Wireless Personal Communications
https://doi.org/10.1007/s11277-023-10508-y

Research on the Application of Intelligent Computer Technology in Minority Traditional Residential Buildings

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Accepted: 15 May 2023

Abstract
In order to improve the analysis and digital protection effect of traditional ethnic minority residents' architectural skills, this paper adopts the method based on moving least squares surface fitting to fit the cement microstructure to obtain the analysis of the traditional minority residents' architectural skills and the mathematical description of digital protection. Moreover, this paper uses the analysis of traditional ethnic minority residents' architectural skills and the study of digital protection reconstruction to obtain high-precision fitting data. In addition, this paper combines intelligent computer technology to analyze the architectural skills of ethnic minority traditional dwellings. The experimental research results show that the analysis method of ethnic minority residents' architectural skills based on intelligent computer technology proposed in this paper has good results.

Keywords Intelligent computer technology · Ethnic minorities · Traditional houses · Architectural skills

1 Introduction

Traditional villages are the living carriers of history and culture, maintaining the strongest "homesickness" of the Chinese nation. Therefore, more and more experts and scholars are participating in the protection of traditional villages. The purpose is to provide substantial protection for valuable ancient villages and towns, and to retain the "root" of Chinese traditional culture.

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Published online: 28 May 2023

The protection and restoration work of ancient buildings needs to be carried out frequently to reduce the erosion and damage of the natural environment to the buildings, and to extend the existence of ancient buildings. This work requires the participation of a group of excellent traditional craftsmen, but due to the rapid development of urbanization. The current society is an efficiency-oriented society, and traditional technologies inevitably go against it. The living space of the inheritors is squeezed, resulting in fewer and fewer traditional craftsmen engaged in ancient building repairs [1]. At present, there are fewer and fewer young people willing to work in the craftsmanship industry, and no one can pass on the construction skills. Moreover, when a person dies, it is also manifested as a death in art. The construction skills of some traditional buildings may become “Guangling masterpieces” due to lack of successors. Therefore, we must speed up the pace and do a good job of rescue records before the disappearance of traditional houses and construction techniques, so as to lay the foundation for the subsequent protection work, and avoid the regrets of wanting to protect and not knowing what to protect or how to protect [2].

In recent years, vernacular architecture has received more and more attention, and construction techniques have also attracted the attention of people from all walks of life. In the context of the new era, higher requirements have been put forward for the research on construction techniques, and it is necessary to “promote the close integration of traditional residential construction techniques with the construction of new rural areas and rural revitalization.” However, the current research scope of construction techniques is relatively limited, and the rural construction techniques in many areas have gradually disappeared. Therefore, we need our efforts to bring more construction techniques into people’s field of vision [3].

This article combines intelligent computer technology to analyze the traditional residential building skills of ethnic minorities, and provides a theoretical reference for the analysis and protection of traditional residential building skills of multiple ethnic groups.

2 Related Work

With the acceleration of the modernization process, both the protection of traditional villages and the inheritance of intangible cultural heritage are facing more severe challenges. Traditional building construction techniques have an important position and role in the protection of traditional villages [4]. Due to insufficient understanding of relevant theories, the focus of protection of traditional villages is limited to the protection of traditional villages, while ignoring the protection of the intangible cultural heritage of traditional construction techniques in villages. The protection and inheritance of traditional construction techniques is an important prerequisite for the continuation and development of traditional villages. Therefore, the relationship between the two should be re-understood to more effectively promote the protection of traditional villages and the inheritance of traditional construction techniques [5]. In the protection of traditional villages, re-understanding and paying attention to the relationship between the two can effectively promote the protection of traditional villages and traditional villages [6, 7]. Inheritance of construction techniques. Literature [8] proposes to pay attention to the attributes of its intangible cultural heritage in the study of traditional village architecture, and believes that the inheritance of traditional architectural skills cannot be separated from the village culture, and must be inherited in life through specific construction activities. Traditional villages are the physical expression of traditional architectural skills and their survival context. Therefore, the protection of traditional architectural skills must depend on the protection of traditional villages, and the two cannot be separated [9].

Diversification of forms of digital protection of intangible cultural heritage. The current digital technologies and forms of intangible cultural heritage show a diversified development trend, mainly including digital modeling, remote sensing technology, virtual reality technology (VR), digital aided design technology, etc., so as to provide digital protection forms for different types of intangible cultural heritage. There are many options [10]. Literature [11] completed the virtual reality model of the ancient city; Literature [12] digitized the ancient villages in the area based on the measurement of virtual reality technology, and the necessary procedures and technologies for digitizing the external landscape and culture of the village; Literature [13] based on image rendering The IBR method, virtual reality, artificial intelligence and other technologies have realized the virtual display of the Dunhuang Grottoes, greatly improving the efficiency of cultural relic protection research; Literature [14] records the movements and audio of local living cultural heritage through digital technology for protection.. Literature [15] proposed to use virtual reality technology to build a digital exhibition hall for various forms of intangible cultural heritage projects, and to build a digital exhibition hall of Manchu intangible cultural heritage by means of material collection, modeling and baking, interactive data, database connection and publishing, etc. The digital exhibition hall is displayed to the public through the Internet media, so that the public can watch and understand the intangible cultural heritage of the Manchu people without the limitation of time and space.

