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Retraction

Retracted: Realization of an Intelligent Image Processing Technology for the Analysis of Chinese Painting Color Education

Mobile Information Systems

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

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

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

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

References

[1] P. Yu, "Realization of an Intelligent Image Processing Technology for the Analysis of Chinese Painting Color Education," *Mobile Information Systems*, vol. 2022, Article ID 8104009, 11 pages, 2022.

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Research Article

Realization of an Intelligent Image Processing Technology for the Analysis of Chinese Painting Color Education

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An intelligent information recognition technology based on picture image processing was proposed to further improve the application effect of intelligent image technology in the color teaching of painting major and improve the level of Chinese painting color teaching with the aid of intelligent image processing technology. Special image recognition technology was used to effectively identify the color of Chinese paintings based on traditional teaching methods. MATLAB software for simulation processing of Chinese painting was also utilized through the fuzzy set theory test sample image recognition. The results show that the method is based on feature vector extraction and orthogonal basis transformation histogram. The former takes 0.072288 seconds in image recognition time, while the latter takes 0.134939 seconds, which is nearly double the former time. Therefore, the software and image processing technology mentioned in the article can further improve the effect and time of image color recognition.

1. Introduction

The digital image processing technology is a discipline that has gradually emerged in recent years. Even so, with the increase in industry demand, it has gradually become a widely used technology in many fields in just a few years. In recent years, with the continuous maturity of technology and the increase in industry demand, digital image processing technology has become an important tool for scholars to carry out visual perception research in computer science, physiology, psychology, and other fields. At the same time, demand for remote sensing meteorological detection and other large applications has also increased in military application [1]. The application of subject teaching has always been an important driving factor for the development of technology. With the in-depth development of computer graphics and image science, computer color teaching and image art restoration have become a new branch and began to be widely used in image teaching. With the change in people's aesthetic concepts, the color teaching of Chinese painting has put forward higher requirements. Chinese painting reflects the specific historical art environment. Innovation can happen in the teaching process by choosing a new starting point. Based on this, this article discussed how to better assist teaching analysis through the application of software technology and the intelligent image processing technology [2].

2. Literature

Patil, S. believes that since the mid-1970s, as digital image technology has advanced, computer science and intellectual property science have developed rapidly, and digital image processing has reached even higher levels. In order to understand the outside world, people began to learn how to interpret images from a computer to achieve the same human vision, which is called visual perception or vision [3]. Huo et al. argue that fast processors and large memory have become cheaper in recent years as the price of the computer equipment needed for image processing has fallen. The increasing popularity of image digitalization and image display equipment as well as the development trend of some new technologies will

stimulate the continuous growth of the digital image processing field. It can be predicted that digital image processing will play a more important role in the future [4]. According to Cho and Lee, the key role of image development is to learn new workflows, develop new processes, and open up multiple applications. Future research includes improving accuracy and addressing operational speed. For example, large data and speed operations are still major issues in improving cloud image imagery for remote sensing [5]. According to Chen et al., we should develop strong research software, focus on new development, especially change, learn from other industry technologies and benefits, research, develop new technologies, strengthen research in the peripheral industries, and support graphic design. Advances in the study of human visual and auditory characteristics of the brain will play an important role in the development of imaging technology, strengthen theoretical research, gradually develop the theoretical framework for graphic design research, and develop models for the visual arts industry [6]. Li et al. state that as there is so much information in photos and large files, it is important to create files, share image files, and communicate. In the current situation, there are many different types of software and hardware, and their inability to communicate and use is a major problem for capital sharing. There should be an image database, an integrated archive, a subroutine procedure, and an integrated search engine [7]. Cai thinks that at present, there is a big gap between theoretical research and applied technology of computer art, and theoretical research is relatively advanced. The applied technology lacks the guidance of the formed theoretical model, and the deep simulation research on the artistic creation process is still in the stage of theoretical exploration. The application focuses on the creation of new works of art, while the restoration and protection of traditional works of art are less considered, and the technology mainly depends on computer graphics, and the integration of multimedia and intelligent technology is less considered [8]. Kubicek et al. believe that the form of current research on art restoration is an human-computer interaction. The technology is about basically image restoration, and there are great limitations with computer graphics image deformation home and abroad. Conferences like EUROGRAPIHCS, SIGGRAPH, China GraPh, and other important academic conferences have had lots of in-depth discussion on the topic [9]. Han and Li believe that in VSMM98, JAPAN conference, the topic of a virtual reproduction of the protection and restoration of cultural relics and cultural relics by computer technology appeared. The virtual restoration and demonstration of Dunhuang frescoes is a new application to protect the artistic heritage of China's cave frescoes by using computers, which has many similarities with artistic restoration and creation [10].

On the basis of current research, this article proposes a kind of intelligent information recognition technology based on picture image processing and uses special image recognition technology to effectively recognize the colors of Chinese paintings. On the basis of traditional teaching methods, MATLAB software is used to simulate Chinese painting, and fuzzy set theory is used to test sample image recognition.

3. Intelligent Image Recognition Processing Technology

3.1. Image Recognition Technology

3.1.1. Fundamentals of Image Pattern Recognition. The entire image style recognition system consists of five sections: image file retrieval, image preview, image features, classifier design, and image distribution. The structure of the special module for recognizing general images is shown in Figure 1:

The concept of drawing develops through the analysis of images, the combination of cognitive abilities, the knowledge of the nature of each object in art, the relationship between them, a better understanding of the meaning of the diagram, and the explanation of similar goals and instructions, as planned. Image comprehension is a high-performance process based on the knowledge of image content as well as the use of marketing expertise and the identification of information contained in images [11]. Between the two links of image pretreatment and image analysis, image segmentation is generally required to extract the object of interest from the original image. In the process of actual program design, image preprocessing, image analysis, and image understanding have a certain level of correlation in each processing link; they influence each other and penetrate each other. There is no strict boundary in the process, the bottom operation is the basis of the top operation, the previous operation is the premise of the next operation, and the latter operation is the purpose of the previous operation.

