Hindawi
Security and Communication Networks
Volume 2024, Article ID 9876519, 1 page
https://doi.org/10.1155/2024/9876519

Retraction

Retracted: Analysis of Painting Elements of Tea Culture and Art Works Based on Image Perception

Security and Communication Networks

Received 8 January 2024; Accepted 8 January 2024; Published 9 January 2024

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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) Manipulated or compromised peer review

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] H. Zhao, "Analysis of Painting Elements of Tea Culture and Art Works Based on Image Perception," *Security and Communication Networks*, vol. 2022, Article ID 2439464, 9 pages, 2022.

Hindawi
Security and Communication Networks
Volume 2022, Article ID 2439464, 9 pages
https://doi.org/10.1155/2022/2439464

Research Article

Analysis of Painting Elements of Tea Culture and Art Works Based on Image Perception

Haiting Zhao

School of Arts, Taiyuan University of Science and Technology, Taiyuan, Shanxi 030024, China

Correspondence should be addressed to Haiting Zhao; 2003080@tyust.edu.cn

Received 18 May 2022; Accepted 21 June 2022; Published 12 July 2022

Academic Editor: Jun Liu

The art works take tea as the theme of painting elements, and depict the content of Chinese traditional culture by showing the connotation of tea culture painting elements. For example, Wen Zhiming, a painter and calligrapher in Ming Dynasty, is best at painting landscape figures. He often uses tea as the theme in his art works, adding the elegant, natural, and simple painting elements of tea into his works, and has created many famous art works that are spread around the world. In recent years, with the deepening of the research on image processing technology, image perception technology has attracted more and more researchers' attention, which has made great achievements and progress in image perception algorithms. This paper studies the tea culture elements of art works based on image perception algorithm. The accuracy of similar image pairs is the ratio that similar image pairs are correctly recognized. When the number of experiments reaches 25, the image sensing algorithm in this paper has the highest accuracy rate, with the accuracy rate of 99.8%, when the number of experiments reaches 20, the ant colony algorithm with the accuracy rate of 96.5%, when the number of experiments reaches 20, and finally the artificial intelligence algorithm with the accuracy rate of 96.0%. The correct rate of similar image pairs is the correct recognition rate of tampered image pairs. When the number of experiments reaches 10 times, the correct rate of image perception algorithm in this paper still ranks first, with the correct rate of 99.8%, when the number of experiments reaches 25 times, the artificial intelligence algorithm with the correct rate of 98.2%, and finally when the number of experiments reaches 10 times, the ant colony algorithm with the correct rate of 96.2%. It can be seen that the numerical values in this column show the robustness of this algorithm. Through the cultivation of students' image perception ability, it can promote students' appreciation ability of tea culture painting elements, learn the knowledge of tea culture painting elements beauty in a deeper level, master the skills of beauty, and improve their artistic temperament and artistic accomplishment.

1. Introduction

There are many famous art works in Chinese history. Among them, many art works take tea as the theme of painting elements. They depict the content of Chinese traditional culture by displaying the connotation of painting elements of tea culture. For example, Wen Zhengming, calligraphers, and painters in the Ming Dynasty, who are best at painting landscape figures, often use tea as the theme in art works and add the elegant, natural, and simple painting elements of tea to their works, He created many famous art works and spread them all over the world [1, 2]. No matter what techniques or methods are adopted in painting, the final expression is the painter's personal thoughts and feelings and his cognition of society. The subjective consciousness has not changed due to the reference to the traditional art of tea culture, but only uses some excellent painting methods to more appropriately express personal subjective emotions, and well integrates Chinese painting skills and even Chinese traditional culture [3]. Because tea culture began to integrate into book art works, the rise of tea culture was perfectly displayed by art works, diversified the forms of art works, and provided inspiration for those writers who like tea. Chinese paintings generally use less than more in the performance of characters. The background is often left blank and mainly outlined by lines. The brush is becoming more and more freehand, advocating simplicity, and then talking about the interests of survival, clumsiness, and plain,

focusing on the expression of the air and charm of the characters in the painting. Westerners often think that Chinese painters do not understand perspective. In fact, Chinese painters pursue the essence of things, which is the reverse perspective that appeared as early as the Song Dynasty [4, 5]. Moreover, the increase of art works, especially those based on tea elements, can better help people understand the elementalization of tea painting, improve people's appreciation of art works, and make their aesthetics develop in a diversified direction [6].

In recent years, with the deepening of the research on image processing technology, image perception technology has attracted more and more researchers' attention, which has made great achievements and progress in image perception algorithms. Image perception algorithm maps the characteristic data of an image to a short string code, which is a compact representation based on the image content [7, 8]. It makes the visually identical image map to the same or similar image, and different images map to different degrees [9]. The technology of expressing image perception information as a brief summary is an efficient and safe solution, which has been applied in the fields of image authentication, tampering detection, image duplication detection, image indexing, image retrieval, digital forensics, and image quality evaluation [10].