Research on the construction of intangible cultural heritage database. The intangible cultural heritage database is the main construction form and the core of the current non-digital construction, and it is also the basic work for the inheritance and dissemination of intangible cultural heritage. Academic circles have discussed the construction of intangible cultural heritage database from the same level. Among them, Literature [16] believes that the fundamental purpose of databases is to solve data security problems, sharing problems and storage problems; Literature [17] points out that with the continuous deepening of intangible cultural heritage protection work, the use of digital technology to carry out real-world intangible cultural heritage, systematic and comprehensive collection and establishment of a database is an effective means to realize the scientific protection of intangible cultural heritage. Judging from the current research, it is still necessary to further explore the classification system, metadata and other information organization issues of the intangible cultural heritage database and related standards and norms, and strengthen the research and case analysis of domestic and foreign intangible cultural heritage databases, especially foreign cultural heritage databases, which will help promote the The digitization of intangible cultural heritage realizes cooperation and exchanges on a national and even international scale. Research on digital museum of intangible cultural heritage. A digital museum is a platform for storing and managing natural and cultural heritage information in a digital way. Literature [18] pointed out that compared with traditional museums, digital museums have the advantages of unlimited reproduction of exhibits, diverse presentation methods, no time and space constraints, and convenient retrieval and research. Academic circles have also discussed the use of digital museums for intangible cultural heritage protection, including their advantages, application fields, construction plans, platform design, etc. In addition, academic circles have also tried to combine the theory of eco-museum with the digital construction of intangible cultural heritage. Literature [19, 20] conducted research and analysis on the construction ideas and elements of digital eco-museum, and discussed the problems and solutions in the construction of digital eco-museum [21, 22]. Although the application of eco-museum theory in the digitization of intangible cultural heritage is rare, it may provide new ideas for the digitalization of intangible cultural heritage in the future. Research on the digital inheritance of traditional architectural construction techniques. At present, there are few studies on intangible culture and architectural techniques. Combined with specific traditional architectural techniques, the application of traditional architectural techniques database, intangible cultural heritage museum dataization and Building Information Modeling (BIM, Building Information Modeling) technology is mentioned. Literature [23] analyzed the significance of the digitization of intangible cultural heritage museums [24, 25], and summarized and explained the technical conditions [26], work implementation and key difficulties of how to effectively collect intangible cultural heritage resources.

3 Micro-digital Processing of Traditional Residential Buildings

In the mathematical definition, the method of calculating the infinite integral of two functions is called convolution. Usually, a matrix is used as the weight of the convolution, and the size of the matrix is the size of the operation field. The matrix slides in the image to perform the convolution operation. Each point in the operation domain is multiplied with the weight and summed, and then re-assigned to the center pixel of the region in the image. For example, if P is a region in the image, the matrix K is the convolution kernel acting on this region, and the matrix size is 3×3. When K is applied to the image P for convolution, the calculation of the central pixel P22 is expressed as:

$$\begin{aligned} p_{22} = & p_{11} \times k_{11} + p_{12} \times k_{12} + p_{13} \times k_{13} + p_{21} \times k_{21} + p_{22} \times k_{22} \\ & + p_{23} \times k_{23} + p_{31} \times k_{31} + p_{32} \times k_{32} + p_{33} \times k_{33} \end{aligned} \tag{1}$$

Among them,

$$P = \begin{bmatrix} P_{11} & P_{12} & P_{13} \\ P_{21} & P_{22} & P_{23} \\ P_{31} & P_{32} & P_{33} \end{bmatrix}, K = \begin{bmatrix} K_{11} & K_{12} & K_{13} \\ K_{21} & K_{22} & K_{23} \\ K_{31} & K_{32} & K_{33} \end{bmatrix}$$

After the entire convolution operation is performed, a value is calculated and a threshold is defined. When the value after convolution is greater than the threshold, it is determined that the gray value jumps at the place where the jump is relatively large, and it is considered that there is an edge point there, otherwise, there is no edge point. So the weights in the convolutional template are crucial for edge detection [27].

Some of the existing edge detection methods have their own advantages and disadvantages, but there is still no universal method. In view of the complex characteristics of traditional residential building elements, the existing methods are difficult to obtain the desired effect, so this paper seeks to find a new edge detection method suitable for edge detection of traditional residential buildings.

In order to study the evolution law of particles in the hydration process of traditional residential buildings, the particles must be separated from the traditional residential building images. However, the presence of partial volumes and the similarity of the secondary interphase intensities make the boundaries of the particles unclear. Traditional edge detection methods are difficult to distinguish the edges of particles in traditional residential building microstructure images. In other words, traditional edge detection methods are not effective for traditional residential building images. Aiming at this problem, this paper proposes an image edge detection method based on interactive genetic algorithm. This method uses genetic algorithm to generate the optimal edge detection template to replace the traditional edge detection template, in which the fitness value evaluation of the intermediate link of the genetic algorithm interacts with people, and uses human knowledge to evaluate the quality of the evolutionary convolution template, thereby producing better Detection template. It can be seen from the experimental results that the edge detection method based on the interactive genetic algorithm can effectively and accurately detect the edge of traditional residential building images.

