Research Article

Traditional Pattern Feature Extraction and Cultural Creative Design Application Based on Multilevel Histogram Shape Segmentation

Xin Liang

School of Art, Yulin University, Yulin 719000, China

Correspondence should be addressed to Xin Liang; liangxin9209@163.com

Received 22 March 2022; Revised 12 April 2022; Accepted 15 April 2022; Published 21 May 2022

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Content-based stereo video and image retrieval relies on traditional pattern feature extraction and cultural creative design applications. In a 3D system, the 3D model is typically projected into a 2D point cloud, after which feature extraction takes place. A depth map is an image created by orthogonal projection of three-dimensional data or viewpoint matching, parallax calculation, and resampling into regular data based on depth value. In this paper, a multilevel histogram-based shape segmentation method is proposed. The threshold can be determined by analyzing the relationship between the peaks if there are several obvious peaks on the image histogram. This paper focuses on the use of traditional pattern feature extraction and cultural creative design based on the shape segmentation of multilevel histograms. Each algorithm can achieve good classification results in the experiment of rotation invariant similarity classification. The average accuracy of the HOD algorithm is 84.1%, the average accuracy of the RSDF algorithm is 86.2%, the average accuracy of the GIF algorithm is 81.3%, and the average accuracy of this paper’s algorithm is 89.9% when the rotation angle is 60–120°. The results show that this paper’s algorithm has a higher classification accuracy compared to the other algorithms and that it maintains a high average classification accuracy across all rotation angles, indicating that it is rotation invariant and robust. The histogram-based threshold method has the advantage of not requiring knowledge of the image’s prior information. The algorithm is easy to understand, straightforward, and quick. However, because the valley point in the histogram is not visible in images with low or high contrast between the target and the background area, it is difficult to select the threshold. The results of traditional pattern feature extraction can be improved using the retrieved pixels.

1. Introduction

With the increased focus on the preservation of traditional cultural heritage, the preservation of traditional patterns, particularly research into their digital analysis and processing, has drawn the attention of a growing number of academics. A traditional pattern can be thought of as a unique image. It shares many of the characteristics of general images, such as color, texture, and shape, but it is distinct from them. It has obvious regionality and contrast in its color feature distribution [1], it has obvious regularity and some regularity in its texture features [2], and it has clear geometric features [3]. The key to content-based stereo video and image retrieval is traditional pattern feature extraction and cultural creative design application. In a 3D system, a 3D model [4] is typically projected to create a 2D point cloud, from which features are extracted, whereas a depth map is used to calculate parallax using orthogonal projection of 3D data or corresponding viewpoint matching. Resample the regular data image according to the depth value. The difference between a two-dimensional image and a depth map of three-dimensional data is that the former is a projection of light reflection, whereas the latter is a projection of depth value, which contains more three-dimensional internal information. When converted to a depth map, it appears to be a two-dimensional image. In the fields of image processing [5], pattern recognition [6], and computer vision [7, 8], the application of traditional pattern feature extraction and cultural creative design plays an increasingly important role and has always been a research hotspot.
This paper presents a shape segmentation method based on multilevel histogram. If there are several obvious peaks in the histogram of the image, the threshold value can be determined by analyzing the relationship between the peaks. Since there are more than two peaks in the histogram of the image, and the ideal threshold is generally located at the valley bottom between peaks, we can try to trace the contour of the histogram and then analyze the extreme points of the obtained contour, and the extreme points that meet certain conditions can be considered as the valley bottom. Image segmentation [9] is the technology and process of dividing an image into regions with different characteristics and extracting objects of interest, which is the key step of image analysis. In the past decade, many color image segmentation methods have been proposed, which can be roughly divided into three categories. The first category is histogram-based segmentation technology: threshold segmentation, clustering, and so forth; the second category is neighborhood-based segmentation technology: edge detection, region growth, and so forth; the third category is physical property-based segmentation technology, using illumination characteristics, object surface characteristics, and so forth. If there are two obvious peaks in the image histogram, the contour of the histogram can be traced and analyzed. After a threshold is obtained by Otsu criterion, the size of the points in the histogram contour can be analyzed at this gray level. If there is a contour point smaller than its height in several points around this point, the door is limited to this contour point [10, 11]. Among them, the threshold method based on histogram is one of the most commonly used image segmentation methods to separate the object from the background, which can be essentially attributed to a simple clustering method that divides the image into two or more categories. It simply divides the gray histogram of an image into two or several classes with one or several thresholds and holds that the pixels whose gray values are in the same gray class belong to the same object [12, 13].