3.1.2. Application of Image Pattern Recognition. Image pattern recognition has been widely used in weather forecast analysis, satellite remote sensing image analysis, natural disaster prediction, etc. Image pattern recognition has been successfully applied in medical image analysis and statistics. Red blood cell and white blood cell recognition and counting system has greatly reduced the burden of medical examiners, B ultrasound image pathological tissue automatic analysis system has improved the diagnostic efficiency, and infrared breast detection system has played a huge role in the prevention of gynecological diseases. Image pattern recognition has made a great progress in biological information processing [12]. Image pattern recognition has been applied in information processing in a practical sense. Print recognition input system, handwriting digital input system, and engineering drawing input system in the form of sketching enable information communication across media.

3.2. Statistic Pattern Recognition. There are many methods for image recognition, the most common of which are the following four types of methods: template matching, statistical identification, structure identification, and neural

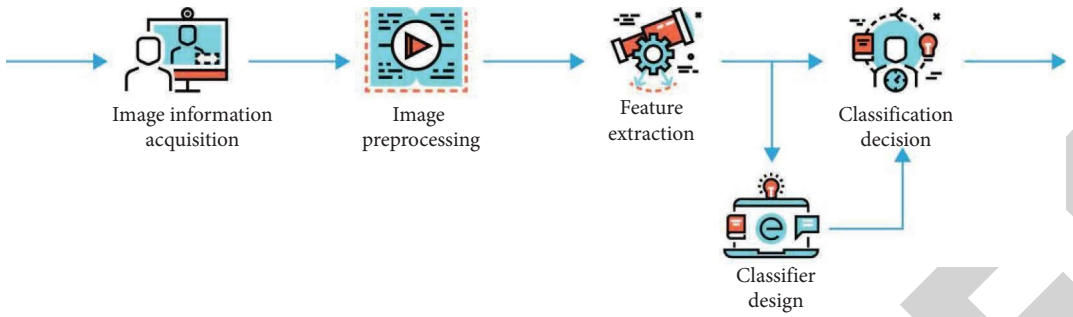

Figure 1: Module composition of image pattern recognition system.

network. A brief description of these four types of methods is shown in Table 1.

Statistical pattern recognition is the most widely used method in image processing, and its understanding is the basis for a thorough understanding of various pattern recognition processes. Its main work is to select feature expression patterns and design classifiers for classification.

3.2.1. Minimum Distance Classifier. The minimum distance classifier is a simple style classifier that calculates all types of style statistics based on sample sampling and is defined by all types of intermediates and variances. Assume that each model room is represented by a vector representation:

$$m_j = \frac{1}{N_j} \sum_{x \epsilon s_j} x \quad j = 1, 2, \ldots, M, \tag{1}$$

where N_j represents the number of S_j patterns in the class. The method of classifying an unknown pattern vector is to assign the pattern to its closest class and use Euclidean distance to determine the degree of proximity, then the problem is transformed into a distance measurement:

$$D_j(x) = \left\| x - m_j \right\| \quad j = 1, 2, \ldots, M. \tag{2}$$

Among them:

$$\|a\| = \left(a^T a\right)\frac{1}{2}. \tag{3}$$

The formula above is the Euclidean module. Because the smallest distance represents the best match, if $D_j(x)$ is the smallest distance, then assign x to the class S_j equivalent to the following:

$$d_j(x) = x^T m_j - \frac{1}{2} m_j^T m_j \quad j = 1, 2, \ldots, M. \tag{4}$$

And assign X to the class S_j when $D_j(x)$ was given the maximum value. For a minimum classifier, the decision boundary between classes s_i and S_j is:

$$d_{ij}(x) \quad = d_i(x) - d_j(x) \quad = x^T\left(m_i - m_j\right) - \frac{1}{2}\left(m_i - m_j\right)^T\left(m_i - m_j\right) \quad = 0. \tag{5}$$

The above equation gives a vertical dichotomy connecting m_i and m_j segments. For $M = 2$, the vertical dichotomy is a line, for $M = 3$ the vertical dichotomy is a plane, and for $M > 3$, the vertical dichotomy is a hyperplane [13].

3.2.2. Bayes Classifier. Bayesian formula can be used to calculate the probability of the sample belonging to various classes, and then the posterior probability of the sample representing the attribution of the recognition object can be calculated. The feature X of the sample to be tested belongs to the class with the highest possibility, and X is assigned to the class with the highest possibility. If M-class W_i is mutually exclusive and complete, the Bayesian formula is expressed as follows:

$$P\left(w_i \mid X\right) = \frac{P\left(X \mid w_i\right)P\left(w_i\right)}{\sum_{j=1}^{M} P\left(X \mid w_j\right)P\left(w_j\right)}. \tag{6}$$

The normal probability density function of one variable is as follows:

$$P(x) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left[-\frac{1}{2}\left(\frac{x-u}{\sigma}\right)^2\right] \quad = N\left(u, \sigma^2\right). \tag{7}$$

where u is the mean or mathematical period and is expressed as follows:

$$u = E(x) \quad = \int_{-\infty}^{\infty} xP(x)\mathrm{d}x. \tag{8}$$

σ^2 is variance, which is expressed as follows:

$$\sigma^2 = E\left[(x-u)^2\right] \quad = \int_{-\infty}^{\infty} (x-u)^2 P(x)\mathrm{d}x. \tag{9}$$

The normal probability density function of multidimensional variables is expressed as follows:

$$P(x) = \frac{1}{(2\pi)^{(n/2)}|S|^{(1/2)}} \exp\left[-\frac{1}{2}(X-\overline{u})^T S^{-1}(X-\overline{u})\right], \tag{10}$$

where

$$X = \left(x_1, x_2, \ldots, x_n\right)^T, \tag{11}$$

where the above formula is the N-dimensional eigenvector.

$$\overline{u} = \left(u_1, u_2, \ldots, u_n\right)^T, \tag{12}$$

where the above formula is the n-dimensional mean vector.