Because the digital image of art works has a large amount of data, it is not easy to manage and maintain the digital image, so how to reduce the data representation of digital image has become an important problem [11, 12]. Image perception algorithm can convert image data in art works into binary sequences of hundreds or thousands of bits, which greatly reduces the storage of digital images and brings great convenience to image management and maintenance. Cultivating students' image perception ability of art works in art teaching can improve students' appreciation ability to a certain extent and experience the emotion that the author wants to convey in the works [13]. In the art teaching based on image perception algorithm, cultivating students' image perception ability of tea culture painting elements of art works can improve students' understanding of beauty to a certain extent [14]. Therefore, finding and feeling the beauty of tea culture painting elements based on image perception algorithm is the premise of creating beauty. Through the cultivation of students' image perception ability, students can promote their appreciation of tea culture painting elements, learn the knowledge of tea culture painting elements at a deeper level, master beauty skills, and improve their artistic temperament and artistic accomplishment.

I put forward the following innovations in this paper. The specific contents are as follows.

(1) In this paper, the features of perceptual images are extracted. Perceptual feature extraction is the focus and key of current research. The effectiveness and reliability of perceptual feature extraction will directly affect the robustness and uniqueness of image perceptual hash sequences. In the aspect of image perceptual feature extraction methods, how to extract the feature points that best represent the image features is the focus and key of people's research.

(2) The embodiment of tea element in art works is explored. Many Chinese painters are influenced by Confucianism in tea culture. Many of them are ambitious, but they have no choice but to have a bad career. Their patriotism and passion have nowhere to be released. Finally, they choose to "be independent" in tea products.

The overall structure of this paper consists of five parts. The first chapter introduces the background and significance of tea culture elements in art works. The second chapter mainly describes the research status of painting elements in art works at home and abroad and the research work of this paper. The third chapter discusses the realization of painting elements of art works with lost image perception. The fourth chapter carries out the experiment and analyzes the results. The fifth chapter is a summary of the full text.

2. Related Work

The main reason why the tea culture painting elements of Kuhn's art works are deeply loved by artists is that in the eyes of artists, tea culture can place its noble character and lofty meaning, which can bring different tastes to people [15]. Scott put forward that tea culture has formed a unique cultural system, is the product of the development of human civilization, and plays an important role in the improvement of human civilization. This also shows that tea culture needs people to inherit, and constantly innovate while not studying in Dunant, so that tea culture can complement and develop together with other cultures [16]. Von and Bonnie put forward that because of the different kinds of tea culture painting elements in art works, the spatial properties are different. Art is an art in which space is the way of existence. There are mainly calligraphy, sculpture, painting, architectural art, etc. Art can only be expressed through modeling, while plastic arts must depend on space [17]. Dubus put forward that Chinese tea culture has long been rooted in people's hearts, and it plays a complementary role in the development of Chinese history and culture, and is inherited together with the moral tradition [18]. Clay proposed that there are many representative Chinese artists in all fields of painting, and at the same time, a large number of abstract works of art with artists' subjective ideas are springing up, among which tea culture painting elements occupy a place in China [19]. Melissa put forward that different art works have different painting elements and different material materials. Only by relying on material materials can art works exist. Different material choices affect the artistic image created by art works. The characteristics of materials are more important in oil painting, Chinese painting, printmaking, and other works [20]. Caldarola proposed that tea culture can not only express various thoughts, but also abstract the combination of its own tea ceremony, thus producing countless profound meanings, making it reach the realm of

"I have things in me, and I have things in me." Moreover, during the historical development, tea culture has not lost its unique light because of the baptism of history, and the characters contained in tea culture have unique and unified meanings in different dynasties and works [21]. Mabrouk pointed out that artists' expressions of tea culture painting elements in art works are increasingly rich and diverse, not only through naturalistic abstraction of picture expression through natural landscapes or natural traces of all things in the universe, but also by adding a series of nontraditional painting materials such as paper, cloth, rope, and other comprehensive materials of painting tools into the artistic concept of creation [22]. Nanay put forward that the main painting element of art works is the presentation of theme, which is the most important part of art works, and the creation of painting element theme is also one of the favorite expressions of art works, including tea culture theme [23]. Kim proposed to improve our understanding of tea culture painting elements in art works, and better explained the relationship between reference and innovation in tea culture painting elements in art works. In addition, this is obviously also conducive to the inheritance and development of tea culture painting elements in art works [24].

Based on image perception, this paper analyzes the painting elements of tea culture in art works, and describes the content of tea culture in detail through art works. Readers are interested in tea culture by watching art works and feeling the meaning of tea culture, so that tea culture aesthetic works can play a role of teaching in fun, which is also the wish of all people who want to understand tea culture. Under the image perception algorithm, materials have different material and texture characteristics, which can produce different artistic effects of tea culture in art works. Therefore, in art creation, paying attention to the performance of tea culture painting elements and materials has a great impact on the style of works. The texture of materials, that is, the surface texture of materials, depends on touch and vision, and people can feel the degree of smoothness, roughness, and fineness. The texture in painting is generally called the texture element in painting. The cognitive process of image includes two stages. The first is the response process of human visual system to optical signal input, and then the process of brain recognition, judgment, association, and memory of the received signal. The research results of human visual system have been mainly used in image quality evaluation.