To reduce the factors of color change and improve the efficiency of image processing in later cultural and creative design, the shooting method of rotating evenly according to the angle and fixing the camera is used in the traditional pattern feature extraction process [14]. The color difference in the collected image is small, so the image is segmented using histogram shape segmentation. If the color value of each pixel in the scanned image is in the range near the main threshold or near the subthreshold during segmentation, it will be considered the background color, filtered, and set to black, while the rest will be considered the target color, filtered, and set to white. In this way, in the cultural and creative design, the multilevel changing background and the background with multiple colors can be filtered out in order to achieve the goal extraction. This method is referred to as the color multilevel threshold image segmentation method in this paper. Color quantization and threshold segmentation are the main goals of the color multilevel threshold segmentation algorithm. The benefit of the histogram-based threshold method is that it does not require knowledge of the image’s prior information, and the algorithm is intuitive, simple, and quick. However, choosing the threshold for images with low contrast or high contrast between the target and the background area will be difficult because the valley point in the histogram is not visible [15].

This paper investigates and innovates the aforementioned issues from the following perspectives: (1) A traditional pattern model is proposed, which is based on multilevel histogram shape segmentation. The geometric moment invariants method in computer image processing and analysis, combined with the histogram adjustment method of gray image, is used to numerically analyze traditional ethnic art patterns and build a model, which provides valuable reference for further application, based on the visual characteristics of Chinese traditional ethnic art patterns. The color model used and the distribution of clusters on the multidimensional histogram have a strong influence on the segmentation effect of the multilevel histogram method. (2) A multilevel histogram shape segmentation-based traditional pattern feature extraction system is built. The color value of the seed is restored using the corresponding relationship between the pixel positions of the binary target image and the original color image, and the spatial coordinates of the seed pixels are calculated using the traditional pattern of multilevel histogram shape segmentation. Three-dimensional region growth can be carried out in the original multilevel histogram space, and some pixels lost due to improper threshold cutting can be recovered, using the multilevel histogram of the original color image as a reference, the pixel frequency values at the coordinates of the seed points in the multilevel histogram space, and the same or similar frequencies as connectivity conditions. An improved feature extraction result of segmented traditional patterns can be obtained using the retrieved pixels.

The paper is divided into five parts, and it is organized as follows: The first chapter introduces the research background and current situation of traditional pattern feature extraction and puts forward and summarizes the main tasks of this paper. The second chapter introduces the related work of traditional pattern feature extraction at home and abroad. The third chapter introduces the principle and model of multilevel histogram shape segmentation. The fourth chapter introduces the implementation of traditional pattern feature extraction and cultural creative design application system and compares the performance of the system through experiments. The fifth chapter is the summary of the full text.

2. Related Work

2.1. Research Status at Home and Abroad. Elaziz MA et al. proposed that the realization of the value of cultural and creative products needs to be completed through the sales of products. Therefore, cultural and creative products can not only bring income to producers but also reduce the pressure on national finances, thereby promoting the development of China’s economy [16]. Guo Yi et al. proposed that the initial traditional model research mainly focused on how to choose appropriate image global features to describe image content and which image measurement methods to use for feature extraction [17]. Wu B et al. proposed integrating traditional...
auspicious patterns into the design and production of cultural and creative products. By digging and refining the form and connotation of traditional auspicious patterns, they can fully demonstrate their cultural origins and help people have more three-dimensional sense and a comprehensive understanding of its historical background [18]. Sang Q et al. proposed a feature extraction method for traditional patterns. The resulting feature descriptors can not only effectively describe the contour shape but also well represent the shape change information in the depth direction and are translation, rotation, and scale invariant [19]. A traditional pattern feature extraction algorithm was proposed by Farshi TR et al. Based on the clear outline of the depth map, the algorithm selects interest points and uses the distance between the interest points as a feature to achieve better depth map feature extraction. Interest point-based feature extraction is mostly rotation and scale invariant but is usually only sensitive to 2D images with strong texture and constant high brightness. For objects with varying brightness and weak textures, the effect is greatly reduced. Therefore, the feature extraction accuracy of traditional modes is not high [20]. Mozaffari MH and others believe that this important attribute of cultural and creative products requires people not only to have use value and sales value when designing or developing products but also to be able to assume the function of cultural communication [12]. In the proposed metric invariant feature algorithm, Masters D A et al. believed that the depth map had the invariance of local metrics such as distance and angle. Based on this feature, the local feature extraction of the traditional mode is implemented [21]. Corantino G et al. proposed a histogram feature extraction method based on interest point detection, which realized the extraction of traditional pattern features. Traditional patterns are usually represented in the form of grayscale images with small color discrimination, so the feature extraction accuracy of related algorithms is low [22]. Compared with more abstract culture, cultural and creative products are closer to people’s real life and easier to be understood by people. When culture is presented in the form of cultural and creative products, it will be easier to understand and more attractive, and the publicity and education functions of cultural and creative products can also be more effectively played [13]. Bhandari AK et al. believed that the directional gradient histogram algorithm is an important innovation based on the traditional pattern feature extraction, which can achieve a certain degree of translation and rotation invariance in the quantization of position and orientation space. At the same time, the effect of illumination variation can be overcome by normalizing the histogram of the local area [23].