Table 1: Common methods of image recognition.

Method	Representation	Recognition type	Typical criterion
Template matching	Sample, pixel, curve	Correlation coefficient, distance measure	Missort
Statistical recognition	Characteristic	Classifier	Missort
Structure identification	Tectonic language	Rules, grammar	Acceptable error
Neural network	Sample, pixel, feature	Network function	Minimum root mean square error

S is the $n \times n$ dimensional covariance matrix, which is expressed as follows:

$$S = E\left[(X - \overline{u})(X - \overline{u})^T\right]. \tag{13}$$

ISI is the column of S, and the quasi-conditional probability density is expressed by the normal probability density function of multidimensional variables:

$$\begin{aligned} P(x \mid w_i) &= \frac{1}{(2\pi)^{(n/2)}|S_i|^{(1/2)}} \exp\left[-\frac{1}{2}(X - u_i)^T S_i^{-1}(X - \overline{u}_i)\right], \\ &= -\frac{1}{2}(X - \overline{u}_i)^T S_i^{-1}(X - \overline{u}_i) - \frac{n}{2}\ln 2\pi - \frac{1}{2}\ln|S_i|. \end{aligned} \tag{14}$$

There are two forms of minimum error rate Bayesian decision-making: one is a posterior probability form, and the other is a conditional probability density form. Using functions:

$$g(x) = g_1(x) - g_2(x) \quad = P(x \mid w_1)P(w_1) - P(x \mid w_2)P(w_2). \tag{15}$$

The above formula represents the discriminant function, so the structure of Bayesian classifier for the two kinds of problems is shown in Figure 2:

The boundary dividing decision domain is called decision boundary, which can be expressed as decision boundary equation in analytical form. Some functions used to express decision rules are called discriminant functions. Discriminant functions are closely related to decision boundary equations, and they are determined by corresponding decision rules [14].

3.3. Neural Network and Genetic Algorithm

3.3.1. Neural Network. The essence of a neural network device is a mathematical instruction that converts ideas into output. This number of relationships is determined by the structure of the network, which must be designed and trained according to the specific situation. Artificial neural networks are self-improving and adaptable and solve some problems that cannot be solved by other classical methods, resulting in the effectiveness of solutions. Because of these properties, neural networks have been widely used in information technology systems. Model recognition is the process of drawing objects from objects to a group number to identify a group of objects. Artificial neural networks are better suited for this type of problem and provide new information as technology. The main applications in this area are the recognition of optical graphics, radar speech recognition, audio equipment, and other devices. The

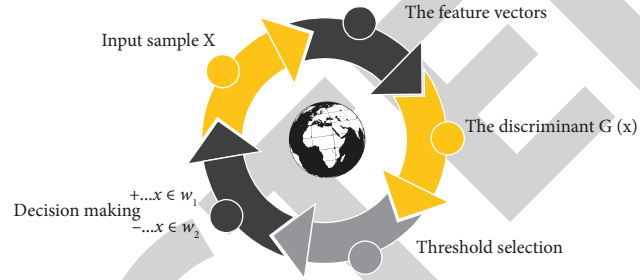

Figure 2: Structure of Bayesian classifier for two classes of problems.

neural network-based general knowledge model initially has three modules, which are trained in graphical normalization and distribution determination, as shown in Figure 3.

3.3.2. Genetic Algorithm. Genetic algorithms start with a set of solutions called populations, which are genetically encoded with a number of individuals representing chromosomes. Taking a population to form a new population is motivated by the hope that the new population will be superior to the old population. The parents used to form the progeny, the new solution, are selected according to their fitness, that is, the more adaptable they are, the more likely they will be selected [15]. This process alternates through generations until certain conditions are met, as shown in Figure 4.

3.3.3. Fuzzy Image Recognition. The methods of statistical image recognition and structure recognition have not only been gradually improved in theory but also achieved good application results in many fields. And one of the most important features of the human brain is its ability to recognize and judge fuzzy things. The core problem of pattern recognition is how to make the robots imitate the thinking methods of human brains. In this way, objective things can be classified and identified more effectively.

4. Chinese Mural Color Intelligent Image Processing

4.1. Image Processing and Image Knowledge. The understanding of image in classical image processing is to simulate people's feeling of image by mathematical method. Classical image processing theory with strict mathematical method as a tool, its accurate quantitative analysis and processing of images, undoubtedly become the basis of all image processing technology. The most basic elements of an image are

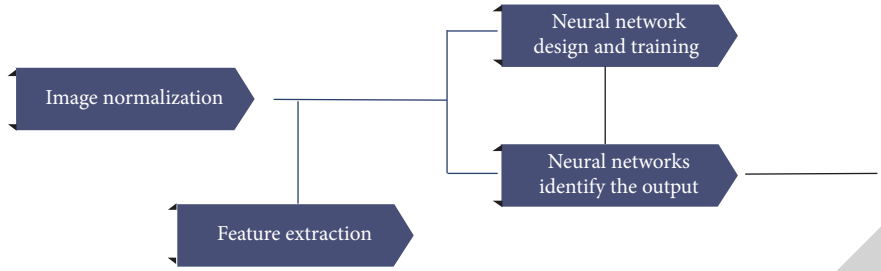

Figure 3: Composition of module of recognition system based on neural network.

