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Computer-Aided Design AND APPLICATIONS

Innovative Design of AR Posters Based on Artificial Intelligence and Computer Aided Design

Shucheng Liao[1,2] and Chun-Liang Lin[3]

[1]Department of Design, National Taiwan Normal University, Taipei 106, Taiwan, 80868005t@ntnu.edu.tw
[2]Zhejiang Gongshang University Hangzhou College of Commerce, Hangzhou 311508, China, 80868005t@ntnu.edu.tw
[3]Department of Design, National Taiwan Normal University, Taipei 106, Taiwan, leolin@ntnu.edu.tw

Corresponding author: Shucheng Liao, 80868005t@ntnu.edu.tw

Abstract. With the continuous innovation of AI (Artificial intelligence) technology, the design tools and means of poster designers have been enriched. Traditional posters and paper media are no longer the only choice to show design. The rapid growth of AR (Augmented reality) technology provides new possibilities for the innovation of poster design. This article discusses the use of AI and CAD (Computer aided design) technology in AR poster design. Based on the content of AR poster, the image feature detection algorithm is modeled. Considering the lack of expressive ability of pure color features to AR poster image information, this article introduces the analysis of texture features of AR poster image, determines the algorithm of extracting texture features based on co-occurrence matrix and Gabor filter, and describes the content of AR poster image by combining color and texture features. The results show that compared with the other two feature detection algorithms, the proposed method achieves better accuracy. In the case of iterative algorithm, its accuracy is generally above 90%. This verifies the effectiveness of the proposed image feature detection algorithm, which can accurately extract image features. Using this method for image processing of innovative design of AR posters has good communication ability and high degree of image information fusion, which improves the innovative design effect of AR posters.

Keywords: Artificial Intelligence; Computer Aided Design; Augmented Reality; Image Feature Detection; Poster Innovative Design
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1 INTRODUCTION

AI mainly studies and manufactures intelligent machines or intelligent systems to simulate human intelligent behavior and activity ability. At present, three hot topics in AI research are: intelligent interface, data mining, agent and multi-agent system. Allagwail et al. [1] conducted feature analysis for image quantity training and recognition. It constructs binary pattern analysis for Gaussian filtering and wavelet transform matrices. To match the extracted features with facial features in the database, common feature matching algorithms such as distance-based matching and similarity-based matching can be used. Based on the matching results, common facial recognition algorithms such as support vector machine based facial recognition and neural network based facial recognition are used to recognize faces. For symmetric facial training samples, common symmetry processing algorithms such as symmetry constraints, symmetry projection, etc. can be used to perform symmetry processing on the samples to improve recognition accuracy. It should be noted that facial recognition based on symmetric facial training samples using local binary patterns and Gabor filters needs to be optimized and adjusted for specific application scenarios to achieve the best recognition effect. At the same time, it is also necessary to consider issues such as the quality and integrity of facial images, algorithm selection, and parameter settings to avoid issues such as mismatches and missed matches. CAD uses computer technology as a means to assist designers to implement design in a systematic way, realize design informatization, and then achieve design data sharing. Asadi et al. [2] analyzed and compared the retrieval of images and datasets, and presented them using advanced color and texture recognition. Integrate color and texture features together. This can be achieved by connecting two feature vectors, or by using weighted averaging or other fusion techniques. Use the fused feature vectors to establish an index of the image. This can be achieved by storing feature vectors in a database and using some form of indexing algorithm, such as B-tree or hash indexing. When it is necessary to retrieve images, the user provided images are transmitted to the system and their color and texture features are extracted. Then, use the index to find the image with the most similar features to the user image. The effective application of AI in computer-aided innovative design of AR posters is embodied in reasoning ability, which mainly includes fuzzy reasoning function and chaos theory reasoning function. In the stage of practical application of AI, these reasoning functions are used synthetically, but not alone. They play their respective advantages and make up for their shortcomings. Boluki and Mohanna [3] proposed a filter for defect quality detection and an automatic detection algorithm for textile parameters. By using a database based adaptive threshold binarization for image coloring detection, the effectiveness of irregular patterns was constructed. After filtering the image through Gabor filters, feature information in the image can be extracted, including edges, textures, colors, etc. According to the extracted feature information, a classifier is designed to classify and test textiles. Common classifiers include support vector machines, neural networks, etc. The results output by the classifier can be displayed and further processed using some common image processing software or programming languages. Textile inspection based on the optimal Gabor filter needs to be optimized and adjusted according to specific textile characteristics and needs to achieve the best inspection effect. At the same time, it is also necessary to consider issues such as the quality and integrity of textile images, as well as the selection of Gabor filters and classifiers, in order to improve inspection accuracy and stability. With the continuous expansion of the application scope of AI and CAD, it has become a new trend to apply AI in the field of AR poster design. Driven by the growth of AI and CAD, the efficiency of AR poster design has been improved. In order to express the appearance of AR poster design more accurately, the field of AR poster design has already taken on a new look. Hammad et al. [4] used a unique texture feature extraction algorithm to extract features from preprocessed images. These features should be able to fully describe the texture information of the image and distinguish between images with and without steganographic information. Common texture feature extraction algorithms include Gabor filters, wavelet transforms, and so on. After extracting texture features, it is necessary to select and reduce the dimensionality of the features to reduce their dimensions and improve the efficiency of the classifier. Principal component analysis (PCA) and other algorithms can be used to reduce the dimensionality of features and select the most important features for classification. Design a classifier based on the extracted texture features and dimensionality reduced features to classify and recognize images. Commonly used classifiers include support vector machines, neural networks, etc. The results output by the classifier can be displayed and further processed using some common image processing software or programming languages. The application of AI and CAD software in the innovative design of AR posters has many values, such as highlighting personalized visual effects, enhancing diversified visual experiences, liberating designers' thinking and improving the creative connotation of design. In addition, the addition of AI and CAD can not only solve the automatic control problem of computer, but also improve the standardization level of innovative design of AR posters to the maximum extent. However, due to the limitation of professional level, the image processing technology of AR poster innovative design has not been updated in time, which leads to the stagnation of the image quality of AR poster design, and it is difficult to produce original innovative results. Han et al. [5] conducted image information detection and analysis of spectral information. By analyzing the co-occurrence matrix image of the network, a hidden abstract graph of spectral spatial features was constructed. It collects enhanced network feature data from hash binarization graphs and block histograms, which shortens the classification performance of network training models. Divide hyperspectral images into multiple small spatial regions and extract spectral and spatial features from each region. Spectral features include one-dimensional and two-dimensional spectral information, which can reflect the differences in spectral characteristics of different substances in the image. Spatial features include grayscale values, textures, shapes, etc., which can reflect the morphological differences of different regions in the image. Then, the principal component analysis network is used to perform dimensionality reduction and denoising on the extracted spectral spatial joint features to obtain the main features. Principal component analysis networks can reduce high-dimensional data to low dimensional data, remove irrelevant features, and improve classification efficiency and accuracy.