After selection, crossover, and mutation operations, a new generation of individuals will be generated, and the new generation of individuals is developing in the direction of improving the overall fitness value, because there will always be more choices of the best individuals. At this time, individuals with low fitness are gradually eliminated. Finally, the algorithm repeats these operations: obtaining fitness values, selection, crossover, and mutation operations to generate new populations, and repeat this process until the termination conditions are met.

The termination conditions are generally as follows:

(1) Limitation of the number of evolutions;
(2) The calculation time is exhausted;
(3) An individual has already met the conditions of the optimal solution, that is, the optimal solution has been found and does not need to evolve;
(4) The fitness value will not change and reach a stable state;
(5) Man-made conditional intervention.

Figure 1 shows the algorithm flow of genetic algorithm.

Interactive Genetic Algorithm (Interactive Genetic Algorithm, IGA) is to help genetic algorithm to optimize by means of human–computer interaction. In the optimization process, the next step of the genetic algorithm is guided according to the feedback given by people, and the intervention of the traditional genetic algorithm is realized, so that the genetic algorithm can evolve faster and better. Moreover, it uses human feedback to evaluate the quality of the results, and is no longer calculated based on the fitness function. At the same time, it solves some problems where no suitable fitness function can be used as an evaluation method, thereby broadening the scope of use of genetic algorithms. The interactive algorithm flow chart is shown in Fig. 2.

The image edge detection process of traditional residential buildings based on IGA is shown in Fig. 3. First, the algorithm initializes the population and gives a set of random initial solutions. Then, the algorithm determines the judgment condition to stop the evolution, judges whether the current solution meets the requirements, and when it does not meet the requirements, executes the edge detection step. The generated individual is used as a convolution template to detect the edges of the image, and the resulting image is saved in a folder. Next, the algorithm uses the human eye to observe the edge detection results of these images, and scores the evaluation value of each image as the fitness value. The algorithm determines whether to be selected according to the fitness value of each individual in the obtained population. If the fitness value is larger, the probability of being selected is greater. Next, the algorithm executes genetic steps, mainly including crossover and mutation, etc., and then obtains a series of new solutions to generate a new population. Finally, the algorithm determines whether the termination

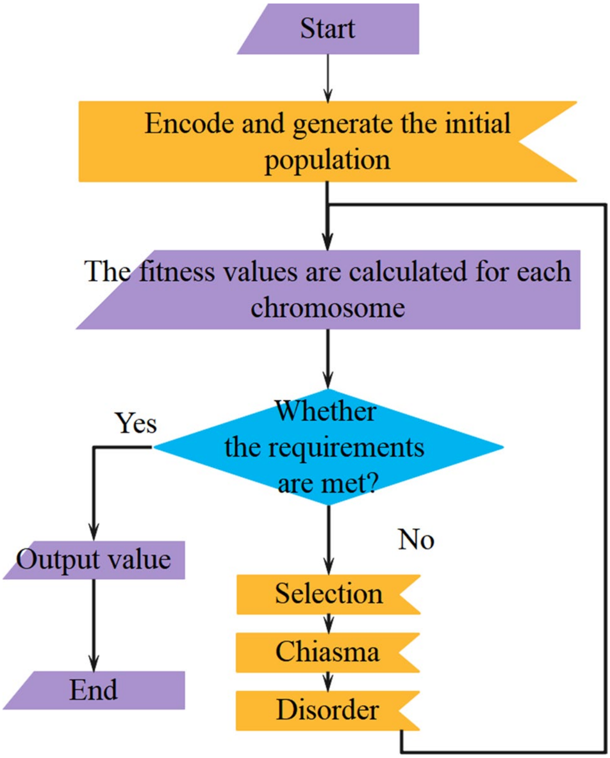

Fig. 1 Flow chart of genetic algorithm

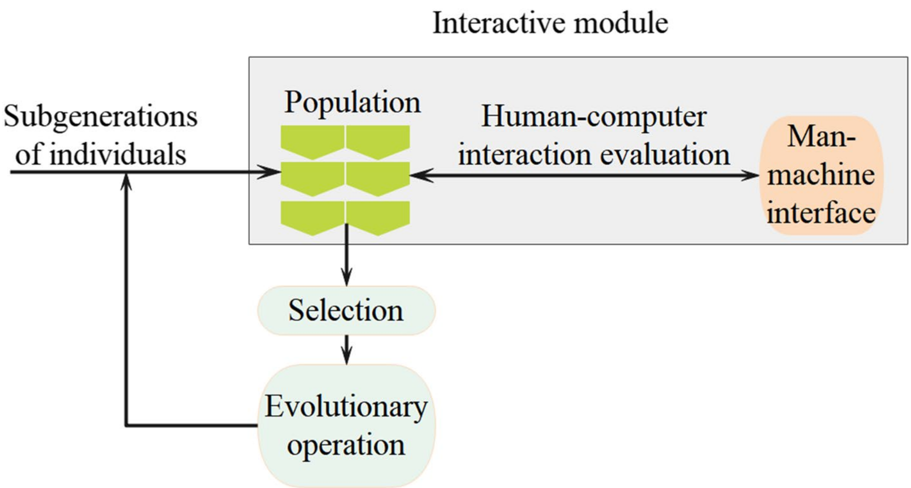

Fig. 2 Flow chart of interactive genetic algorithm

conditions are met. Generally, the above steps can be iterated multiple times before the termination condition is met. In the entire genetic algorithm, a series of operations are