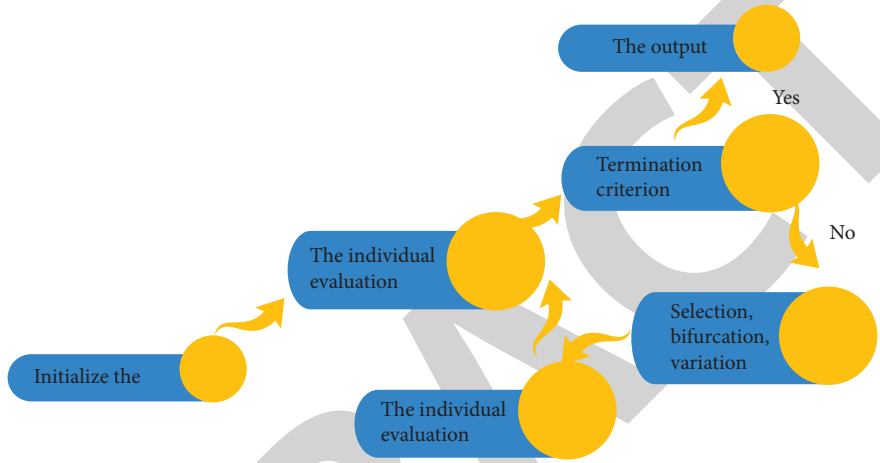

Figure 4: Genetic algorithm flow.

the position of pixels and their color value. It can only express and process properties unrelated to the domain, such as color shape and texture, while it is powerless to do anything related to the domain, such as content style. Computer technology is only a partial simulation of the human mind. When a person looks at a picture, he thinks more about the things in the field: what is painted on the picture, are the colors bright or dull, are the lines clear or vague, are they realistic or abstract, etc. Similarly, when one creates a picture or restores a picture, one hardly thinks of the relationship between pixel points [16].

The expression of color knowledge is usually represented by image color layering. The same color is located in the same color layer. The color layer mainly contains the color value of the color image, the number of pixels of the color image, and the spatial information of continuous area color blocks. The color layer not only contains the probability distribution information of the image color but also contains the color space information of the image. The original image can be generated by combining all the color layers, that is, the color layers represent the color information of the image with almost no loss.

Texture is an important attribute of image. There are many definition and quantization methods of texture, which mainly include two types: one is structural method and the other is statistical method. The method of structure is to analyze the features with structural rules in the image, and the latter method is to carry out statistics on the spatial distribution information of color intensity in the image [17].

Table 2 shows the texture feature representation set adopted by them, "×" indicating that the feature was selected.

The image is divided into objects first, and then each object is processed. However, in every step of the same process, we are based on knowledge processing method, so the traditional object extraction method and restoration method need to be improved.

4.2. Object-Oriented Image Knowledge Representation. The visual features of an image refer to the features reflected by the surface properties of the image. The collection of all the visual features of the image forms the visual feature space of the image. If we further divide the visual feature space of the image, it can be divided into color feature space, shape feature space, texture feature space, and other basic visual feature space. They contain the visual characteristics of the lower level of the image, and the relationship between them is independent. In the image database, the image objects distributed in the image have different positions, sizes, and directions, and the starting points of these shape boundaries are also different in the extraction process. Therefore, it is necessary to normalize these situations so that the description of shapes can be carried out in a unified coordinate position, a unified size, a unified orientation, and a unified starting point, ensuring that the description of shapes is

Table 2: Various texture feature representation methods.

Property	Tamura	Amadasun & King	Rao & Lohse	Wu & Chen	Asendorf & Herm
Linelikeness	×				×
Bloblikeness	×				×
Multiares					×
Planarity					×
Coarseness	×	×		×	×
Directionality	×		×		×
Regularity	×			×	
Contrast	×	×	×	×	×
Roughness	×		×	×	
Complexity		×			
Periodicity				×	
Busyness		×	×		
Texture strength		×			
Softness					×

independent of the spatial orientation of shapes [18]. We normalized the shapes with their regional features as shown in Figure 5:

4.3. Mechanism of Object Extraction Based on Knowledge. Cluster analysis is performed on the color table after it has been obtained. The colors are then clustered to see which cluster each color falls into. For mural images, we choose HSV and RGB color space. HSV color space is visually uniform and has a good consistency with human color vision. It is more suitable for human-computer interactive image segmentation. However, choosing HSV color space cannot achieve ideal results in the whole range of color distribution. Experiments show that the value range of saturation component S has a certain influence on the image segmentation results dominated by hue component H. When $s > 20\%$, the segmentation result is more reliable, while when $s < 10\%$, there is a big gap between the segmentation result and vision. Therefore, when $s < 10\%$ or R, G, B binary value is close, the image will be directly segmented in RGB color space [19]. The process is shown in Figure 6:

In our mural restoration system, we have realized an improved image white motion layering algorithm based on the above methods. On the basis of white motion layering, we can also perform operations such as hand l_ layering or merging two layers. The key to white dynamic stratification is statistics of the image of the child to color, and hand l_ stratification can allow users to feel the main color of the image.

4.4. Mural Color Virtual Restoration Based on Image Knowledge

4.4.1. Knowledge Representation of Mural Images. We summarize the knowledge as experiential knowledge and fresco knowledge. Experiential knowledge refers to the knowledge of Dunhuang typical colors accumulated by artists for a long time and the knowledge of Dunhuang typical color changing rules of fresco protection scientists. Mural knowledge refers to the background content, color, shape, layout, and other Dunhuang colors extracted from the mural itself, including the color at the beginning of the painting and the current color. We use three kinds of color rules to express knowledge: the original typical color rules of Dunhuang, the typical color rules of Dunhuang, and the rule of change of the typical color rules of Dunhuang. In Dunhuang frescoes, each fresco was painted in a specific dynasty and cave at that time [20]. Therefore, we believe that the investigation of Dunhuang frescoes can be carried out from three dimensions, namely time dimension, space dimension, and style dimension, as shown in Figure 7, which provides a basis for the design of Dunhuang wall painting library. At present, it is necessary to study the development and evolution process of Dunhuang fresco style from the perspective of time dimension, while the spatial dimension mainly represents the specific location of the cave wall of a certain fresco, which is not the key of the research at present.