Keyvanpour et al. [6] conducted an application analysis of image matching visual processing. It constructs a model estimation transformation framework for feature matching extraction. Wave transform is a Time–frequency analysis method, which can decompose the image into frequency bands of different scales to extract the texture features of the image. The method based on wavelet transform has good efficiency and operability in extracting image texture features. Filtering is a commonly used image processing method that can extract texture features of an image by performing convolution operations on the image. The filtering-based method has good stability and operability in extracting image texture features. Deep learning is a machine learning method based on neural networks, which can learn deep level features and texture information in images. The method based on deep learning has good accuracy and scalability in extracting image texture features. The category of image creativity is relatively wide. It can be said that all visual communication forms used for information transmission can be regarded as the category of image creativity, including logo design and AR poster design. AR technology provides fresh ideas and powerful grasping hands for poster design. By simulating and superimposing the virtual content with the real world, the poster realizes the expression across fixed media. In the innovative design of AR posters, incorporating images can not only play a decorative role, but also improve the artistry of AR poster design [8]. Creative design of images can improve the aesthetic feeling of innovative design of AR posters and meet people's psychological needs. With the rapid growth and popularization of media technology industry, the application scope of AR poster design has been gradually expanded. Its design level has gradually improved, which leads designers to greatly improve the clarity and resolution of the image and try to remove the noise in the image, thus improving the quality of the image. But the current technology is not enough to meet people's requirements. The traditional method has a good effect on Gaussian noise processing, but the denoising effect on mixed noise is not ideal.

At present, image processing technology has been widely used in various fields, including image recognition, AI, etc., all of which require image processing as an important foundation. In the innovative design processing of AR posters, the effect of image feature detection and noise can have a great impact on image quality, so it is of high practical value to conduct in-depth research on image processing technical measures [9]. Images are different from text information, and the image content itself cannot be directly sorted and compared accurately, so it has visual characteristic information that is difficult to describe with symbols. This makes the text-based method often unable to accurately retrieve and achieve satisfactory results [10]. This article discusses the application of AI and CAD in AR poster design, and models the image feature detection algorithm based on the content of AR poster. Its innovations are as follows:

㊀ In this article, Canny operator is used to extract the edge of AR poster image, and the target area of AR poster image is obtained by preprocessing the contour line.

② Seven eigenvalues of shape invariant moments are selected as the shape features of the target AR poster image. The descriptor has the advantages of rotation, translation and scale invariance, and can describe the shape and spatial distribution information of AR poster images well.

This article first introduces the research background of innovative design of AR posters based on AI and computer-aided, and summarizes the main research contents and organizational arrangements of this article. Then the related research literature is introduced. On this basis, the design and implementation of image feature detection algorithm based on AR poster content are discussed. Then the image feature detection algorithm based on AR poster content proposed in this article is simulated and compared with other algorithms. Finally, it summarizes the contents of the full-text research and looks forward to the follow-up research.