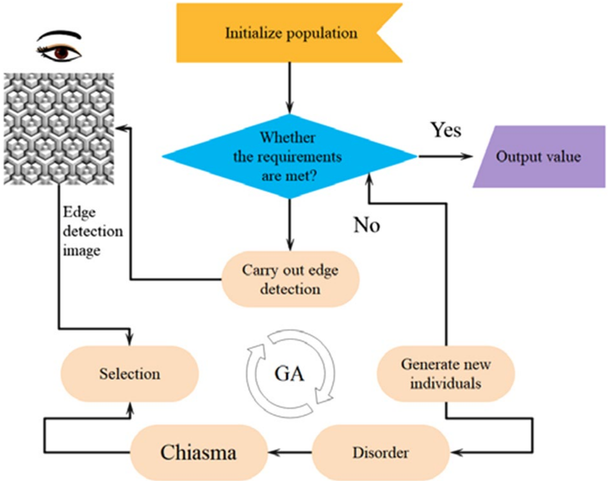

Fig. 3 Flow chart of edge detection based on interactive genetic algorithm

completed in a random manner. This series of operations includes operations such as generating the initial population, selection, crossover, and mutation.

IGA adds human factors on the basis of traditional genetic algorithms. The idea of personnel subjective evaluation of ability value replaces the process of automatic calculation of ability value by genetic algorithm ability value function. The human eye has a strong visual ability and can easily distinguish the target object from the complex background. IGA uses people as the standard to evaluate the value, and people observe the edge of the image to score, and this score is used as the fitness value to affect the selection of the next-generation genetic algorithm population and continue genetic operations. In genetic algorithms, the greater the individual's fitness value, the better the individual and the greater the probability of survival. Therefore, when the edge detection result is good, the score is larger. This article sets a maximum score of 10 points, when the edge is not detected, 0–3 points are given. When an edge is detected but the boundary is not closed, 4–6 points can be given. Only when the edge is clear and the boundary line is closed, that is to say, when the edge detection effect is good, it can score 7–10 points.

First, the algorithm initializes the genetic structure of the population. This article can try to grasp the distribution space of the optimal solution in the entire problem space, and then set the initial population in this distribution. First, the algorithm generates many individuals in a random manner, and puts these individuals into the initial population. The algorithm repeats this operation until the number of individuals in the initial population reaches the previously set number. Then, the algorithm performs edge detection based on the convolution template automatically generated by the image processing convolution. By observing and giving scores as fitness values, it replaces the calculation function of the fitness function of the traditional genetic algorithm. It is the core of the interactive genetic algorithm. The evaluation function is the key to the fusion of genetic algorithm and edge detection.

Selection.

In the selection step, individuals with relatively high fitness values will have a high probability of entering the next round of evolution, so they will have a higher probability of producing offspring. Relatively speaking, individuals with low fitness will have a small probability of entering the next round of evolution and therefore will have a high probability of being eliminated. In this paper, we mainly use roulette to select individuals. If the number of individuals in the population is N, the calculation formula is as follows:

$$P(xi) = \frac{f(xi)}{\sum_{i=1}^{N} f(xi)} \tag{2}$$

Among them, P(*xi*) is the probability of the i-th individual being selected, and *f*(*xi*) is the fitness value of the i-th individual. It can be seen from the formula that the size of the fitness value is proportional to the probability of being selected.

(2) Crossover.

This article uses a single-point crossover method to randomly select the selected population, using random numbers as the crossover point, and perform gene exchange before the crossover point of the selected population to form a new individual.

(3) Mutation.

Mutation is a certain probability of changing the chromosome value of a gene. Gene mutation is a very important step in biological evolution, changing a gene at a specific position on the chromosome. In genetic algorithms, the probability of an individual's gene mutation is very small, generally between 0.001 and 0.1. Although the probability of mutation is very small, there is a chance to generate new individuals.

The convolution template used in this paper is an n × n matrix, and the range of values in the template is [− U, U]. The algorithm uses IGA to initialize a random number matrix from (0, U), and then applies the matrix to the convolution template. When n = 3, the algorithm uses the convolution template shown in Fig. 2. Figure 4a is the 45° direction of the edge, and Fig. 4b detects the 135° edge. In this paper, the convolution template is applied to the image of the traditional residential building, and then the sum of the image convolution is calculated and the absolute value is taken. The algorithm sets a threshold. When one of the results in the two directions is greater than the threshold, the pixel value is set to 0, that is, the point is black. Otherwise, the pixel value of the point will be set to 255, that is, the point is set to white. In this way, the edges of the image are distinguished. The edge-detected image is saved in a folder, and the human eye gives a good or bad score based on the result of the image. The level of the score reflects the selection, crossover and mutation operations of the random number matrix, and a new matrix is generated and applied to the two convolution templates. After that, the algorithm performs edge detection again, loops to the end of the set maximum algebra, and finally outputs the best matrix.