2.2. Research Status of Traditional Pattern Based on Multilevel Histogram Shape Segmentation. This paper investigates the traditional pattern based on multilevel histogram shape segmentation, which converts RGB color space into HSV space and divides pixels in the image into singular and nonsingular points based on saturation and brightness; for nonsingular points, a method based on hue histogram is used for segmentation, and the periodicity of the hue histogram is also taken into account. The traditional pattern, on the other hand, has a simple hierarchy, fewer texture changes, and a clear outline, whereas the depth map has a simple hierarchy, fewer texture changes, and a clear outline. At the same time, the traditional pattern is color independent, which means that, unlike a color image, the depth map will not be affected by changes in light, shadow, or environment. As a result, traditional patterns are extracted and cultural and creative design is applied primarily using color, shape, points of interest, gradient, and other multilevel histogram shape segmentation features. Because most image backgrounds in traditional patterns have hierarchical change and multiple color combinations and because the number of pixels in the background color is generally greater than that of the target color, the number of pixels in the background color is extracted according to size, and the color with the most pixels is chosen as the main threshold. The array contains all of them. The pixels in singular points have gray attributes due to their low saturation or brightness, and the method based on gray histogram is used for segmentation; finally, region merging technology is used to merge the segmentation results of the first two stages. Continue tracking along the histogram’s contour until you reach a minimum point, that is, the valley bottom, where the “drift” caused by the Otsu criterion can be effectively corrected. People can integrate the multilevel histogram shape segmentation into the feature extraction of traditional patterns, express the original connotation with its inherent form, and convey the design theme of products based on this in the development and design of contemporary cultural and creative products.

3. Principle and Model of Multilevel Histogram Shape Segmentation

A histogram is a graphical representation of statistics. The histogram of a gray image depicts the statistics of the image’s various gray levels. It gives the overall description of all gray values in an image or it gives the distribution of gray values in the original image. The histogram and the visual effect of an image are frequently in sync. The visual effect of an image is usually greatly influenced by the shape and change of the histogram. Histogram equalization is the process of adjusting the distribution range of an original image using the cumulative distribution function in order to improve image contrast and visual effect. Traditional patterns’ gray values are typically distributed in a gray range, with strong intraregional identity and interregional dissimilarity. As a result, the pattern image can be n-valued before other numerical analyses to better represent the pattern’s characteristics and increase the gray difference. The value of n in this case is usually much lower than the value of 256 of the general gray image but higher than the binary value of the black-and-white image obtained by edge detection. The H component can be used to describe how people feel about various colors. The method based on multilevel histogram shape segmentation overcomes many of the shortcomings of traditional K-means clustering methods, such as a fixed
number of initial clusters, time-consuming iteration, and loss of accuracy due to color quantization. To begin, non-singular points are clustered using a one-dimensional statistical histogram of the H component; for singular points, the traditional pattern of multilevel histogram shape segmentation is used for feature extraction due to the instability of hue.

The geometric moment invariants method in computer image processing and analysis, combined with the histogram adjustment method of gray image, is used to numerically analyze traditional ethnic art patterns and build a model, which provides valuable reference for further application, based on the visual characteristics of Chinese traditional ethnic art patterns. The color model used and the distribution of clusters on the multidimensional histogram have a strong influence on the segmentation effect of the multilevel histogram method. When the multidimensional histogram’s clusters are projected onto the 1D histogram, there will be an overlap between them, causing the segmentation threshold to deviate and the same cluster to be incorrectly divided into different classes, resulting in oversegmentation of the target due to a lack of local spatial knowledge of the image. Because the space focuses on the expression of color, the H component can fully express the color information, so the H component is used for segmentation in traditional pattern segmentation. However, due to the singularity of the H component, a segmentation method based on multilevel histogram is used to assist. When merging regions, however, because the space focuses on vision consistency, visual perception is more uniform, and the European distance in space can well express color similarity, while there are few singular points. The first step in region merging is to remove the interference of small trivial regions and noise points; the second step is to merge the remaining areas in space using the color similarity. The process model diagram is shown in Figure 1.