3. Realization of Painting Elements of Art Works Based on Image Perception

3.1. Image Perception Algorithm. Image perception algorithm extracts and compresses the media perceived content and information to form a brief summary, which is used to record or identify the media content, or further used to find the tampered or tampered location of the media content. Because of its wide application prospect, image perception algorithm is attracting more and more researchers. The perceived value of the image is calculated by using the information such as the gray difference of adjacent pixels [25]. The widely used average image sensing algorithm mainly uses the low-frequency component of the image, which is the area with small brightness change, to describe the information contained in the whole image. The computational complexity is low, but the accuracy of image similarity detection is low. The image sensing algorithm proposed in this chapter is divided into the following steps. The first step is to transform the input image into a normalized image through preprocessing. The second step is to extract the features of the image [26]. Then image perception is generated by semisupervised training. Next, the threshold of a single image is determined by adaptive threshold decision. Finally, the threshold and image perception algorithm are combined to generate the final image. The flowchart of image perception algorithm is shown in Figure 1.

For reference images and received images, we use semisupervised learning algorithm for generation and image authentication. Generally speaking, Gaussian low-pass filtering can be realized through convolution mask. Let $G(i, j)$ be the element in row i and column j of the convolution mask. It can be calculated by the formula

$$G(i, j) = \frac{G(i, j)}{\sum_i \sum_j G(i, j)}, \tag{1}$$

$G(i, j)$ is defined by the formula

$$G(i, j) = e^{-\left(i^2+j^2\right)/2\sigma^2}, \tag{2}$$

σ in the above formula is the standard deviation of all elements in the convolution mask.

Suppose there are N images in the training set, and L images are selected as the marker image, then $L \le N$. We represent the features of a single image as $X \in R^M$, where M is the extracted feature length. Then the characteristic expression of all images

$$X = \{X_1, X_2, ..., X_N\}. \tag{3}$$

Including $X \in R^{M \times N}$. The feature of the marked image is represented as $X \in R^{M \times L}$. Note that these characteristic matrices are normalized to zero centered.

This function can be defined as a formula

$$H = W^T X. \tag{4}$$

Therefore, the function of a single image is defined as a formula

$$h_i = W^T X_i. \tag{5}$$

In order to learn a W that maximizes both the empirical accuracy of the marked image and the hashbit variance of all images, the empirical accuracy of the marked image is defined as a formula

$$P_1(W) = \sum_{\left(X_i, X_j\right)} E_{ij} h_i h_j. \tag{6}$$

It can be seen from the above properties that traditional image perception is very sensitive to the change of multimedia information. In multimedia information processing,

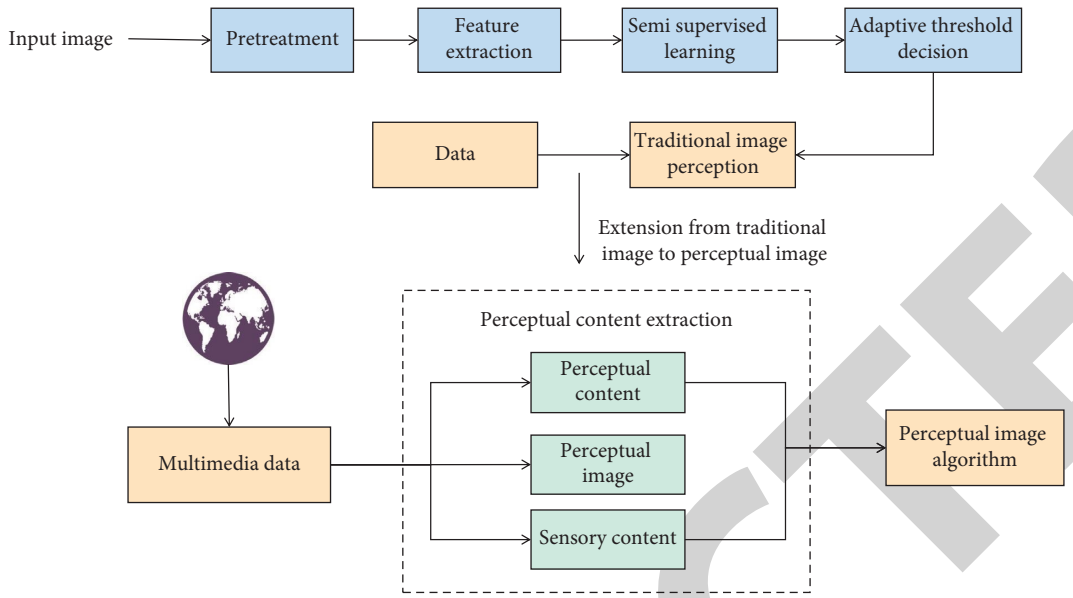

Figure 1: Flowchart of image perception algorithm.