4.4.2. Color Restoration of Works Using Image Knowledge. The purpose of region replacement is to transform the analog image (or region) to match the shape of the original image (or region) and then assign the color and texture of the analog image to the source image. Since any shape can be approximated by a polygon, and a polygon is a relatively easy shape to deal with, we propose a method of deforming polygons according to key points, transforming one polygon into another. That is, first change the vertices, increase or decrease the number of vertices, and change the position of vertices. The intermediate region is then interpolated according to the vertices. As the image (or region) enlarged to a certain extent will affect the visual effect, the premise of this method is that the areas of two polygons cannot differ too much, which can be used to estimate whether the area difference of two polygons exceeds a certain min value by comparing the area of the surrounding rectangle of two polygons. If exceeded, the shape of the image (or region) is not appropriate, and a new image (or region) must be found [21].

4.4.3. Color Evolution Simulation of Mural Based on Image Knowledge. The evolution of discoloration and fading is a process of color transition. Color transition refers to

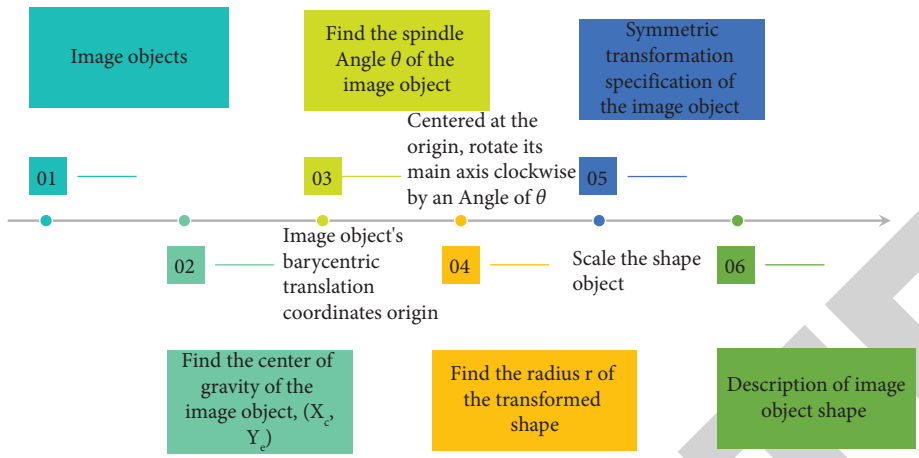

Figure 5: The normalization process of an image object.

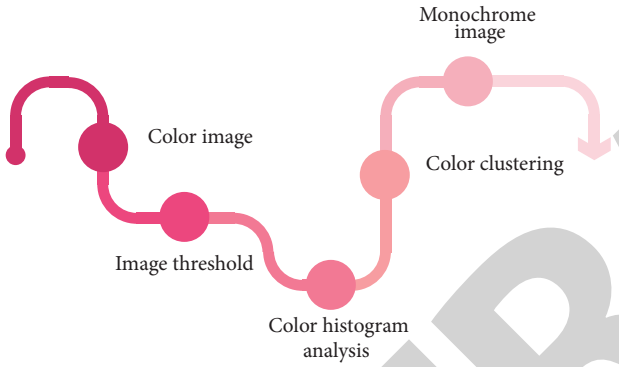

Figure 6: Color image conversion flowchart.

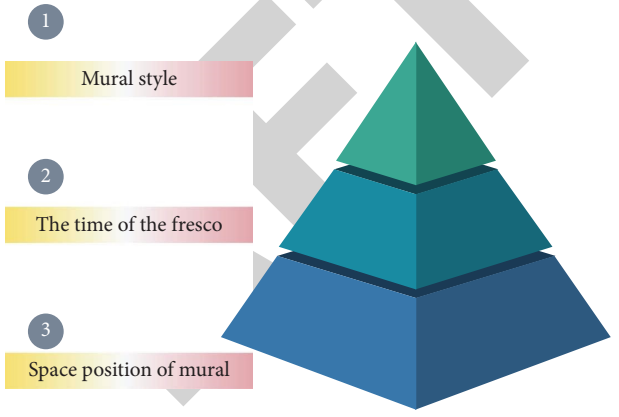

Figure 7: Three-dimensional analysis of Dunhuang frescoes.

finding a transition curve in the color space from one color to another. Considering that the discoloration or fading process usually starts relatively quickly and gradually slows down, a linear transition is not appropriate. To achieve this effect, there are two methods: one is to inserting an intermediate color transition value, using these transition values to control the evolution speed, and obtaining a Bessel curve as the transition curve from these transition values. The second way is to using some nonlinear function, which starts out with a high slope and then slows down.