Let the original traditional image be \( f(x, y) \) and let the distribution range be \( 0 \leq f \leq L - 1 \). Then its histogram function is

\[
h(k) = n_k, \quad k = 0, 1, \ldots, L - 1.
\]

In the above equation, \( n_k \) is the number of pixels with gray value \( K \) in \( f(x, y) \). It is written in a more general form of probability expression as

\[
P_f(k) = P(f = k) = \frac{n_k}{n}.
\]

In the above equation, \( n \) is the total number of pixels in the image. Its cumulative distribution function is

\[
t(k) = \sum_{j=0}^{k} P_f(j).
\]

Then the transformation formula between the original traditional image and the adjusted traditional image at \((x, y)\) pixel is

\[
g(x, y) = T(f(x, y)) = T(k) = \text{round}\left(\frac{t(k) - \min t(k)}{n - \min t(k)} \times (L - 1)\right).
\]

In this paper, the 12 invariant moments are used to form the feature vector describing the statistical features of the image to extract the features of the image. The feature vector of the \( i \)th image is defined as follows:

\[
\phi_i = (\phi_{i1}, \phi_{i2}, \ldots, \phi_{i12}).
\]

The distance between two images is defined as follows:

\[
D(i, j) \| \phi_i - \phi_j \|_2 = \sqrt{\sum_{k=1}^{12} (\phi_{ik} - \phi_{jk})^2}.
\]

In the above equation, the traditional image mainly exists at the edge of the object area shape, and the edge detection of the area shape can be realized by Canny operator. The magnitude and direction of gradient modulus are defined as

\[
G(x, y) = \sqrt{G^2_h(x, y) + G^2_v(x, y)},
\]

\[
\theta(x, y) = \arctan\frac{G_h(x, y)}{G_v(x, y)}.
\]

where \( G_h(x, y) \) and \( G_v(x, y) \) represent the magnitudes of horizontal and vertical modulus, respectively. The traditional image is processed by \([-1, 0, 1]\) nonsmooth gradient operator convolution operation mode, and the horizontal modulus and vertical modulus are, respectively,

\[
G_h(x, y) = d(x + 1, y) - d(x - 1, y),
\]

\[
G_v(x, y) = d(x, y + 1) - d(x, y - 1),
\]

and color image has multidimensional feature components. The histogram analysis method proposed by Ohlander et al. uses 9 different essential color components of multiple color models to segment the image and maps the 3D histogram to the scale space filtering (SSF) of 1D histogram. The starting point of these methods is basically the same, which is to project the dimension reduction of clustering in multidimensional space to one-dimensional components, so as to reduce the amount of computation and improve the processing speed. In this paper, the dimensionality reduction methods with the above characteristics are collectively referred to as multidimensional threshold segmentation (MDT). The traditional pattern is processed by shape segmentation based on multilevel histogram, and the rest are singular points. Because of its low contrast or dark brightness, multilevel histogram is used to deal with singular points. The idea based on multilevel histogram is basically the same as that based on hue histogram. The only difference is that the periodicity of multilevel histogram is not considered. According to the segmentation effect of the actual image, the effective new feature component method is usually selected; that is, the original color image is transformed into the component image, and then the component image is segmented by the automatic threshold method. If the target can be well separated from the background, this component can be added to the MDT method. For all kinds of images, the feature dimension of MDT method is about 5 dimensions, which can well meet the requirements of
extraction target and has a wide range of application. The dimensionality reduction projection of dimensional clustering is not easy to represent, and its principle can be extended to high-dimensional space. Therefore, the dimensionality reduction mapping is exemplified by multidimensional histogram, as shown in Figure 2.