2 RELATED WORK

Khaldi et al. [7] extracted feature information from images using image processing techniques that combine color and grayscale co-occurrence matrix features, and compared the advantages and disadvantages of different image processing methods. Color histogram is a commonly used image processing method that can be used to describe the frequency of different colors appearing in an image. Color histograms can be used to compare the color distribution differences between different images, but they cannot reflect the texture information in the images. Grayscale co-occurrence matrix is a commonly used image processing method that can be used to describe the grayscale relationships between different pixels in an image. The grayscale co-occurrence matrix can be used to extract texture information from images, but it cannot reflect the color information in the image. In summary, different image processing methods have their own advantages and disadvantages, and choosing the appropriate method depends on the specific application scenario and requirements. Joint feature methods and deep learning algorithms are current research hotspots, which can provide more accurate and rich image feature information, but require more computational resources and time. Li et al. [8] conducted a scheme detection analysis on the operator description of texture features based on the difference in image grayscale between adjacent pixels. By analyzing the linear grayscale values of the image, it constructs a texture matrix feature for fabric image threshold detection. Preprocess the input fabric image, including image format conversion, image enhancement, image filtering, and other operations to remove noise and interference from the image. Convert the preprocessed image into multiple binary modes to capture different texture information in the image. Calculate the grayscale co-occurrence matrix for each binary mode image to capture local texture information in the image. Extract image features using grayscale co-occurrence matrix and multi-directional binary mode, including energy, contrast, correlation and other features in grayscale co-occurrence matrix and texture features in multi-directional binary mode. Use some common object detection algorithms, such as support vector machine-based methods and neural network-based methods, to classify and recognize the extracted features to detect defects in the fabric. It should be noted that the patternless fabric defect detection method based on multi-directional binary mode and grayscale co-occurrence matrix needs to be optimized and adjusted for specific application scenarios to achieve the best detection effect. At the same time, it is also necessary to consider issues such as the quality and integrity of fabric images, algorithm selection, and parameter settings to avoid issues such as false detections and missed detections. Reska and Kretowski [9] proposed a framework extraction method for image texture feature analysis and recognition. Through the analysis of specific texture level integration regions, it constructs a set of high-performance ethical frameworks for natural images. Firstly, preprocess the input image, including image format conversion, image enhancement, image filtering, etc., to remove noise and interference from the image and improve its quality and readability. Use some common segmentation algorithms, such as threshold-based methods and edge-based methods, to perform preliminary segmentation on the preprocessed image and obtain the preliminary segmentation results of the image. Match the extracted texture features with a predefined texture feature library, and use common feature matching algorithms such as distance-based matching and similarity-based matching to find the most similar features in the predefined texture feature library. The output of fine segmentation results can be displayed and further processed using some common image processing software or programming languages. It should be noted that the above method is a multi-stage image segmentation method based on image texture feature analysis and recognition, which can quickly and accurately segment different regions in the image. However, the specific implementation still needs to be optimized and adjusted according to different application scenarios to achieve the best segmentation effect.

Shahabian et al. [10] carried out extensive management analysis and construction of image clustering vision, and selected sample information of different Areal feature of clustering parameter images to build strategy classification. Calculate the texture features of the image using the GLCM algorithm. GLCM is a matrix based on the relationship between image grayscale levels, where different grayscale levels correspond to different texture features. Feature selection algorithms, such as principal component analysis (PCA), can be used to select and optimize effective features from the extracted texture features. Based on optimized texture features, a classifier can be designed using machine learning algorithms such as Support Vector Machine (SVM). Conduct experimental validation using test datasets to evaluate the performance and accuracy of the classifier. It should be noted that in the process of statistical texture analysis, appropriate GLCM algorithms and parameters, as well as optimized features and classifiers, need to be selected to achieve better recognition results. At the same time, it is also necessary to consider the impact of road conditions and environmental factors, and conduct a more comprehensive and systematic analysis. Slavkovic and Bjelica [11] conducted an image filtering analysis based on texture features. It constructs a statistical algorithm for feature vector similarity in image road measurement selection. It uses cameras or sensors to collect image data of vehicles driving on the road. Preprocess the collected images, including image format conversion, image enhancement, image filtering, and other operations to remove noise and interference from the images. Segmenting the preprocessed image and separating the road part from the background part. Use image texture extraction algorithms such as grayscale co-occurrence matrix and wavelet transform to extract texture features of road images. Use some common risk prediction algorithms, such as support vector machine-based methods and neural network-based methods, to classify and recognize the extracted texture features to predict risks in vehicle driving on the road. Based on the risk prediction results, common vehicle control algorithms such as adaptive cruise control and automatic emergency braking are used to control the vehicle to avoid risks and improve driving safety. It should be noted that risk prediction algorithms based on image texture extraction need to be optimized and adjusted for specific application scenarios to achieve the best risk prediction effect. At the same time, it is also necessary to consider issues such as image quality and integrity, algorithm selection, and parameter settings to avoid issues such as false detections and missed detections. Tadi and Fekri [12] conducted color information retrieval and substitution analysis of image textures. It performs phased anti-noise processing on image colors retrieved from the color space domain. It uses spatial and frequency domain algorithms to extract texture and color information from images, including texture features, color histograms, color saturation, etc. To match the extracted features with image features in the database, common feature matching algorithms such as distance-based matching and similarity-based matching can be used. Based on the matching results, the image results that are most similar to the input image can be returned using some common image retrieval algorithms, such as content-based image retrieval and similarity-based image retrieval. It should be noted that content-based image retrieval based on the combination of texture and color information extracted from spatial and frequency domains needs to be optimized and adjusted for specific application scenarios to achieve the best retrieval results. At the same time, it is also necessary to consider issues such as image quality and integrity, algorithm selection, and parameter settings to avoid issues such as mismatches and missed matches.