we often use some information processing means, such as compression. These operations will undoubtedly change the bit representation of information, but they have not changed the authenticity and integrity of information, so the traditional hash function obviously cannot meet the requirements. Different from traditional image perception, the image perception algorithm in this paper is closely related to people's subjective perception. This is because the characteristics of multimedia information are determined by people's cognitive psychological process of multimedia, which means that for the same multimedia data, because people's cognitive psychological process is different, the processing process of multimedia data will be different. Image perception algorithm is a big branch, and its feature extraction and coding stage need to contain more visual perception information to meet its robustness requirements. However, the current research on image perception algorithm lacks the consideration of human visual characteristics, and the features concerned are still on the general image features such as image grayscale and feature points. Classical human visual system reflects the visual features of images from multiple angles by multichannel decomposition, and integrates the evaluation results of each channel by error merging. However, the current image perception algorithms are often based on the extraction of a certain image feature, and because of the limitations of the selected features, the algorithms often show performance deviations for different attacks. The purpose of image preprocessing is to eliminate some useless or irrelevant information, such as noise, which affects the original image, preserve the real information of the image to the maximum extent and reduce the amount of data to the maximum extent, thus improving the reliability and effectiveness of feature extraction. There are many methods of image preprocessing, such as geometric transformation, image normalization, smoothing, and image enhancement. In this paper, discrete cosine transform (DCT) is used to extract perceptual features. In this process, the data representation of images is mapped from 2D to 1D feature vectors, and the 1D feature vectors have the following features: if the 1D feature vectors of images with the same or similar content are the same or similar, on the contrary, the 1D feature vectors of images with different content are different, that is, their perceptual distance is larger than the threshold value. The experimental results are shown in Figure 2.

Perceptual feature extraction is the focus and key of current research. The effectiveness and reliability of perceptual feature extraction will directly affect the robustness and uniqueness of image perceptual hash sequence. In terms of image perceptual feature extraction methods, how to extract the feature points that can best represent the image features is the focus and key of people's research.

The matching standard of image sensing algorithm is calculated according to the sensing distance between two hashes. Then, for image perceptual hash sequences in binary vector form, their perceptual distance is the normalized Hamming distance, which can also be called bit error rate, which can be defined as follows:

$$\begin{aligned} BER &= d_{ij} \\ &= \frac{1}{N}\sum n = 1N\left|\left(h_i\right) - \left(h_j\right)\right|, \end{aligned} \tag{7}$$

N represents the length of image perception hash, h_i and h_j. Theoretically, when comparing two images with similar perception content, $BER \approx 0$. If the image perception content is different, the smaller the degree of similarity, the larger the BER should be.

Γ is used to represent the whole probability density space of d_{ij}, which is divided into Γ_{H_0} and Γ_{H_1} by the threshold T. Their relationship can be explained by the following expression:

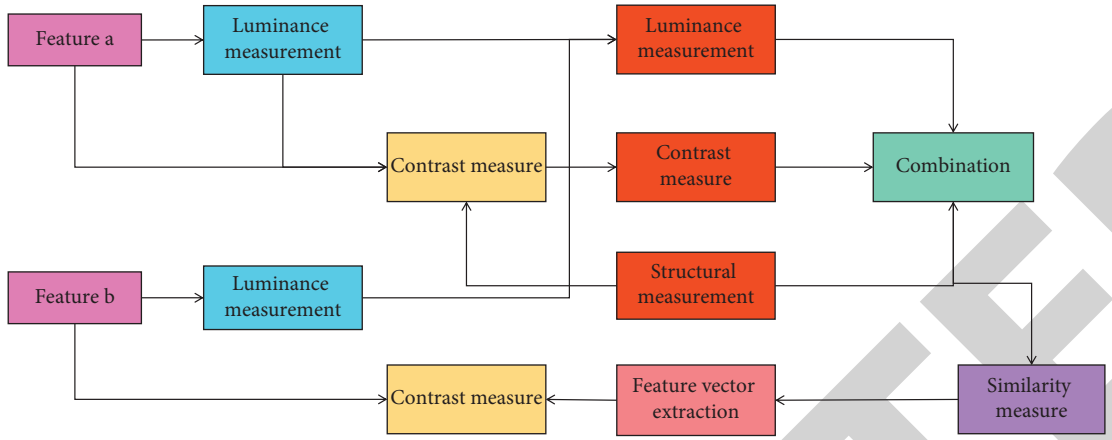

Figure 2: Perceptual image feature extraction.

$$\Gamma_{H_0} \cap \Gamma_{H_1} = 0,$$
$$\Gamma_{H_0} \cup \Gamma_{H_1} = \Gamma. \tag{8}$$

Further, we can get the false connection rate in *FAR* certification and the false recognition rate in *FRR* certification, which are defined as follows:

$$FAR = D\left(d_{ij} \in \Gamma_{H_0} | H_1\right),$$
$$FRR = D\left(d_{ij} \in \Gamma_{H_1} | H_0\right), \tag{9}$$

FAR represents the uniqueness of image perception sequence, while *FRR* represents the robustness of image perception sequence.

The low-frequency components of the image are obtained by orthogonal transformation. As long as the mutual spatial relationship between the images remains unchanged, it can provide a good effect of similar image recognition. However, most of the image perception values of these algorithms can only represent an estimated value compared with the average frequency of the image, and cannot provide the real low-frequency properties of the image. On the one hand, these feature information reflect the perceptual features of the image; on the other hand, they also make the algorithms based on them robust to various content maintenance operations and transformations to varying degrees. However, these image perception algorithms do not do special research on the process of human perception of images and the perception characteristics of human vision.

