of remote sensing image segmentation. It is the basis and key step of remote sensing image processing and application. It can transform the original image into a more abstract and compact form, making it possible for high-level analysis and decision-making. Edge refers to the set of pixels in an image whose gray level has a step or roof change. The step edge is located where the gray values of pixels on both sides are obviously different, and the roof edge is located at the turning point where the gray values increase to decrease. The segmentation method based on edge detection tries to solve the problem by detecting the edges of different areas. Usually, the gray values on the edges of different areas often change greatly, which is one of the main assumptions for the realization of edge detection methods. Edge segmentation is mainly divided into the following categories.

2.1. Point Detection. Discrete points are detected first, and then the points are connected into closed boundaries. The process is to use a template to detect discrete points in the area to be detected.

2.2. Line Detection. In online detection, there are two ways: one is to use line detection module for line detection, and the other is to use huff transform for direct detection.

2.3. Edge Detection. Edge detection technology can be divided into serial edge detection and parallel edge detection according to the processing order. In the serial edge detection technology, whether the current pixel belongs to the edge to be detected depends on the detection result of the previous pixel. In parallel edge detection technology, whether a pixel belongs to the detected edge is only related to the current pixel and its adjacent pixels. This needs to detect
3. Overall Realization of Technology and Visual Preprocessing of Remote Sensing Technology

3.1. Remote Sensing Visual Detection of Spatial Distribution of the Ecological Building Edge. In order to realize the planning and design of multiview ecological building edge space under the background of rural revitalization based on remote sensing image edge segmentation, a multiview ecological building edge space remote sensing image acquisition model was established by combining color space feature analysis and saliency map model, and the dynamic frame sequence of multiview ecological building edge space remote sensing was analyzed by combining the method of ecological building space complex hierarchical segmentation and video frame detection [12, 13]. Using the method of hierarchical segmentation and frame counting of ecological building space complexity, through object feature detection and template matching under the condition of multiview ecological building edge space occlusion, combined with fine-grained feature analysis, a multiview ecological building edge space remote sensing image matching and ambiguity detection model is constructed, and the design flow chart of multiview ecological building edge space remote sensing image collection and multiview ecological building edge space planning is obtained as shown in Figure 1.

Based on edge segmentation and positioning of remote sensing images, this paper analyzes the location information, texture features, super-resolution edge information features, and different level change features of multiview ecological buildings’ edge space distribution. According to the driving mechanism of spatial composite design and parameter information detection, it adopts the methods of adjacent frame registration and deformation template detection to analyze the appearance features of the remote sensing edge such as gray, color, texture, contour, and corner, of the whole building public space and adopts deformation template matching. Through the direction and the deformation of the direction gradually adapting to the real buildings in the image, the dynamic planning of the edge spatial distribution of multiview ecological buildings can be realized. The flow chart of the technical realization structure of the method proposed in this paper is shown in Figure 2.

According to the above overall structure design, the multiview remote sensing visual detection of ecological buildings under the background of rural revitalization is realized by fusing multiscale features and multisource scene remote sensing images, and the extracted multiview remote sensing images of ecological buildings under the background of rural revitalization are calibrated by threshold segmentation and corner location [14, 15].

3.2. Multi-Perspective Remote Sensing Image Sampling and Preprocessing of Ecological Buildings under the Background of Rural Revitalization. On the basis of the overall structural analysis of the planning and design of multiview ecological building edge space under the background of rural revitalization, the multiview ecological building remote sensing vision detection under the background of rural revitalization is realized by fusing multiscale features and multisource scene remote sensing image detection, and the extracted multiview ecological building remote sensing image under the background of rural revitalization is segmented by the threshold and corner location, and the multiview ecological building remote sensing image under the background of rural revitalization is obtained as follows:

$$L = J(w, e) = \sum_{i=1}^{N} a_i \varphi(x_i),$$

where $J(w, e)$ represents the dimension of the feature map, $a_i$ is the pixel feature quantity of the remote sensing image of the edge space of multiview ecological building, $\varphi(x_i)$ is the second-order geometric moment of multiview ecological building under the background of rural revitalization, $N$ is the pixel number of multiview ecological building under the background of rural revitalization, and the contour feature distribution of multiview ecological building image under the background of rural revitalization is as follows:

$$j^\text{dark}(x) = \min_{c \in \{r, g, b\}} \left( \min_{y \in \Omega(x)} \{ f(y) \} \right),$$

where $f$ is the filter transmission coefficient of multiview eco-building images under the background of rural revitalization, and $\Omega(x)$ is the neighborhood size of location information distribution of multiview eco-building edge space. Combining with the feature reorganization of motion parameter information of eco-building edge space, the white balance sensitivity feature decomposition result of multiview eco-building images under the background of rural revitalization is as follows:

$$I(x) = J(x) + A(1 - t(x)),$$

where $A$ is the scale information of multiview remote sensing images of ecological buildings under the background of rural revitalization, $t(x)$ is the enhancement coefficient of multiview remote sensing images of ecological buildings under the background of rural revitalization, and $J(x) + A(1 - t(x))$ is the parallax component of multiview remote sensing images of ecological buildings under the background of rural revitalization. By smoothing the feature map set and weighted summation pixel-by-pixel, the discriminant function of ecological building edge space detection after the feature fusion in the first stage is obtained as follows:

$$H_1: U(t) = V(t) + \alpha(t)W(t),$$
$$H_0: U(t) = V(t),$$

where $V(t)$ represents the prior information component of remote sensing vision sensing of spatial distribution of multiview ecological building edge; $W(t)$ represents the statistical value of dynamic planning of multiview remote sensing image frames of ecological buildings under the
background of rural revitalization; \( a(t) \) represents multiple chromatic aberration nuclei; \( H_t \) represents the fine-grained feature distribution area, and \( H_0 \) represents the layer feature distribution area of multiview ecological building edge space distribution [16–18].

According to the above analysis, the background differential detection model of multiview ecological building remote sensing images under the background of rural revitalization is established, and the dynamic planning of multiview ecological building edge spatial distribution is carried out through frame dynamic planning and differential image clustering [19–21].

4. Multi-Perspective Ecological Building Edge Space Planning and Design

4.1. Extraction of Spatial Distribution Characteristics of the Multiview Ecological Building Edge Based on Edge Segmentation of the Remote Sensing Image. The edge pixel fusion method is adopted to locate the edge space of multiview ecological buildings by remote sensing vision, and the pheromone intensity at the characteristic points is obtained. Based on the tracking detection method of the deformation template [22–24], the appearance features of multiview ecological buildings such as gray scale, color, texture, outline, and corner are obtained, and the appearance features of multiview ecological buildings under the background of rural revitalization are differentiated and fused, and the detected pixel sequence distribution of multiview ecological buildings under the background of rural revitalization is as follows:

\[
J(x) = \frac{I(x)A}{\max(t(x), t_0)} + A,
\]

where \( I(x) \) is the optical flow field of multiview remote sensing images of ecological buildings under the background of rural revitalization in horizontal direction, \( A \) is the scene appearance component of multiview remote sensing images of ecological buildings under the background of rural revitalization, \( t(x) \) is the detection time variation parameter of multiview remote sensing frames of ecological buildings under the background of rural revitalization, and \( t_0 \) is the optical flow characteristic value projected in the adjacent area on the image plane [25, 26]. Combining with the Markov chain method, the visual characteristic distribution set of multiview remote sensing images of ecological buildings under the background of rural revitalization with high resolution is obtained, and the multiview ecology under
the background of rural revitalization is obtained within the adjacent points in a small area.

\[ u(d_{ij}) = f\left(|x_i - x_j|\right) \]
\[ = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{(x_i - x_j)^2}{2}\right), \quad (6) \]

where \( x_i \) represents the background gray value of an \( N \times N \) window, and \( x_j \) represents the gradient operator of the multiview ecological building edge space remote sensing image. In the image stabilization stage of the multiview ecological building edge space remote sensing image, the output Lab color feature is \( \hat{A}_n \). On this basis, the multiview ecological building edge space remote sensing image is subjected to image stabilization processing, and the detection results of multiview ecological building edge space planning feature points under the background of rural revitalization are as follows:

\[
\begin{align*}
    y_0 &= f(c_0, c_1, \ldots, c_{N-1}), \\
    y_1 &= f(c_0, c_1, \ldots, c_{N-1}), \\
    \ldots, \\
    y_m &= f(c_0, c_1, \ldots, c_{N-1}),
\end{align*} \quad (7)
\]
where $c_0$ represents the corner information of multiview remote sensing images of ecological buildings under the background of rural revitalization after the registration of adjacent frames, $c_{N-1}$ represents the edge space movement information of ecological buildings after tracking the edge space of ecological buildings through remote sensing optical flow field tracking, and according to the feature extraction results, the dynamic planning of edge space of ecological buildings is realized by using the information fusion and clustering processing of the inter-frame movement.

4.2. Planning and Design of Edge Space of Multiview Ecological Buildings under the Background of Rural Revitalization. By using frame dynamic programming and differential image clustering, the distance of multiview ecological building edge space corresponding to the hierarchical centroid is calculated, and the detection and estimation of statistical characteristics of the multiview ecological building remote sensing image background model under rural revitalization background are established. Let $F_m(x, y)$ be the gray value of multiview ecological building remote sensing image pixels under rural revitalization background at the $T$ frame $m$, and $B_m(x, y)$ represents the gray value of multiview ecological building remote sensing image background pixels under rural revitalization background calculated from the previous frame. The optical flow equation of each multiview ecological building edge space distribution is

$$B_m(x, y) = \frac{1}{m} \sum_{i=0}^{m-1} F_i(x, y),$$

where $m$ is the serial number of the current frame, and $F_i(x, y)$ is the optical flow gradient of multiview remote sensing images of ecological buildings under the background of rural revitalization. When $m$ gradually becomes larger, the pixels occupied by the edge space of ecological buildings are smooth and close to the real pixels of the background model. According to the remote sensing parameter estimation and pixel gray value detection of multiview ecological buildings under the background of rural revitalization, combined with the edge contour detection of remote sensing images of ecological buildings, the multiview ecological building edge space planning is realized. The realization steps are as follows:

1. The edge space information of ecological buildings is used for matching or data association, and the image is divided into the foreground area and the background area by the initial threshold. Observe the distribution of these two areas, determine the correlation and matching relationship between the edge spaces of ecological buildings and get that the orientation parameters of the edge spaces of ecological buildings in the current frame and successive frames before the current frame of multiview remote sensing optical flow trajectory of ecological buildings under the background of rural revitalization are

$$\mu_B = \frac{\sum_{(i,j) \in \text{background}} F(i, j)}{\# \text{background\_pixels}},$$

$$\mu_O = \frac{\sum_{(i,j) \in \text{objects}} F(i, j)}{\# \text{object\_pixels}},$$

where background\_pixels is the gray pixel value of the background area, $F(i, j)$ is the spatial location constraint parameter of the multiview ecological building under the background of rural revitalization, and object\_pixels is the gray pixel value of the edge space area of the ecological building.

2. Set the characteristic variable $T$, $T = (\mu_B + \mu_O)/2$ of remote sensing vision sensing in the edge space of multiview ecological buildings. Among them, the spatial orientation information of the ecological building edge is obtained.

3. The updated $T$ setting, through tracking the optical flow trajectory characteristics of multiview remote sensing images of ecological buildings under the background.
background of rural revitalization, obtains the light transmittance in all directions of the images, thus obtaining the specific characteristic points of the edge space of regional ecological buildings, as shown in Figure 3;

(4) Repeat (1) to (3), and end when approaching $\mu_B$. The implementation process of the improved algorithm is shown in Figure 4.

5. Experimental Analysis

The simulation experiment verifies the performance of this method in the planning and design of multiview ecological building edge space under the background of rural revitalization. The hardware configuration of the experiment is a desktop with a main frequency of 2.6 GHz, a memory of 2 GB, and Matlab R2011a simulation software. The remote sensing video VIVID database is used for sampling the information of ecological building edge space, and the visual sensing pixel value of multiview ecological building edge space under the background of rural revitalization is $4,500 \times 2,400$. The detection threshold of ecological building edge space is set to 0.38, and the spatial regional fusion feature distribution set of remote sensing visual sensing is 125. The 1024th and 2000th frames are taken as research objects, and the multiview visual sensing image collection of ecological building edge space distribution is shown in Figure 5.

Taking the above two multiview ecological building edge spatial distribution visual sensing images as the research object, the position information, texture features, super-resolution edge information features, and different level change features of multiview ecological building edge spatial distribution are extracted, and through frame dynamic planning and differential image clustering, the fusion results of multiview ecological building edge spatial distribution images are obtained as shown in Figure 6.

According to the fusion results of multiview ecological building edge spatial distribution images in Figure 6, combined with the edge contour detection of ecological building remote sensing images, the dynamic planning of multiview ecological building remote sensing images under the background of rural revitalization is realized, and according to the comparison of other methods, the multiview ecological building edge spatial planning output is obtained as shown in Figure 7.

Ecological buildings and the accuracy of edge space detection of ecological buildings is better, which reduces the probability of missing detection of edge space of ecological buildings. The comparison results are shown in Table 1.
According to the analysis of Table 1, the accuracy of this method for the spatial distribution planning of the edge of multi-perspective ecological buildings is higher than 0.899. The highest values of 0.594 and 0.810 are higher than those of reference [10] and reference [11]. This proves that the planning and design method of multi-perspective ecological building edge space under the background of rural revitalization proposed in this paper has a good planning effect.

### Table 1: Comparison of positioning accuracy of multi-perspective ecological building edge space planning.

| Iterative steps | Methods of this paper | Reference [10] | Reference [11] |
|-----------------|-----------------------|----------------|----------------|
| 10              | 0.899                 | 0.592          | 0.773          |
| 20              | 0.893                 | 0.591          | 0.78           |
| 30              | 0.905                 | 0.593          | 0.785          |
| 40              | 0.902                 | 0.596          | 0.789          |
| 50              | 0.903                 | 0.598          | 0.789          |
| 60              | 0.901                 | 0.597          | 0.795          |
| 70              | 0.897                 | 0.589          | 0.796          |
| 80              | 0.893                 | 0.594          | 0.802          |
| 90              | 0.916                 | 0.593          | 0.807          |
| 100             | 0.913                 | 0.594          | 0.81           |

### Figure 7: This method can effectively locate the edge space of multiview. (a) Appearance observation. (b) Structural observation. (c) Fusion observation.

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### 6. Conclusion

In this paper, the planning and design method of multi-perspective ecological building edge space under the background of rural revitalization is proposed. On the basis of remote sensing visual detection, multiple feature points of
multiview ecological building edge spatial distribution are extracted. Through background difference and edge contour detection, the edge space planning and design of ecological buildings are completed. Simulation results show that the proposed method has good planning performance.

Data Availability

The data are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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