It is feasible to use the IGA method for edge detection. As the fitness value increases, the edge detection effect becomes better. At this time, the edge detection template of this time is output:

$$\begin{bmatrix} 1.920 & 2.106 & 2.169 \\ 2.934 & 0 & 3.685 \\ 2.517 & 2.658 & 1.506 \end{bmatrix}$$

Therefore, the corresponding convolution template for the 45° and 135° directions is:

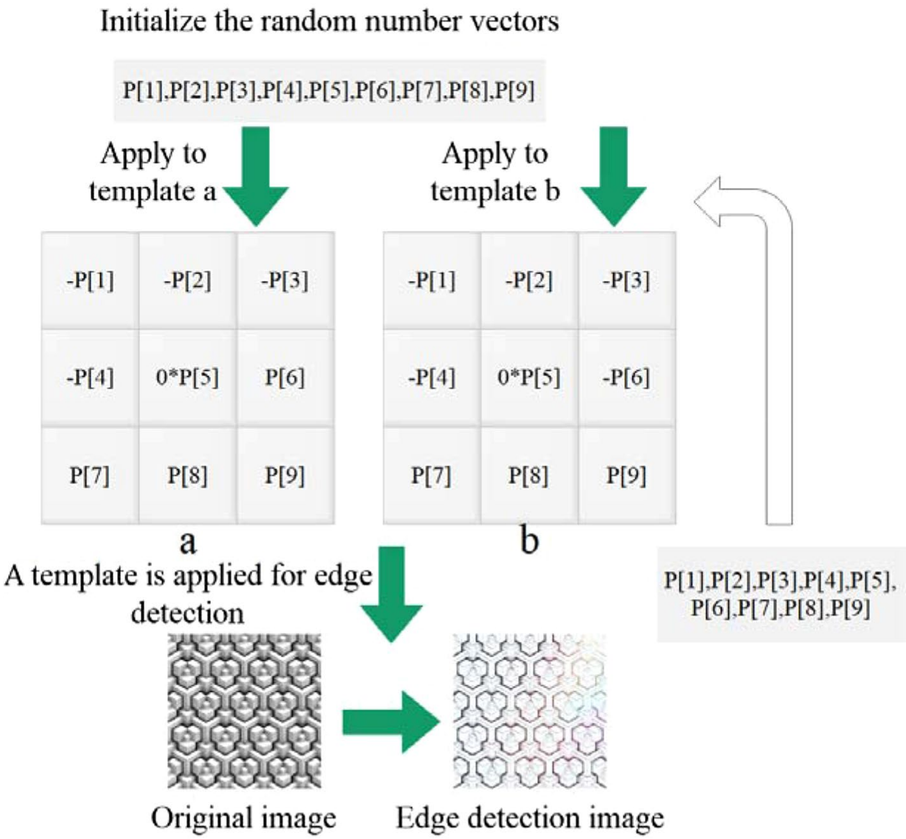

Fig. 4 The edge detection process of traditional residential building images

$$\begin{bmatrix} -1.920 & -2.106 & -2.169 \\ -2.934 & 0 & 2.685 \\ 2.517 & 2.658 & 1.506 \end{bmatrix} \textit{and} \begin{bmatrix} -1.920 & -2.106 & -2.169 \\ 2.934 & 0 & -2.685 \\ 2.517 & 2.658 & 1.506 \end{bmatrix}$$

The evolution process of fitness is shown in Fig. 5.

The algorithm obtains a set of optimal matrices through edge detection based on IGA, and then obtains two sets of corresponding convolution templates. The convolution template can be used to process other sample images, and it can also detect the edges of sample images.

The results show that the convolution template obtained by this method has strong robustness and can be widely used in other images. The edge detection results are compared with template applications of Sobel, Laplacian, and Roberts. The convolution template of the Sobel operator is:

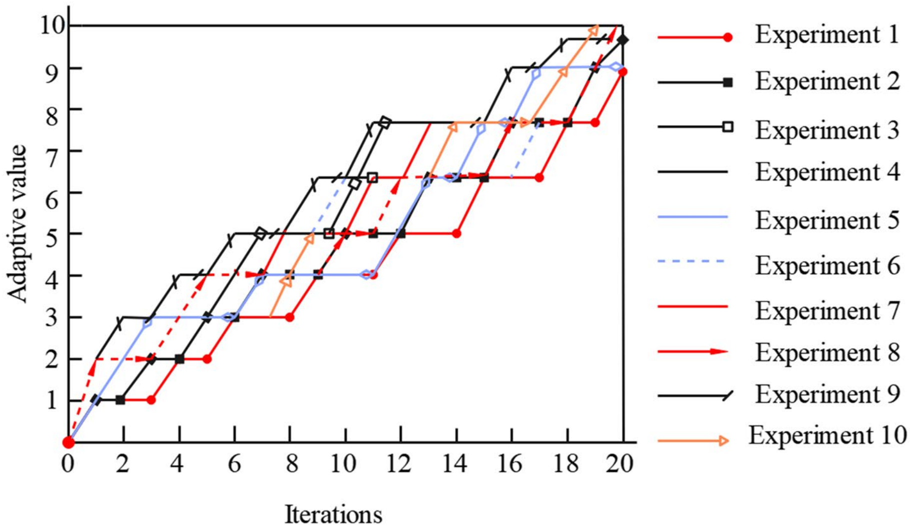

Fig. 5 The evolution process of fitness

$$\begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix} and \begin{bmatrix} -1 & -1 & -1 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