3.2. Analysis of the Development Process of Painting Creation. For the creation of art works, artists will collect all kinds of materials, so that inspiration can be inspired from them. In the long history of China, many artists' inspiration comes from their own lives. Artists generally prefer to combine their works with nature, which makes their works more intimate and acceptable to viewers. From the analysis of the development process of tea culture, painters have the habit of drinking tea since ancient times. They believe that in the process of drinking tea, the integration of man and nature can be achieved. In the mountains and rivers, enjoying a cup of green tea quietly will relax both body and mind. Many of them are ambitious, but they have no choice but to have a bad career. Their patriotism and passion have nowhere to be released. Finally, they choose to "be independent" in tea products. At the same time, painters will also feel Taoist thoughts from the tea culture, and some of them are far away from the noise of the world, living in the mountains like a paradise. This attitude towards life, which is free from the world, liberates their mind and body and calms their hearts. When painting, they have a deeper understanding of nature and life, and the connotation of their works is rich in tea culture. Among Chinese art works, the artistic conception of art works is not expressed through the inherent form, but the integration of white real life and painting art, and the use of color to express its cultural connotation, so as to blend tea elements with painting elements, thus showing aesthetic thoughts and making works contain classical essence, thus highlighting the progress of the times. Art works need a lot of materials and inspiration. Throughout the 5000-year history of Chinese civilization, the paintings of ancient Chinese painters are closely related to life. By seeking inspiration and feeling emotions in their own lives, they yearn for a peaceful and simple artistic conception, like to be close to nature, and express their emotions in it, so that their paintings are more full of vitality and rich in forms.

The habit of drinking tea has been popularized. Generally, tea is used to entertain guests, which also provides a background for ancient artists to create many works about tea production and picking, which can not only clearly understand the artistic conception of the author, but also touch the feelings of the viewer. Through the application of water elements and painting elements, the spiritual metaphor is added to the painting. Artists can also transform the way of life into the way of creation through the integration of elements, so that the artistic conception of painting can become the aesthetic pursuit of spirit. It can also be said that if painters apply the tea element well, they can combine real life and build the cultural value behind tea. In the process of painting, painters pursue the perfect combination of nature and painting. From painting, people can experience their

Table 1: Content retention operation parameters of training set.

Content retention operation	Parameter value	Parameter value	Quantity
Average filtering	Window size	1, 2, 3, . . ., 10	10
Gaussian blur	Window size	1, 2, 3, . . ., 10	10
Motion blur	Window size	1, 2, 3, . . ., 10	10
Image sharpening	Parameter alpha	0.05, 0.14, . . ., 0.93	10
Total			40

Table 2: Content retention operation parameters of test set (I).

Content retention operation	Parameter value	Parameter value	Quantity
Average filtering	Window size	3	1
Gaussian blur	Window size	2	1
Motion blur	Window size	2	1
Image sharpening	Parameter alpha	0.48	1
Total			4

understanding of freedom and their desire for inner freedom. Tea culture flourished in the Tang Dynasty. Before the Tang Dynasty, there was very little combination of Chinese paintings and tea. One of the earliest paintings recorded in history, mainly in the teahouse, is the painting of tuning the piano and sipping tea in the Tang Dynasty. This is a hand-painted traditional Chinese painting, which depicts the leisurely life of palace women while listening to the piano and drinking tea. In order to achieve the best effect of tea culture, we need to analyze the basis of tea culture, observe the relevant concepts of tea culture, and let the creators have a certain understanding of the knowledge system of art works, so as to effectively integrate the two and achieve the best effect. The integration of painting and Chinese tea culture can be traced back to the prosperous Tang Dynasty. Since the prosperous Tang Dynasty, a very close relationship has been established between Chinese art works and tea culture. Under this cultural background, tea culture has a more profound impact on painters' painting thinking, and more and more excellent art works have emerged, which not only promoted the inheritance and development of tea culture, but also promoted the innovation and reform of Chinese art works.

4. Experimental Results and Analysis

4.1. Training and Testing Process. In order to ensure that the images in the training set are different from those in the test set, we selected 311 nonrepetitive original images and corresponding tampered images, totaling 622 images. Four types of content retention operations are tested, and each content retention operation has 10 parameters. The specific parameters are shown in Table 1.

After adding the content retention operation, 66,130 images are generated as our training data. We randomly selected 10,000 images from 66,310 images as a subset of markers. Semisupervised training method is used for each content retention operation.

In the test, we selected 225 duplicate original images and their corresponding set of tampered images to determine the threshold of each image. We named it the first test set, and then used 225 duplicate original images and their other set of tampered images to test the performance of adaptive threshold. We named it the second test set. Some images of the test set are shown in Table 2.

In order to effectively verify our method, we use the second set of test sets to verify the effectiveness of the algorithm. The retention operation is added to the second set of tests, and then the features are extracted and combined with the trained w calculation to generate an image, as shown in Table 3.

In terms of performance analysis, the method proposed in this chapter is compared with ant colony algorithm and artificial intelligence algorithm to test the accuracy of similar images in art painting elements, and gradually improve the performance of the algorithm. The experimental results are shown in Figure 3.

It can be seen from Figure 3 that the accuracy rate of similar image pairs is the ratio that similar image pairs are correctly recognized. When the number of experiments reaches 25, the image sensing algorithm in this paper has the highest accuracy rate, with the accuracy rate of 99.8%, when the number of experiments reaches 20, the ant colony algorithm with the accuracy rate of 96.5%, when the number of experiments reaches 20, and finally the artificial intelligence algorithm with the accuracy rate of 96.0%. It can be seen that the image sensing algorithm in this paper is the value in this column, which shows the robustness of the algorithm.