The higher the feature dimension in MDT method, the more serious the phenomenon of oversegmentation. However, it is worth noting that the noise in the obtained target image will also be greatly reduced. This is because the higher the dimension, the more accurate the description of pixels. Regional consolidation is divided into small regional consolidation and large regional consolidation. The purpose of small area merging is to eliminate the interference of trivial areas and noise points in the image and make the image look more uniform. The purpose of large area merging is to merge areas with similar colors in the image, so that the segmentation results are more in line with human visual effects. According to the segmentation of multilevel histogram shape, foreground and background can be easily separated to form obvious gradient and edge of regional shape, which greatly reduces the difficulty of recognition. However, the depth map obtained by equipment usually has many invalid areas, such as object boundary, reflecting surface, long-distance image, and object surface absorbing infrared light. Through the feature extraction of traditional patterns, the algebraic invariant theory is applied to the normalized moment of scale, and seven famous Hu moment invariants with translation, rotation, and scale invariance are constructed. Invariant moment is a statistical feature of image, which describes the distribution characteristics of image gray level by using the moments of each order of image gray level distribution. These areas will have bad effects because they are not properly repaired, so it is difficult to make good use of depth information. In fact, these methods simply extract features from images, which will make it impossible to apply better cultural and creative design to weak texture image objects because of the sensitivity of image features to brightness changes.

4. Pattern Feature Extraction and Application of Cultural Creativity

4.1. Pattern Feature Extraction and Creative Design Based on Histogram. The development of traditional patterns has experienced thousands of years of evolution. In this development process, it will inevitably be affected by some foreign cultures. In addition, as a very important decorative body, Chinese traditional patterns can not only decorate and shape cultural and creative products but also emphasize the relationship with the environment of the times. A traditional pattern feature extraction system is constructed based on multilevel histogram shape segmentation. The multilevel histogram shape segmentation of traditional pattern is a visual data map, from which the feature extraction of pixels in color space can be observed. According to the viewpoint of feature extraction, in high-dimensional color space, the target pixels of the same kind are usually feature extracted together, and the frequency of some adjacent pixels is also the same or similar; that is, there is measurable connectivity between the same target pixels. If we know that most of the target pixels are in the shape segmentation of multilevel histogram, we can use this connectivity principle to retrieve the cultural and creative design in the traditional pattern cut-off by the threshold hyperplane. In the system, the direct application of traditional patterns in creative products has a very intuitive advantage; that is, it can create a historical time and space for people, enable people to replace themselves, and then better perceive the beauty of auspicious patterns in products and the charm of Chinese traditional culture. The
specific method is as follows: firstly, the target binary image is extracted by MDT method as the seed, and then the color value of the seed is restored by using the pixel position correspondence between the binary target image and the original color image, and the spatial coordinates of the seed pixels in the traditional pattern of multilevel histogram shape segmentation are calculated; taking the multilevel histogram of the original color image as a reference, using the pixel frequency value at the coordinates of seed points in the multilevel histogram space, and taking the same or similar frequency as the connectivity condition, the three-dimensional region growth in the original multilevel histogram space can retrieve some lost pixels due to improper threshold cutting. According to the retrieved pixels, the improved traditional pattern feature extraction results can be obtained.

In principle, all pixels can be regarded as a node, and connections can be established between every two nodes, which will bring about great computational complexity. Under the traditional pattern feature extraction system, when the traditional image is segmented by multilevel histogram shape, in order to reduce the computational complexity, multiple pixels can be selected as a node, but these pixels must be in a closed region; that is, a continuous closed interval can be selected as a single node. In all traditional image segmentations with multilevel histogram shape, the most important thing is how to select the segmentation criteria. The formation process of the minimum spanning tree is similar to the growth process of the region. Under the realization of separated set forest, each tree in the forest represents a set formed by connected nodes, which is mapped into a homogeneous region in the image. From the perspective of human vision, the differences between different regions are more obvious than those within regions. This kind of difference within and between regions can constitute the criterion of whether a region is divided or not, and this criterion can obtain global characteristics to some extent. Then the cultural elements are analyzed, so as to find the cultural elements that can be used for systematic extraction. By determining the cultural elements and deconstructing them, available cultural elements can be obtained, which may lack the applicability of narrative design. At this time, it is necessary to refer to the requirements of plot elements in narrative design to sort out the changes of design elements of cultural elements and apply design elements to the practice of traditional pattern feature extraction system on the premise of conforming to cultural events. In view of this, when people integrate traditional patterns into cultural and creative products, they should simplify the traditional patterns, keep the charm of the patterns, delete the cumbersome branches in the patterns, and then highlight the main image.

4.2. Experimental Results and Analysis. In this experiment, the Euclidean distance between two images is calculated according to the feature vector of traditional images, and the Euclidean distance matrix between two images is given. Two experiments are carried out, respectively, for comparison. The experimental results are shown in Tables 1 and 2.