The convolution template of Roberts operator is:

$$\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix} and \begin{bmatrix} 1 & -01 \\ 0 & -1 \end{bmatrix}$$

The convolution template of the Laplacian operator is:

$$\begin{bmatrix} 0 & -1 & 0 \\ -1 & 4 & -1 \\ 0 & -1 & 0 \end{bmatrix}$$

Fitting modeling process:

1. Three-dimensional scattered point mapping of two-dimensional traditional residential building images.

The grayscale image of traditional residential buildings is a two-dimensional image structure composed of multiple pixels, and the grayscale value range is 0–255. In order to use the moving least squares surface to fit the grayscale image of traditional residential buildings, it is necessary to map the two-dimensional image data of traditional residential buildings into three-dimensional scattered points. A three-dimensional spatial coordinate system containing x, y, and z axes is defined. The traditional residential building image is placed on the x–y plane and placed in the first quadrant of the space, so that the mapped point set x is greater than zero, and y is also greater than zero. Using the gray value of the traditional residential building image as the z value of the scattered point in space, the three-dimensional coordinate representation (x, y, z) of the scattered point in the space of the traditional residential building image is obtained, where $x \geq 0$, $y \geq 0$, $0 \leq z \leq 255$. Thus, the three-dimensional spatial distribution of scattered points is established, as shown in Fig. 6.

(2) Grayscale compression.

Due to the complexity of the traditional residential building image, this paper reduces the complexity of the traditional residential building image gray scale by remapping the gray level in the traditional residential building image, thereby reducing the complexity of the entire modeling. Because the image itself is an 8-bit bitmap, the gray levels are mapped to eight gray levels. The original image contains 256 Gy levels, and the gray levels are re-divided into 8 Gy levels. When dividing, the histogram at the peak (corresponding to the hydration product) is divided into two parts, and each part is further divided into four parts with the same area. Through this area equal division method, the gray level is mapped to 0–7. The gray-scale compressed image is shown in Fig. 7.

(3) Moving least squares curved surface method for surface fitting of scattered points in traditional residential buildings.

First, the algorithm derives the formula of the moving least squares surface fitting principle, and obtains the fitting function expression of discrete points. On the surface fitting problem, in the local subspace of the fitting space, the approximation function that needs to be fitted can be expressed as:

$$\widehat{Z}(x, y) = \sum_{j=1}^{m} d_j(x, y)p_j(x, y) = d^T(x, y)p(x, y) \tag{3}$$

Among them, m is the number of terms of the basis function, d (x, y) is the basis function, and (x, y) its coefficient. If it is assumed that the basis function d (x, y) is a polynomial, its form is as follows:

The linear basis function is:

$$d^T = (1, x, y) \tag{4}$$

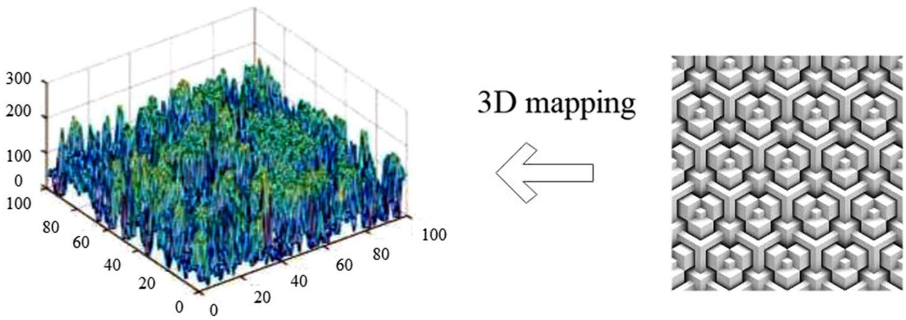

Fig. 6 Three-dimensional image three-dimensional mapping

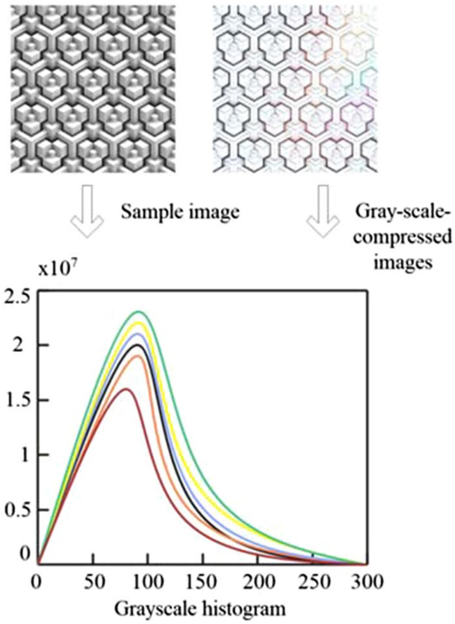

Fig. 7 Grayscale compressed image

The quadratic basis function is:

$$d^T = \left(1, x, y, x^2, xy, y^2\right) \tag{5}$$

The cubic basis function is:

$$d^T = \left(1, x, y, x^2, xy, y^2, x^3, x^2y, xy^2, y^3\right) \tag{6}$$

Using formula (11), the weighted least squares method is used to form a quadratic form:

$$J = \sum\nolimits_{i=1}^{n} w_i(x, y)\left[\sum\nolimits_{j=1}^{m} d_j\left(x_i, y_i\right)p_j(x, y) - z_j\right]^2 \tag{7}$$

Among them, n is the number of affected nodes nearby, and i (x, y) is a smooth continuous weight function with tightly supported properties at the nodes $(xi,)$, and its value is. When inside the node, $wi\ (x, y) > 0$. When the node is on its border and outside, $wi\ (x, y) \leq 0$, zi represents the gray value of the point (xi, yi).