The method proposed in this chapter is compared with ant colony algorithm and artificial intelligence algorithm to test the accuracy of tampered image pairs in tea culture elements of art works. The experimental results are shown in Figure 4.

As can be seen from Figure 4, the correct rate of similar image pairs is the correct recognition rate of tampered image

Table 3: Content retention operation parameters of test set (II).

Content retention operation	Parameter value	Parameter value	Quantity
Average filtering	Window size	1, 2, 3, 4, 5, 6	5
Gaussian blur	Window size	1, 2, 3, 4, 5, 6	5
Motion blur	Window size	1, 2, 3, 4, 5, 6	5
Image sharpening	Parameter alpha	0.1, 0.2, . . ., 0.4	5
Total			20

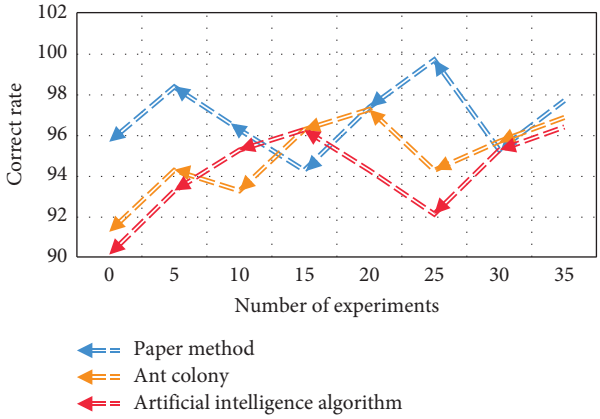

Figure 3: Accuracy of similar images in tea culture elements under different algorithms.

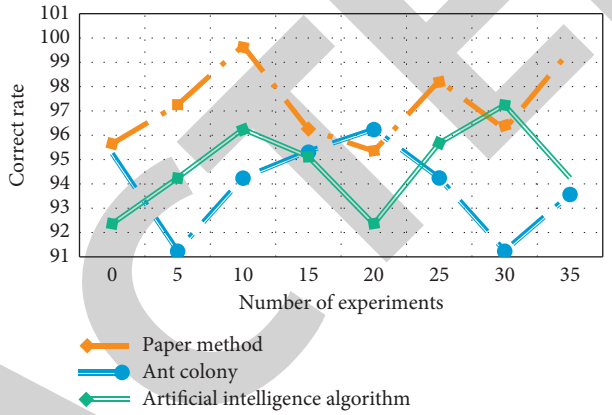

Figure 4: Correct rate of tampering images in tea culture elements under different algorithms.

pairs. When the number of experiments reaches 10 times, the correct rate of image perception algorithm in this paper still ranks first, with the correct rate of 99.8%, when the number of experiments reaches 25 times, the artificial intelligence algorithm with the correct rate of 98.2%, and finally when the number of experiments reaches 10 times, the ant colony algorithm with the correct rate of 96.2%. Therefore, it can be concluded that the correct rate of tampered image algorithm in this paper is the highest among the tea culture elements, which shows the advantages of this algorithm.

4.2. Distinguishing Performance Experimental Analysis. In this experiment, the robustness of tea culture elements in art works under different content retention operations was tested, and the average filtering and Gaussian blur were compared. The experimental results are shown in Figure 5.

It can be seen from Figure 5 that the average Hamming distance under different content saving operations of painting elements of art works is shown. The x-axis under average filtering and Gaussian blur preserving operation is the 10 parameter values of each content preserving operation. The y-axis is the average distance for each parameter. It can be seen that the average distance is no more than 5. On the whole, the average Hamming distance under the preservation operation of tea culture elements in all art works is no more than 15.

Then, the experiment tested the robustness under the retention of tea culture elements in different content art works, and compared the experimental results for motion blur and image sharpening, respectively. The experimental results are shown in Figure 6.

It can be seen from Figure 6 that the average Hamming distance under different content preservation operations of tea culture elements in art works is also shown. The x-axis under motion blur and image sharpening retention operation is the 10 parameter values of each content retention operation. The y-axis is the average distance for each parameter. It can be seen that the average distance is no more than 5. Overall, the average Hamming distance under all content saving operations is still no more than 15.

In fact, the embodiment of robustness and discrimination is closely related to the threshold we choose. In this experiment, the change of different image loss accuracy rate is tested according to the detection performance of tea culture elements under different thresholds. The robust discrimination results under different thresholds are shown in Figure 7.

As can be seen from Figure 7, robustness is expressed by the percentage of correct recognition of similar image pairs of tea culture elements in art works, and distinctiveness is expressed by the percentage of correct recognition of different image pairs. It can be seen that the smaller threshold of painting elements in art works can improve the recognition ability of the algorithm, but it will reduce the robustness. Similarly, a larger threshold can improve the robustness of hashing, but weaken the distinguishing ability. In practical application, the appropriate threshold can be selected according to different requirements.