Wu et al. [13] analyzed a specific convolutional network model of filters and images for background image detection. It determines a fitness function to evaluate the performance of each particle (i.e., real Gabor filter). In image surface detection, the fitness function can be an evaluation function based on image edges, textures, or other features. The Particle swarm optimization algorithm is used to find the optimal combination of real Gabor filter parameters through iteration. In each iteration, the particle swarm updates its position and velocity based on the fitness function and moves towards the direction of the optimal solution. Once the optimization is completed, the obtained optimal real Gabor filter can be used to filter the image and perform surface detection on the image. It should be noted that the parameter selection and optimization process of real Gabor filters need to be optimized and adjusted according to specific image characteristics and needs. At the same time, the parameter settings of Particle swarm optimization also need to be adjusted according to the actual situation to obtain the best optimization results. The flame image texture feature extraction algorithm based on industrial boilers needs to be optimized and adjusted for specific application scenarios to achieve the best feature extraction and matching results. At the same time, it is also necessary to consider issues such as image quality and integrity, algorithm selection, and parameter settings to avoid issues such as mismatches and missed matches. Yang et al. [14] constructed a matrix feature enhancement for image texture features through feature extraction and analysis of flame images. By compressing and filtering Gaussian images, a centralized regression model data framework for image prediction was constructed. Use cameras or monitoring equipment to collect image data of industrial boiler flames. Preprocess the collected images, such as denoising and enhancement, to improve image quality and readability. Segment the preprocessed image and separate the flame part from the background part. Some common texture feature extraction algorithms can be used, such as wavelet transform, grayscale co-occurrence matrix, etc., to extract the texture features of the flame part. Use some common feature matching algorithms, such as feature point-based matching and shape-based matching, to match similar flame images. Zitouni et al. [15] analyzed and constructed a region construction texture framework based on feature analysis of image segmentation. By analyzing the pixel features of the network classifier, an efficient performance combination of the image dataset was obtained. Preprocess the collected texture images, including image format conversion, image enhancement, image filtering, and other operations to remove noise and interference from the images. Using information fusion methods, the image is divided into multiple regions and texture features such as grayscale co-occurrence matrix and wavelet transform are extracted from each region. Fusion the texture features extracted from each region to obtain a more comprehensive representation of image features. Use machine learning or deep learning algorithms to train classifiers for fused texture features and establish a classification model. Output the classification prediction results, which can be displayed and further processed using some common image processing software or programming languages. Texture image classification based on new information fusion methods needs to be optimized and adjusted for different application scenarios to achieve the best classification effect. At the same time, it is also necessary to consider issues such as the quality and integrity of texture images, the selection of feature extraction and fusion algorithms, in order to avoid misclassification and missed classification.

Based on previous research, this article discusses the application of AI and CAD in AR poster design. Based on the content of AR poster, the image feature detection algorithm is modeled. The simulation results verify the effectiveness of the proposed image feature detection algorithm, which can denoise and restore AR poster images better than the existing algorithms, and the adaptive threshold can effectively improve the quality of AR poster image restoration.

3 MODELING OF IMAGE FEATURE DETECTION ALGORITHM BASED ON AR POSTER CONTENT

The color, texture, shape, spatial relationship and other features of an image are the underlying information in the image, and they do not need special knowledge or contextual information in related fields, so they are widely used in image retrieval at present. In this article, the shape feature of AR poster image is extracted. Firstly, the edge of AR poster image is extracted by Canny operator, and the target area of AR poster image is obtained by preprocessing the contour line. Seven eigenvalues of shape invariant moments are selected as the shape features of the target AR poster image. The descriptor has the advantages of rotation, translation and scale invariance, and can describe the shape and spatial distribution information of AR poster images well, with simple calculation, especially for images with simple background and clear target outline. In order to keep the important information in the original image as much as possible, this article uses the gray information of the image and combines The schematic diagram of the image feature detection algorithm is shown in Figure 1.