The derived coefficient P(x, y) is:

$$\frac{\partial J}{\partial pj} = 2\sum\nolimits_{i=1}^{n} d_k\left(x_i, y_i\right)w_i(x, y)\left[\sum\nolimits_{j=1}^{m} d_j\left(x_i, y_i\right)p_j(x, y) - z_i\right] = 0 \tag{8}$$

The above formula can be written as:

$$P(x, y)p(x, y) = B(x, y)z \tag{9}$$

Therefore,

$$P(x) = p^{-1}(x, y)B(x, y)z \tag{10}$$

Among them,

$$P = D^T W(x, y)D \tag{11}$$

$$B = D^T W(x, y) \tag{12}$$

Therefore,

$$D = \begin{bmatrix} d_1(x_1, y_1) & d_2(x_1, y_1) & \cdots & d_m(x_1, y_1) \\ d_1(x_2, y_2) & d_2(x_2, y_2) & \cdots & d_m(x_2, y_2) \\ \vdots & \vdots & \ddots & \vdots \\ d_1(x_3, y_3) & d_2(x_3, y_3) & \cdots & d_m(x_3, y_3) \end{bmatrix} \tag{13}$$

$$W(x, y) = \begin{bmatrix} w_1(x, y) & 0 & \cdots & 0 \\ 0 & w_2(x, y) & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & w_m(x, y) \end{bmatrix} \tag{14}$$

Substituting formula (2.1) into formula (2.5), the expression of the surface approximation function is obtained:

$$\widehat{Z}(x, y) = d^T P^{-1}(x, y)B(x, y)z \tag{15}$$

The determination of the weight function should follow certain rules. First, the weight function (x, y) in the moving least squares surface should be tight. In other words, when the weight function is in the subspace of (x, y), it is greater than zero. When the weight function is outside the subspace, it is equal to zero, which forms the support area of the point. In surface fitting, the ball is usually selected as the support domain of the weight function. Due to the compactness of the weight function, only the data point contained in the support domain has an influence on the value of the point (x, y). In the next section, the choice of the size of the support domain will be discussed. The commonly used weight function is the spline weight function. It is expressed as:

$$s = \sqrt{(x - x_i)^2 + (y - y_i)^2} \tag{16}$$

$$\ddot{s} = \frac{s}{s_{\max}} \tag{17}$$

Then, the cubic spline curve function is obtained as follows:

$$w(\ddot{s}) = \begin{cases} \frac{2}{3} - 4\ddot{s}^2 + 4\ddot{s}^3 & \left(\ddot{s} \le \frac{1}{2}\right) \\ \frac{4}{3} - 4\ddot{s} + 4\ddot{s}^2 - \frac{4}{3}\ddot{s}^3 & \left(\frac{1}{2} < \ddot{s} \le 1\right) \\ 0 & (\ddot{s} > 1) \end{cases} \tag{18}$$

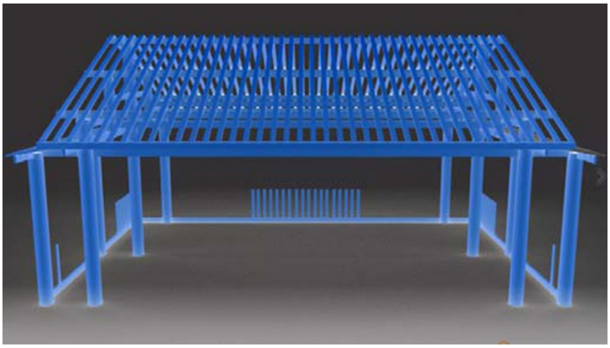

Fig. 8 The first stage visual plan

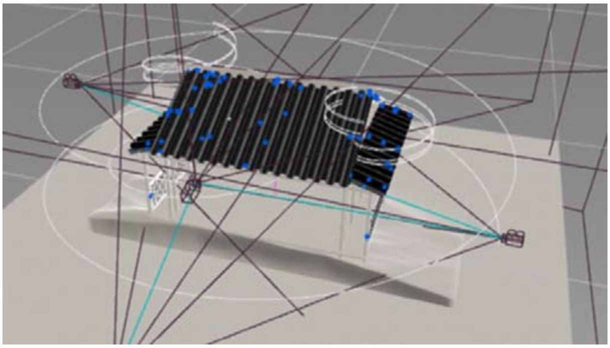

Fig. 9 Architectural technical details processing based on digital processing

4 Research on the Application of Intelligent Computer Technology in Minority Traditional Residential Buildings

This article combines the above architectural digital processing methods and chooses the modeling software BIM to use several cases to analyze the architectural skills of ethnic minority traditional dwellings. First of all, this paper carries out the first stage of visual scheme design, as shown in Fig. 8.