The color transition trajectory that must be Dunhuang color can be obtained (Figure 8):

In fact, the knowledge given by color analogy is basically the same as the global color rules above, except that the color analogy refers to the actual well-preserved murals, while the color rule reference is the empirical summary of some artists. But no matter through which means, the final use must be interpreted as how to use color, quantified into the image of the proportion of various color components. For color analogy, we can get a good part of an image by analogy, and we need to do some tools or algorithms to simulate the local drawing process, such as some face smudge and so on. For example, in one corner of the south wall of Cave 200, there is an area filled with cement, which should be replaced by a certain arrangement of thousand Buddhas according to the relationship between the upper and lower pictures. When a shedding area happens to erase part of an object, modeling knowledge is needed to determine how to add complete composition to it. Modeling knowledge should also be interwoven with each other. There are also many similarities as shown in Tables 3 and 4:

The virtual repair and virtual demonstration prototype system is a modular and open system in which each module of the system is independent of each other. The human-machine interaction of the system is very strong, and users can manipulate the intermediate results at any time. That is to say, the system is not only a very practical repair tool but also an open research framework, which provides a good experimental platform for further research.

4.5. Image Recognition Based on Fuzzy Set Theory. There are two types of sample set selected in this chapter, which can be regarded as a whole. In other words, there are 20 sample elements in the total sample set, and their fuzzy feature vectors are extracted. Then, fuzzy method is adopted to calculate the closeness degree between the images to be tested and the known sample images, and classification is

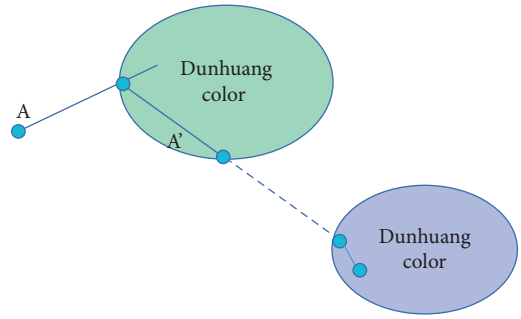

Figure 8: Color transition trajectory.

Table 3: Color modeling fixes content elements.

Restore to repair because of	Around the design	Composition rule Id	Modeling rule Id	The base of color	Reference images
Local from	Thousand Buddhas	10	20	Earth is red	ID

Table 4: Types of relevant elements.

RULE ID	INT	The rule number is the primary key of the table
TRACKRULEID	INT	The track ID, the correlation domain with the track table, and the track equation of the elements arranged in the track
RULESTYLEID	INT	ID in the equation information table, -1 has no trajectory The style category attribute of the rule is the ID number of the style category table
RULENAME	STRING	Names of rules
EL ENUM	INT	Number of default elements
MAXNUM	INT	Maximum number of elements
MINNUM	INT	Minimum number of elements
STARTOBJ	INT	Start the geometry transformation information of the object, pointing to the ID in the object geometry information table
VARYTYPE	INT	Object transformation type. 0 indicates equal increment, 1 indicates discrete increment, and 2 indicates scatter
ARRAYTYPE	INT	In the arrangement relation of elements, 0 is equal distance, 1 is equal difference, 2 is equal ratio, and 1 is when there is no trajectory
ARRAYPARA	Double precision	Permutation parameters, according to permutation relations. It is equal difference and equal ratio coefficient, 0 is invalid

carried out according to the principle of proximity selection. It is assumed that the intact image corresponds to set A and the defective image corresponds to set B. Here, 10 images of set A and 10 images of set B are selected to form known samples. After feature extraction, a matrix with an input vector of 3×20 is obtained, which can form fuzzy feature quantities, among which there are 20 fuzzy subsets. Each fuzzy subset corresponds to a 3×1 column matrix, so the problem of image recognition is transformed into the problem of the proximity between the fuzzy subset corresponding to the image to be tested and 20 fuzzy subsets [22].

Since the image is known to be 20 samples, and each sample corresponds to a 3×1 matrix, the fuzzy set of known samples is represented as a 3×20 matrix. Feature vectors corresponding to the image to be tested are extracted, and the closeness degree between the sample to be tested and the known sample set is calculated according to the closeness degree. The maximum value is the category of the sample to be tested.

Experimental data are shown in Figure 9:

The value of r of closeness between the tested sample and each known sample is calculated according to the program in the appendix. There was no significant positive correlation or negative correlations here as shown in Figure 10:

Based on the above criteria, 20 images from known models were taken as class recognition standards, strategies were selected, estimated, measured, found the highest value, and the relative numbers of the known patterns are found and distributed correctly.

In the experiment, the timing starts from the input of the sample to be tested and stops from the maximum closeness corresponding to the sample attribution. From the running time of the program, it can be seen that the two algorithms have a great difference in the recognition time. The feature vector extraction method used in this article takes 0.072288 seconds and 0.134939 seconds in recognition time compared with the fuzzy feature vector extraction method obtained from the histogram of orthogonal basis transformation in literature.