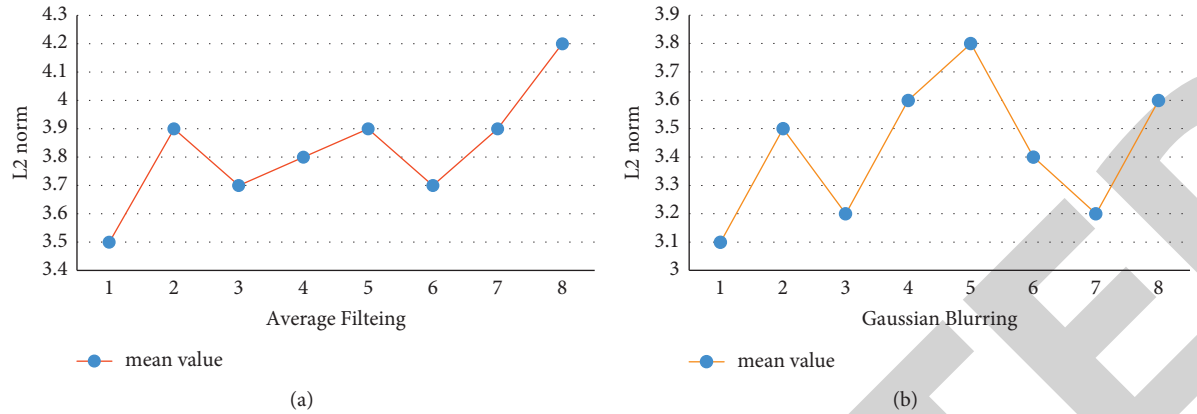

Figure 5: Robust performance of tea culture elements under average filtering and Gaussian fuzzy retention. (a) Average filtering. (b) Gaussian blur.

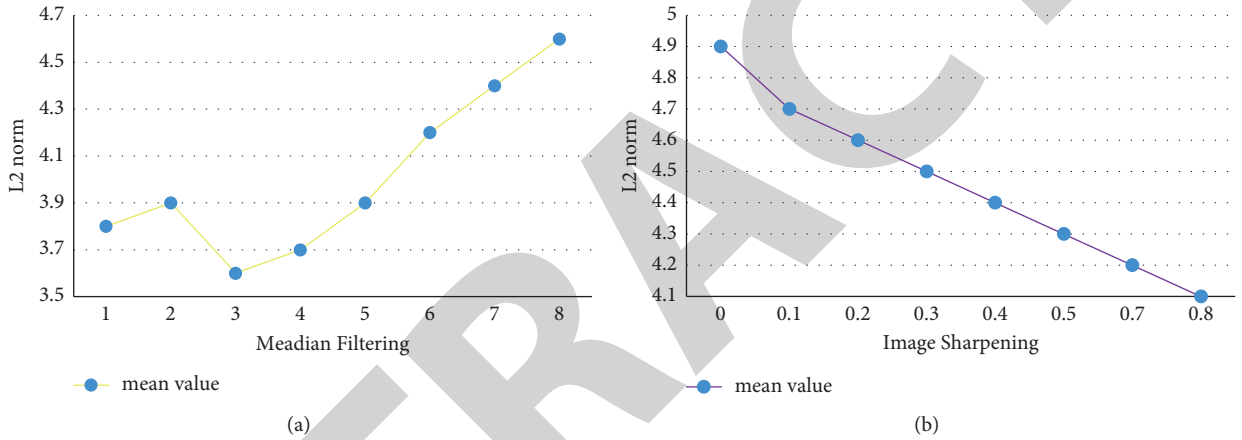

Figure 6: Robust performance of tea culture elements under motion blur and image sharpening retention. (a) Fuzzy motion. (b) Image sharpening.

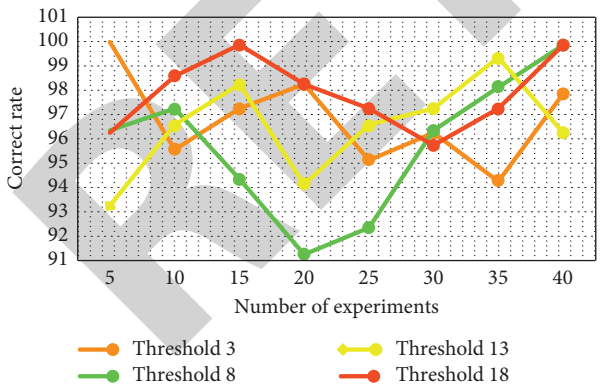

Figure 7: Detection performance of tea culture elements under different thresholds.

5. Conclusion

(1) From the perspective of the overall integration of tea culture, the understanding of tea culture in art works is the most mature. In order to make the tea culture more popular, we need to make use of the characteristics of the form of calligraphy and painting to make it a perfect carrier, so as to make up for the lack of text popularization, make the popularization of tea culture more interesting, and make the tea culture fully display its connotation in the form of calligraphy and painting.

(2) This paper studies the elements of tea culture in art works based on image perception algorithm. Under different fitting times, the average correct recognition rate of similar images and tampered images is better than ant colony algorithm and artificial intelligence algorithm. The image perception algorithm in this paper is superior to other algorithms in robustness and gender discrimination.

(3) Our algorithm also achieves reasonable performance in terms of execution time. Image perception algorithm can better publicize tea culture and improve people's love for tea culture elements in art works.

Data Availability

The figures and tables used to support the findings of this study are included within the article.

Conflicts of Interest

The author declares that there are no conflicts of interest.