The second stage is to combine the digital processing method of this paper to carry out the detailed processing of architectural skills, and obtain the result shown in Fig. 9.

In the second stage, the use of camera animation to achieve the display of local construction information (Fig. 10). It provides an ever-changing perspective and displays the craftsmanship of traditional residential buildings of ethnic minorities from multiple angles. When the camera zooms out, its perspective shows the traditional residential buildings of ethnic minorities. When the camera is advanced, it features a close-up of a part of the traditional residential buildings of ethnic minorities.

The reliability of the system in this paper is verified through the above cases. On this basis, through the analysis of multiple groups of ethnic minority traditional residential building techniques, the research is conducted to determine whether the method proposed in this paper is reliable. After that, this paper evaluates the construction digital processing and construction technology analysis effect of this system, and obtains the results shown in Tables 1 and 2.

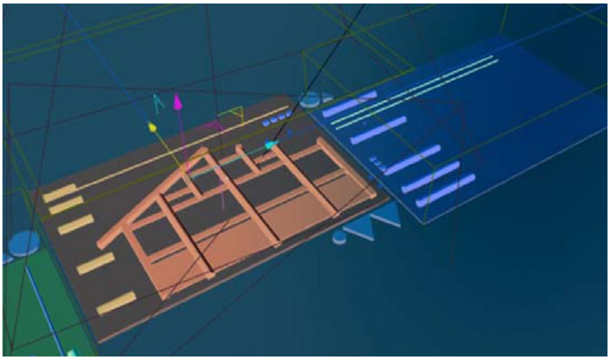

Fig. 10 The second stage color scheme

Table 1 The effect of building digital processing

Number	Building digital processing	Number	Building digital processing	Number	Building digital processing
1	79.8	21	83.3	41	80.4
2	85.8	22	87.8	42	79.7
3	84.1	23	87.9	43	85.1
4	80.2	24	85.3	44	92.9
5	85.0	25	90.8	45	88.6
6	83.3	26	92.1	46	81.8
7	84.5	27	79.3	47	81.5
8	80.5	28	89.4	48	84.6
9	85.3	29	84.9	49	89.6
10	86.8	30	81.1	50	84.8
11	86.0	31	84.3	51	90.5
12	82.7	32	92.6	52	86.6
13	79.0	33	92.1	53	79.0
14	87.5	34	89.8	54	90.8
15	82.2	35	89.3	55	85.3
16	82.6	36	79.9	56	90.1
17	79.7	37	92.5	57	80.0
18	86.6	38	83.7	58	92.8
19	81.5	39	89.3	59	85.9
20	91.7	40	79.0	60	83.1

From the above research, it can be seen that the analysis method of ethnic minority residents' architectural skills based on intelligent computer technology proposed in this paper has good results.

Table 2 The effect of architectural skill analysis

Number	Architectural technology analysis effect	Number	Architectural technology analysis effect	Number	Architectural technology analysis effect
1	89.5	21	83.5	41	81.9
2	86.4	22	81.6	42	88.1
3	84.0	23	85.4	43	75.6
4	80.7	24	88.4	44	91.1
5	86.6	25	85.3	45	80.4
6	79.5	26	84.7	46	86.2
7	80.5	27	90.2	47	77.0
8	75.7	28	88.7	48	83.8
9	82.7	29	78.7	49	82.0
10	79.5	30	78.1	50	85.7
11	90.5	31	91.0	51	91.7
12	83.3	32	83.0	52	77.6
13	83.2	33	86.2	53	84.9
14	86.1	34	86.3	54	88.7
15	89.5	35	77.8	55	81.6
16	81.0	36	83.2	56	87.2
17	76.1	37	75.8	57	87.5
18	76.2	38	76.4	58	81.1
19	87.4	39	81.1	59	82.3
20	82.2	40	85.8	60	84.2

5 Conclusion

The microstructure fitting of traditional residential buildings is an important step in the modeling of traditional residential buildings. The microstructure fitting of traditional residential buildings needs to obtain the edge information of traditional residential buildings to guide the acquisition of better fitting results. This article first studies the extraction of edge information. Edge information extraction is the key to realizing the reconstruction and fitting of the microstructure of traditional residential buildings. It extracts the edges of the traditional residential buildings in the image of traditional residential buildings. Then, the edge information can be accurately fitted and the subsequent image reconstruction of traditional residential buildings can be carried out. Traditional edge detection is not satisfied with the image results of traditional residential buildings with extremely complex internal information. Therefore, this paper proposes an edge detection method based on interactive genetic algorithm, and conducts research through the analysis of multiple groups of ethnic minority traditional dwellings, and makes statistics on whether the method proposed in this paper is reliable. The research results show that the analysis method of ethnic minority residents' architectural skills based on intelligent computer technology proposed in this paper has good results.

Acknowledgements Not applicant.

Author's Contributions The authors contributed significantly to the research and this paper, and the first author is the main contributor.

Funding This work received no specific funding.

Availability of Data and Materials Not applicable.

Declarations

Conflicts of interest The authors declare that they have no conflicts of interest to report regarding the present study.

Informed Consent Not applicable.

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