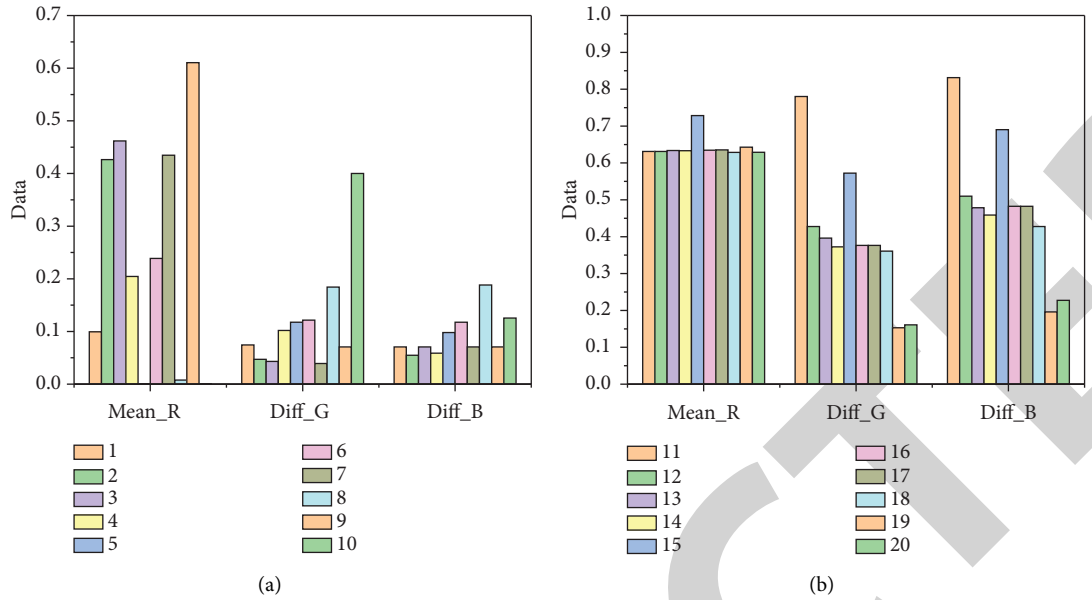

Figure 9: Input sample data. (a) 1~10 samples. (b) 11~20 samples.

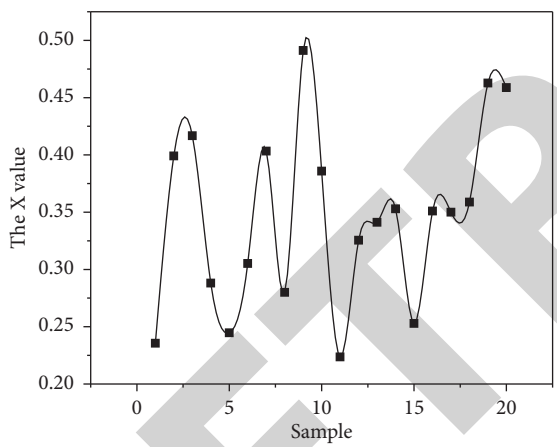

Figure 10: The degree of closeness between the image to be tested and the known sample.

Therefore, although the color correlation can be reduced by using orthogonal basis color space, the recognition efficiency is not as good as the method adopted in this article [23].

5. Conclusion

5.1. Innovate Color Teaching Mode. Influenced by ancient Chinese traditional ethics and Confucianism, traditional flower and bird painting is relatively simple in color application, even called single, and more cold colors are used. In most cases, they are drawn with simple lines and dyed with ink. Although the drawing is simple, the expression of emotion and thought is not bright enough, and the language color of painting cannot be clearly displayed. At the same time, in traditional flower and bird paintings, things are usually colored according to the original color, which has a strong conceptual and symbolic image. Therefore, with the development of The Times, in contemporary flower and bird painting, many painters began to learn Japanese painting colors, adding colorful colors to the teaching of contemporary Chinese flower and bird painting, showing more tension in the characteristics of painting, with super appeal and expression. The emergence and application of modern colorful flower and bird painting also has a profound impact on the development of the current fine brushwork, which is more consistent with the aesthetic concept of contemporary painting, whether through the contrast of colors or the expression of emotion through the deduction of rhythm. In addition to the use of foreign painting colors and contemporary painting skills, in the modern flower and bird painting, a variety of folk painting colors and matching skills are introduced in modern flower and bird painting. The introduction of colors and techniques in folk paintings makes the performance of paintings more spontaneous and natural and makes the paintings develop towards an unconscious form of expression. The main purpose of the painting is to record the beautiful things that I think and show them to everyone through the application of colors. Therefore, in the content of the works, the instinctive cognition of beauty is more displayed. The application of this form of color expression in the teaching of modern flower and bird painting adds a different rhythm and color artistic conception to the painting works, which belongs to the most authentic and simple idea in the author's heart.

5.2. Consolidate the Students' Foundation of Chinese Flower and Bird Painting. Colleges and universities should change the traditional teaching concept, attach importance to laboratory construction, and continue to invest teaching funds

for laboratory construction within the scope of their ability. For the initial construction of the laboratory, there may be backward equipment and other problems, colleges and universities should be updated in time, so that the laboratory construction closely follow the pace of new media technology, to meet the reasonable standards and requirements of practical teaching. Open laboratories should be constructed, and students should be encouraged to take advantage of the convenience they offer. Based on the strong practical characteristics of Chinese flower-and-bird painting course, its teaching assessment mode should be more inclined to the practical direction of assessment, rather than theoretical examination as other majors. Therefore, teachers should balance the importance of the assessment proportion, not ignoring theoretical knowledge, but also grasping the focus of practical assessment.

5.3. Reform the Assessment and Evaluation Methods. Teachers are the creators and managers of classroom situational teaching. Therefore, they also need to objectively evaluate the performance of students in the situation they set. This evaluation cannot be determined by a simple sentence of right or wrong from teachers but requires a complete assessment and evaluation mechanism as a guarantee. In the whole assessment, it is necessary to carefully observe the students' classroom performance and pay attention to the evaluation of the process. Although students make mistakes, but as long as its serious research efforts to explore, teachers also want to give its affirmation. At the same time, students should be helped to analyze the problem, find out the reason, encourage to continue to work hard. Under the traditional teaching mode, the examination method is mainly theoretical. Combined with the knowledge points of Chinese flower-and-bird painting course and the situation of students, the assessment method should be reformed, the enthusiasm and initiative of students to learn should be stimulated, and the assessment system should be rebuilt based on professional quality and technical standards. In practice, theory tests students' mastery of relevant theoretical knowledge, while classroom practice tests students' drawing ability to strengthen students' intuitive feelings of relevant theoretical knowledge and appreciation. Broadening the content of practical training examination, we can adopt the mode of situational experience, namely learning and examination, and add situational simulation in the examination way to observe students' innovation ability and communication ability. In the teaching of Chinese flower and bird painting, after each 3-4 lessons, the teacher will arrange a lesson time for students to carry out a comprehensive review. In this class, students are required to answer all the questions they have mastered about Chinese flower and bird painting and help them sort out the scattered knowledge points into systematic content so as to promote the improvement of the quality of Chinese flower-and-bird painting color teaching.