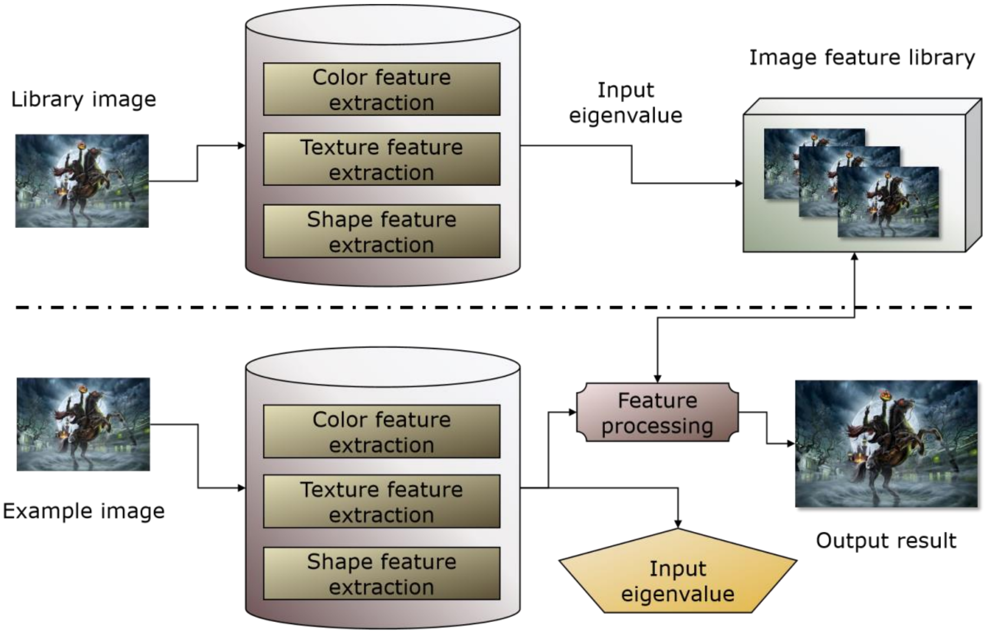

Figure 1: Schematic diagram of image feature detection algorithm.

In this article, three image feature detection modes are adopted, namely, color-based feature mode, shape-based feature mode and comprehensive feature mode based on color and shape. According to different feature detection modes, different methods are used for calculation. The model includes the automatic extraction of color, texture and shape of content-based images, and the automatic storage of various feature values in the corresponding image feature database as the basis for subsequent image retrieval. In addition, the retrieval results based on color, texture, shape features and the combination of color and texture features are analyzed respectively. Because the edge of an image has information coherence in different degrees, the amplitude and phase of each decomposition result are correlated with the adjacent results. For the pixel (x, y) of the original image, let K_j be the window width of the image, then the horizontal and vertical conjugate components are respectively:

$$\overline{W}_{2^j}^{1d} I(x,y) = \sum_{x'=-K_j}^{K_j} \sum_{y'=-K_j}^{K_j} W_{2^j}^{1d} I(x+x', y+y') \tag{1}$$

$$\overline{W}_{2^j}^{2d} I(x,y) = \sum_{x'=-K_j}^{K_j} \sum_{y'=-K_j}^{K_j} W_{2^j}^{2d} I(x+x', y+y') \tag{2}$$

The average phase of the pixel (x,y) is defined as follows:

$$\overline{P}_{2^j} I(x,y) = \arctan \frac{\overline{W}_{2^j}^{2d} I(x,y)}{\overline{W}_{2^j}^{1d} I(x,y)} \tag{3}$$

According to the threshold δ_j between phase and average phase, the phase deviation caused by noise is filtered.

The shape features of sub-objects in the image, such as region, boundary and skeleton, can be obtained by edge extraction and image segmentation. Extracting features from the segmented objects and features of all objects of the image transforms the original image into a more abstract and compact form, which makes the description of the feature vectors of the whole image more accurate. In order to realize the image information collection of visual communication technology, the texture information clustering method of rough set is used to construct multiple textures of AR poster design images, and the local edge contour features of AR poster design images are obtained. Figure 2 is a schematic diagram of the contour tracking algorithm, in which the arrow represents the search direction.

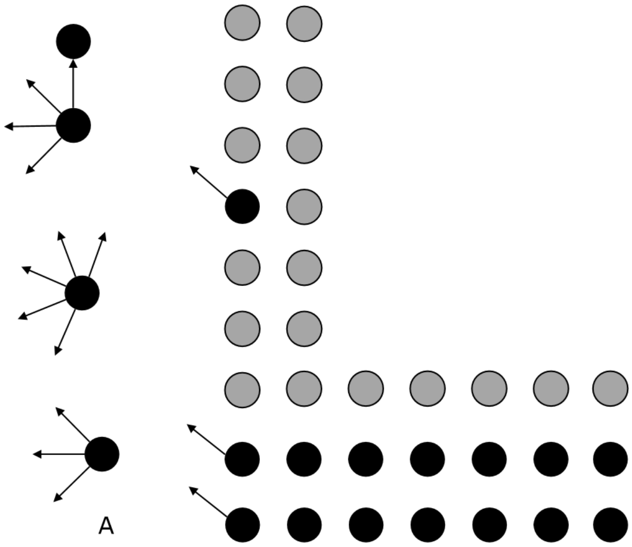

Figure 2: Schematic diagram of contour tracking algorithm.