It can be seen from Tables 1 and 2 that, if classified according to this distance, 1 and 3 will be divided into the same category, and 2 and 4 will be divided into the same category. The classification result is obviously different from the visual effect of the original image. The Euclidean distance between the gray image feature vectors after histogram equalization. According to this distance, the result is consistent with the visual effect of the original image. For the traditional patterns with very complex modeling structure, the designers of cultural and creative products can summarize and abstract through lines or curves and then process the extracted pattern subjects in groups, so as to make the originally complex and cumbersome patterns simple and elegant without losing their charm. The experiment evaluated the rotation invariance and antinoise stability of feature descriptors of traditional pictures, rotated the traditional pictures to be matched in the same plane, and added the zero-mean Gaussian noise with standard deviation $\sigma = 15$ to
the images to simulate the influence of environmental factors. Then, HOD, RSDF, GIF, and this paper’s algorithm were used to extract features, respectively, and the average classification accuracy rate and the average classification accuracy rate of Street sequence were obtained by similar classification through matching. Three experiments were conducted for comparison, and the experimental results are shown in Figures 3, 4, and 5.

As can be seen from Figures 3–5, in the experiment of similarity classification with rotation invariance, each algorithm can achieve good results. When the rotation angle is 0°–120°, the average accuracy of HOD algorithm is 84.1%, that of RSDF algorithm is 86.2%, that of GIF algorithm is 81.3%, and that of this paper’s algorithm is 89.3%, which shows that this paper’s algorithm has better accuracy compared to the other algorithms. In this experiment, the zero-mean Gaussian noise of standard deviation \( \sigma = 10, 25, 40, 55, 70, 85 \) is added to the traditional images for similarity classification. The average classification accuracy experiments are carried out by using HOD, RSDF, GIF, and this paper’s algorithm, respectively. Two experiments are carried out, respectively. The experimental results of the average classification accuracy of the sequence are shown in Figures 6 and 7.

As can be seen from Figures 6 and 7, with the increase of image noise, the average classification accuracies of HOD, RSDF, and GIF algorithms drop rapidly in the standard deviation of 40–55. In the standard deviation of 40–55, the average classification accuracy of HOD algorithm is 88.5%, that of RSDF algorithm is 85.2%, that of GIF algorithm is 88.3%, and that of this paper’s algorithm is 94.5%. Generally speaking, this paper’s algorithm has little change on the whole, which shows that it is less affected by noise and has better stability to noise.
Figure 4: Similarity classification accuracy for rotation.

Figure 5: Similarity classification accuracy for rotation.

Figure 6: Similarity classification accuracy for noise.
5. Conclusions

The methods based on multilevel histogram shape segmentation can be used alone or in combination with traditional image segmentation. The algorithm is not sensitive to threshold segmentation errors and has strong adaptability to color space because the two algorithms start with oversegmentation to improve the segmentation effect; at the same time, the algorithm is intuitive, simple, and fast. The disadvantage is that the algorithm must determine some parameters for various types of images, and adaptive determination of spatial resolution reduction parameter is an area of research that needs to be pursued further. The phenomenon of oversegmentation is overcome and the ideal segmentation effect is achieved using the feature extraction of traditional image pixels in multilevel histogram shape segmentation using an organic combination of multidimensional threshold segmentation (MDT) method, multilevel histogram shape segmentation method, and scale space clustering method. Each algorithm can achieve good results in the rotation invariant similarity classification experiment. When the rotation angle is 60–120°, the average accuracy of the HOD algorithm is 84.1%, the average accuracy of the RSDF algorithm is 86.2%, the average accuracy of the GIF algorithm is 81.3%, and the average accuracy of this paper’s algorithm is 89.3%. It can be concluded that the algorithm in this paper has better accuracy compared to the other algorithms and maintains a high average classification accuracy in the case of each rotation angle, demonstrating that the algorithm in this paper is superior to the other algorithms. This method can be applied to the feature analysis and feature recognition of traditional patterns, as well as the application of cultural and creative design, as shown by the calculation results of numerical examples. People should integrate the trivial pattern into traditional culture and then delete the cumbersome pattern from the traditional image, due to the simplicity of the main image.

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 does not have any possible conflicts of interest.

Acknowledgments

This study was supported by the Science and Technology Project of High-tech Zone in Yulin City: A Study on the Cultural Creative Design of Yulin Tourist Souvenirs Based on the Innovation-Driven Development Strategy (CXY-2021-53).

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