Data Availability

The labeled dataset used to support the findings of this study is available from the author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

References

[1] A. Singh, P. Li, K. K. Singh, and V. Saravana, "Real-time intelligent image processing for security applications," *Journal of Real-Time Image Processing*, vol. 18, no. 5, pp. 1787-1788, 2021.

[2] Z. Shiling, "Research on operation characteristics of UHV converter valve hall based on intelligent image processing and 3D modeling technology," *Journal of Physics: Conference Series*, vol. 1871, no. 1, p. 012135, 2021.

[3] S. Patil, V. Kulkarni, and A. Bhise, "Intelligent system with dragonfly optimisation for caries detection," *IET Image Processing*, vol. 13, no. 3, pp. 429–439, 2019.

[4] L. Huo, J. Zhu, P. K. Singh, and P. A. Pavlovich, "Research on QR image code recognition system based on artificial intelligence algorithm," *Journal of Intelligent Systems*, vol. 30, no. 1, pp. 855–867, 2021.

[5] J. Cho and M. Lee, "Building a compact convolutional neural network for embedded intelligent sensor systems using group sparsity and knowledge distillation," *Sensors*, vol. 19, no. 19, p. 4307, 2019.

[6] H. Chen, X. Chu, and Q. Jia, "Retracted article: windbreak and sand fixation of sand plants based on intelligent image processing and plant landscape design," *Arabian Journal of Geosciences*, vol. 14, no. 17, pp. 1816–1912, 2021.

[7] Y. Li, L. Chu, Y. Zhang, C. Guo, Z. Fu, and J. Gao, "Intelligent transportation video tracking technology based on computer and image processing technology," *Journal of Intelligent and Fuzzy Systems*, vol. 37, no. 3, pp. 3347–3356, 2019.

[8] H. Cai, "Application of intelligent real-time image processing in fitness motion detection under internet of things," *The Journal of Supercomputing*, vol. 78, no. 6, pp. 7788–7804, 2022.

[9] J. Kubicek, M. Penhaker, O. Krejcar, and A. Selamat, "Modern trends and applications of intelligent methods in biomedical signal and image processing," *Sensors*, vol. 21, no. 3, p. 847, 2021.

[10] Y. Han and Q. Li, "Detection method of Hg^{2+} impurity content in marine pollution based on intelligent image processing," *Journal of Coastal Research*, vol. 97, no. sp1, p. 229, 2019.

[11] N. Paliwal, P. Vanjani, J. W. Liu, S. Saini, and A. Sharma, "Image processing-based intelligent robotic system for assistance of agricultural crops," *International Journal of Social and Humanistic Computing*, vol. 3, no. 2, p. 191, 2019.

[12] R. Huang, P. Yan, and X. Yang, "Knowledge map visualization of technology hotspots and development trends in China's textile manufacturing industry," *IET Collaborative Intelligent Manufacturing*, vol. 3, no. 3, pp. 243–251, 2021.

[13] R. Alhamad, "Optimal harvesting and sensing durations for multi-antenna cognitive radio networks using intelligent reflecting surfaces," *Signal, Image and Video Processing*, vol. 16, no. 4, pp. 931–936, 2021.

[14] Y. Ming and L. Yufei, "Design of intelligent safety protection robot based on global position system and machine vision," *Journal of Physics: Conference Series*, vol. 1883, no. 1, p. 012146, 2021.

[15] X. Liu, C. Ma, and C. Yang, "Power station flue gas desulfurization system based on automatic online monitoring platform," *Journal of Digital Information Management*, vol. 13, no. 06, pp. 480–488, 2015.

[16] D. P. Penumuru, S. Muthuswamy, and P. Karumbu, "Identification and classification of materials using machine vision and machine learning in the context of industry 4.0," *Journal of Intelligent Manufacturing*, vol. 31, no. 5, pp. 1229–1241, 2020.

[17] Y. Zhao, X. An, and N. Sun, "Virtual simulation experiment of the design and manufacture of a beer bottle-defect detection system," *Virtual Reality & Intelligent Hardware*, vol. 2, no. 4, pp. 354–367, 2020.

[18] S. Shriram, B. Nagaraj, J. Jaya, S. Shankar, and P. Ajay, "Deep learning-based real-time AI virtual mouse system using computer vision to avoid COVID-19 spread," *Journal of Healthcare Engineering*, vol. 2021, Article ID 8133076, 8 pages, 2021.

[19] M. Fan and Y. Li, "The application of computer graphics processing in visual communication design," *Journal of Intelligent and Fuzzy Systems*, vol. 39, no. 4, pp. 5183–5191, 2020.

[20] Z. Xing and G. Li, "Intelligent classification method of remote sensing image based on big data in spark environment," *International Journal of Wireless Information Networks*, vol. 26, no. 3, pp. 183–192, 2019.

[21] A. D. Ulyev, V. L. Rozaliev, A. V. Zaboleeva-Zotova, and Y. A. Orlova, "An intelligent video surveillance system for human behavior," *Scientific and Technical Information Processing*, vol. 48, no. 5, pp. 388–397, 2022.

[22] X. Ren, C. Li, X. Ma et al., "Design of multi-information fusion based intelligent electrical fire detection system for green buildings," *Sustainability*, vol. 13, no. 6, p. 3405, 2021.

[23] Z. Ya Ng, M. Li, B. Liu et al., "Research on intelligent inspection method of transmission channel satellite remote sensing environmental changes," *Journal of Physics: Conference Series*, vol. 1966, no. 1, p. 012033, 2021.