Relaxation parameters are used to control different requirements in different environments. If it is needed to extract multi-layer contours or weak boundaries, the value can be appropriately reduced, generally between 0.1 and 0.2. But at this time, the convergence speed is slow and sensitive to noise. If only a single-layer contour needs to be extracted or the target boundary in the image is a strong step boundary, a larger value is taken, generally between 0.2 and 0.3. At this time, the convergence speed is faster, and the sensitivity to noise is correspondingly weakened. Let each pixel (p,q) of the image be filtered by Gabor filter to obtain the output value:

$$F_{mlpq} = \left| I_{mlpq} \right| \quad m = 0,1,2,3,\ldots,M-1 \quad l = 0,1,2,3,\ldots,L-1 \tag{4}$$

In this way, given an AR poster image, its texture features can be obtained from the output of Gabor filter:

$$E_{ml} = \frac{\sum_{p,q} {F_{mlpq}}^2}{\sum_{m,l,p,q} {F_{mlpq}}^2} \tag{5}$$

The denominator in the formula is the standardization factor. Its function is to enhance the content of the image and reduce the influence of illumination and contrast on the image characteristics during the shooting process. The design strategy of Gabor filter in this article is to ensure that the half-peak amplitudes of Gabor filter banks can contact each other in the spectrum and do not overlap with each other, that is, the tangency of circles in geometry. As shown in figure 3.

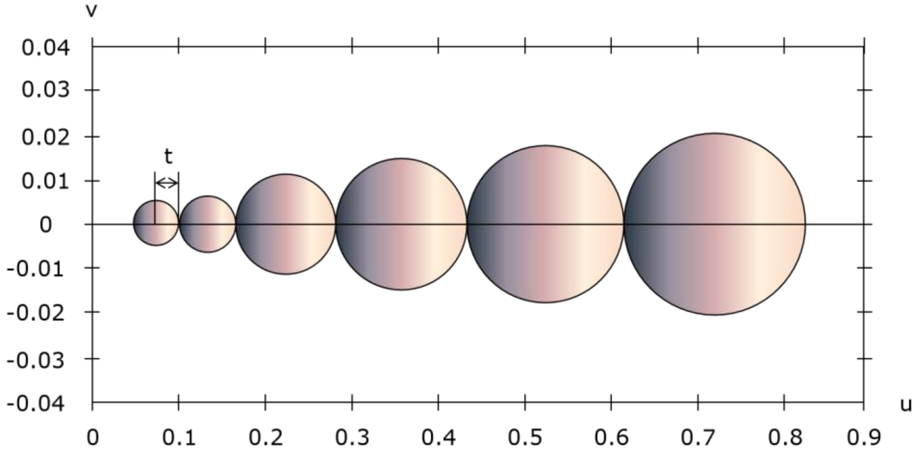

Figure 3: Filters without directional transformation at various scales.

If there is a big difference in gray values at the boundary between the object and the background in the image, then the outline of the object will form an obvious edge. That is, the gradient modulus of the image will reach the local maximum at the boundary of the object. Due to the commonness of human visual system and attention mechanism, some areas in the image can always attract the attention of observers significantly, and these areas often contain rich information. Therefore, according to the characteristics of human visual observation, using the general process and laws of human cognition, and using some underlying features of the image, we can approximately judge the significant areas of the image. Through rough set feature recognition, the frequency factor of AR poster design image is obtained:

$$U = \frac{\tau C_{\max} C_{\min} / K}{C_0 \tau} \tag{6}$$

Where C_0 is the fitness coefficient of the poster design image. The block fusion model of AR poster design image is obtained as follows:

$$L = W \otimes U + a \tag{7}$$

Where $\otimes$ designs fuzzy convolution operators for AR posters; U design the focus function of the image for the AR poster; a is the fusion factor.

4 SIMULATION EXAMPLE AND EXPERIMENTAL ANALYSIS OF ALGORITHM

The experiment in this section adopts Microsoft XP operating system, and the development language adopts object-oriented programming language C++ and development environment Visual Studio. Net and Matlab. In the experiment of image feature detection, seven moment features are extracted from the retrieved image and each image in the image database according to the above method, and the similarity retrieval between the example image and the image in the database based on invariant moment features is carried out by using Euclidean distance. The main time-consuming part of the algorithm is the stage of calculating the global optimal thresholds for the subgraphs respectively, and the objective function needs to be optimized twice before the respective optimal thresholds of the two subgraphs can be calculated. Figure 4 shows the running time comparison of matched filtering method, Otsu method and the proposed algorithm.