Acknowledgments

The author would like to show sincere thanks to those technicians who have contributed to this research.

References

[1] M. Stanowski, "Conceptual art and abstraction: deconstructed painting," *Leonardo*, vol. 53, no. 5, pp. 1–13, 2019.
[2] B. Matthew, "Indiscernibly bad: the problem of bad painting/good art," *Oxford Art Journal*, vol. 41, no. 3, pp. 321–339, 2018.
[3] M. Trusted, "Transatlantic works of art: the hybrid qualities of two kinds of baroque," *Renaissance Studies*, vol. 34, no. 4, pp. 669–686, 2020.
[4] M. Bustillo, "On christian iconography: selections from "the art of painting" (1649)," in *Renaissance Quarterly*, F. Pacheco, Ed., vol. 71, no. 3, pp. 1072-1073, 2018.
[5] A. M. D. Figueiredo and S. F. Rodrigues, "Onde estava a periferia da arte? Circulação e recepção de cópias de pintura europeia na Amazônia no século XIX," *Tempo*, vol. 23, no. 3, pp. 590–608, 2017.
[6] A. Fl, A. Gs, B. Dma et al., "Lighting and visual experience of artworks: results of a study campaign at the national museum of san matteo in pisa, Italy - ScienceDirect," *Journal of Cultural Heritage*, vol. 45, pp. 254–264, 2020.
[7] C. Reymond, M. Pelowski, and K. Opwis, "Aesthetic evaluation of digitally reproduced art images," *Frontiers in Psychology*, vol. 11, pp. 1–15, 2020.
[8] J. Bruwer, M. A. Pratt, and A. Saliba, "Regional destination image perception of tourists within a winescape context," *Current Issues in Tourism*, vol. 20, no. 1-4, pp. 157–177, 2017.
[9] D. Shaham, A. Belfer-Cohen, and R. Rabinovich, "A mousterian engraved bone—principles of perception in middle paleolithic art," *Current Anthropology*, vol. 60, no. 5, pp. 7080–7716, 2019.
[10] M. Szubielska and E. Niestorowicz, "Seeing suppresses haptic pleasure while perceiving contemporary," *Art. i-Perception*, vol. 11, no. 3, pp. 1–5, 2020.
[11] R. Giustetto, E. M. Moschella, and M. Cristellotti, "Deterioration of building materials and artworks in the 'Santa Maria della Stella' church, Saluzzo (Italy): causes of decay and possible remedies," *Studies in Conservation*, vol. 62, no. 7-8, pp. 474–493, 2017.
[12] V. Gastel, "Painting and economics in baroque naples," *Art History*, vol. 41, no. 1, pp. 205–207, 2018.
[13] M. Kaneko, "The politics of painting: fascism and Japanese art during the second world war by asato ikeda," *Monumenta Nipponica*, vol. 74, no. 2, pp. 312–315, 2019.
[14] E. S. Warner, "Marketing the monumental: wall painting at midcentury," *Archives of American Art Journal*, vol. 56, no. 2, pp. 26–49, 2017.
[15] L. Kuhn, "Painting historicity: William Dunlap's engagement with the circumstances of time and place," *Art History*, vol. 45, no. 1, pp. 102–125, 2022.
[16] K. Scott, "Painting matters," *Art History*, vol. 43, no. 1, pp. 207–213, 2020.
[17] L. A. Von and R. Bonnie, "Expanding abstract expressionism: elaine de Kooning, action painting, and the American west," *American Art*, vol. 32, no. 2, pp. 52–79, 2018.
[18] P. Dubus, "Painting the lifeless man: the foreshortened figure in the cinquecento," *Artibus et Historiae*, vol. 1, no. 77, pp. 57–76, 2018.
[19] S. J. Clay, "Master of Black≐igure painting: the art and legacy of exekias. By elizabeth moignard. New york: I. B. Tauris," *Religious Studies Review*, vol. 43, no. 4, pp. 397-398, 2015.
[20] L. Melissa, "Children readily think about people's minds when they think about artworks," *Empirical Studies of the Arts*, vol. 38, no. 1, pp. 81–89, 2019.
[21] E. Caldarola, "Architecture and sites," *Croatian Journal of Philosophy*, vol. 21, no. 61, pp. 5–23, 2021.
[22] N. Mabrouk, "Archaeometrical study of a rare embroidered and appliqued leather tapestry from the safavid artworks. Part I: weaving fibers and dyes," *Mediterranean Archaeology and Archaeometry*, vol. 20, no. 1, pp. 163–171, 2020.
[23] B. Nanay, "The aesthetic experience of artworks and everyday scenes," *The Monist*, vol. 101, no. 1, pp. 71–82, 2018.
[24] E. K. Kim, "The elements and characteristics of islamic on enamelled painted wares of the qing dynasty," *Art History*, vol. 38, pp. 107–132, 2019.
[25] V. Foskolou, "Decoding Byzantine ekphraseis on works of art. Constantine Manasses's description of earth and its audience," *Byzantinische Zeitschrift*, vol. 111, no. 1, pp. 71–102, 2018.
[26] Y. Felber-Seligman, "Painting in turbulent times: house wall art, culture, and commentary in colonial east africa," *African Arts*, vol. 53, no. 2, pp. 54–65, 2020.