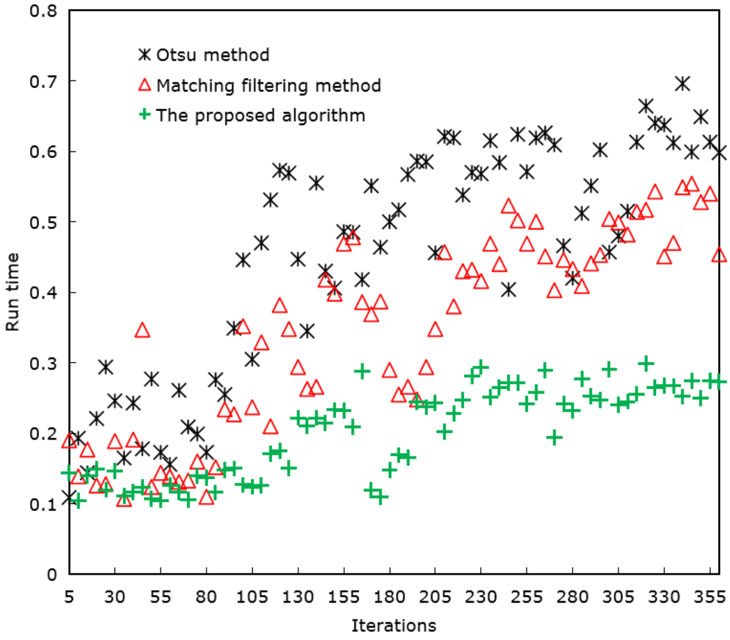

Figure 4: Comparison of running time of algorithms.

Different denoising algorithms are compared by using the same image, and the PSNR (Peak signal-to-noise ratio) and MSE (Mean square error) of image restoration are compared. The PSNR measurement method and MSE calculation formula are as follows:

$$\text{PSNR} = 10 \times \log_{10}\left(\frac{MAX_i^2}{MSE}\right) \tag{8}$$

$$MSE = \frac{1}{\text{N}} \sum_{(\text{x,y})} \left\| Rco(nx, y) - Or(ix, y) \right\|^2 \tag{9}$$

Where MAX_i is the largest pixel in the poster image, $Rcon$ is the reconstructed poster image, $Or(ix, y)$ is the real image of the reconstructed poster image, and N is the total quantity of pixels. The texture feature value of each AR poster image based on co-occurrence matrix is extracted, and the AR poster image feature detection system automatically stores it in the image feature library corresponding to the image.

In order to segment the mesh model in a meaningful way, this article defines the segmentation distance function between two vertices on the mesh by combining the minimum rule, and obtains visually meaningful mesh segmentation results by clustering the mesh vertices. At the same time, according to the adaptive image segmentation algorithm, the image is segmented and the main object or region of interest of the segmented image is extracted, so as to extract the texture features of the image. The fixed block method is used for images that cannot be segmented. To reduce the dimension of image color features and reduce the amount of calculation. The processing results of AR poster images by matched filtering method, Otsu method and the proposed algorithm are shown in Figures 5 and 6.

(a) Original AR poster design image

(b) Noise-added AR poster design image

Figure 5: AR poster design image schematic diagram.

(a) Processing result of matched filtering algorithm

(b) Otsu method processing results

(c) The algorithm in this paper processes the results

Figure 6: Processing results of three algorithms.

The main disadvantage of traditional methods is that they are sensitive to noise, which is hard to avoid in actual images. Laplacian operator is the most sensitive to noise, because it uses the second derivative, and it usually needs to smooth the image first. Prewitt operator can suppress noise, but the edges it extracts are not completely connected and disconnected to some extent. In addition, the edge image obtained by Sobel operator has the problems of discontinuity, low positioning accuracy, sensitivity to noise and multi-pixel edge. In this article, the edge extracted by Canny operator overcomes the above shortcomings, which can not only detect the edge well, but also suppress the point noise. The following experiments are carried out, and the output PSNR and MSE are calculated and compared by using the final processing data of matched filtering method, Otsu method and the proposed algorithm respectively, and the results are shown in Table 1.

Algorithm	***PSNR***	***MSE***
Matching filtering method	23.687	5.163
Otsu method	20.514	6.184
The proposed algorithm	26.137	4.261

Table 1: Parameter comparison of output results of image processing algorithms.

From the comparison results of Figure 5, Figure 6 and Table 1, it can be seen that compared with the processing results of matched filtering method and Otsu method, the algorithm proposed in this article has better performance in image denoising and is closer to the presentation effect of the original image. However, the output PSNR of AR poster design and image enhancement processing using this method is higher, which shows that the model image enhancement performance is better.

Because the physical meaning and range of the characteristic values of AR poster images are different, these characteristic values should be internally normalized. In this article, Gaussian normalization method is adopted, which has the advantage that a small quantity of ultra-large or ultra-small element values have little effect on the whole normalized element value distribution. In order to better test the performance of the proposed image feature detection algorithm, the proposed method is compared with matched filtering method and Otsu method. The test results of the test images are compared as shown in Figure 7.

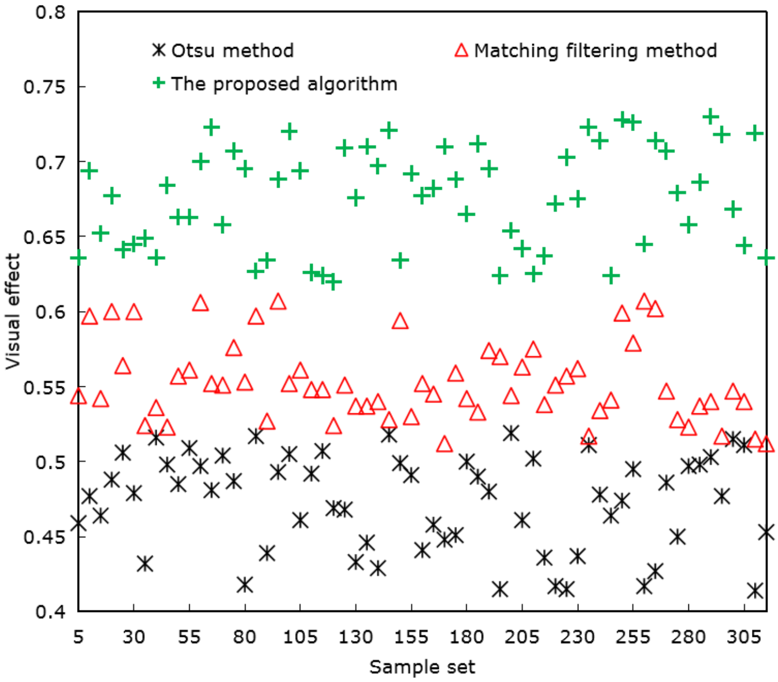

Figure 7: Comparison of image threshold segmentation results.

In this article, the image is divided into several clustering domains with different color characteristics and the matching weight of each domain is calculated. According to the matching weights of each cluster domain of the target map, a domain closest to it is selected as the matching domain in the reference map; Finally, the membership factor is introduced to weight the processing results of matching domains in the source map of various clustering domains of the target map. Figure 8 shows the evaluation results of feature detection quality of different image feature detection algorithms.

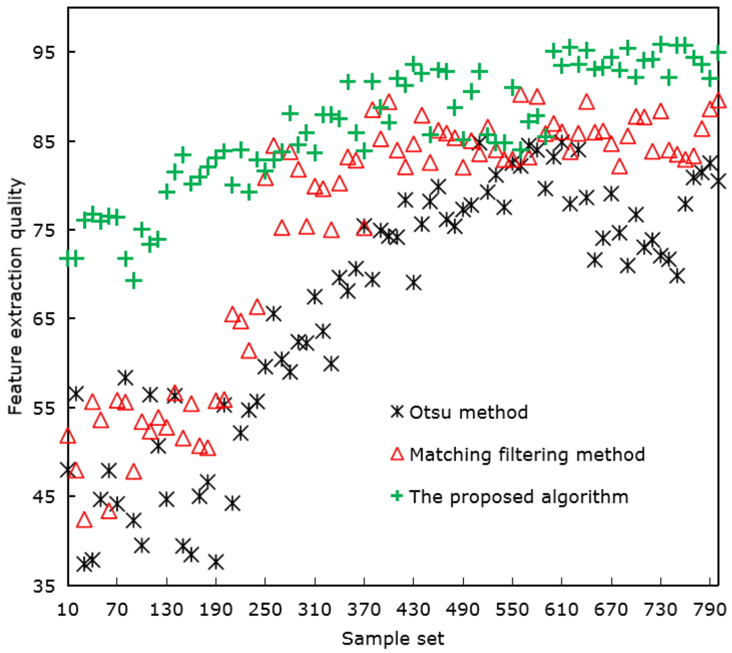

Figure 8: Comparison of feature detection quality.

In the case of iterative algorithm, its accuracy is generally above 90%. In the visual aesthetics of AR poster design, the application of AI and CAD can make designers have a higher experience in geometric design of designed works, and at the same time make AR poster works more visually advantageous. The simulation results in this section verify the effectiveness of the proposed image feature detection algorithm. Compared with the existing algorithms, it can better denoise and restore the AR poster image, and the adaptive threshold can effectively improve the restoration quality of the AR poster image.

5 CONCLUSIONS

In recent years, AI and CAD have been highly valued in the field of design. The application of AI and AR technology has expanded and enriched the performance space of posters, and made the posters change from a single two-dimensional static form to a multi-dimensional dynamic interaction, presenting a new visual form of the integration of technology and art, giving the posters new "vitality". This article discusses the application of AI and CAD in AR poster design, and models the image feature detection algorithm based on the content of AR poster. Different from the traditional wide-value segmentation method, the proposed method combines the threshold selection process with human visual characteristics, and proposes a visually consistent adaptive image threshold segmentation method. The simulation show that compared with the matched filtering method and Otsu method, the proposed method achieves better accuracy. In the case of iterative algorithm, its accuracy is generally above 90%. The results verify the effectiveness of the proposed image feature detection algorithm, which can denoise and restore AR poster images better than the existing algorithms, and the adaptive threshold can effectively improve the quality of AR poster image restoration. The color, texture and shape features of AR poster image extracted in this study can meet the description requirements of AR poster image content, and have certain reference value and practical significance for promoting the growth of innovative design of AR poster based on AI and computer-aided.

Shucheng Liao, https://orcid.org/0009-0009-3494-6332
Chun-Liang Lin, https://orcid.org/0009-0003-3999-6167

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