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Research Article

Art Effect of Photographic Darkroom Stunt Simulation Based on Mobile Computing to Synthesize Images across Image Moving Selected Regions

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Prior to the advent of digital image processing technology, image composition primarily used human vision to identify colors and artificially convert them. However, manually synthesizing and transforming graphics images will not only consume a lot of manpower, time, and energy but also due to manual limitations in the process of synthesizing and coloring the pictures, the resulting pictures cannot meet people's needs. In order to improve the speed and quality of image synthesis, and to synthesize the pictures people need more quickly and accurately, this article synthesizes the image based on the movement calculation across the selected area of the image and analyzes the photographic darkroom special effects of the synthesized image to simulate the artistic effect. Using case analysis method, literature analysis method, and other methods, the database was collected and a model of photographic darkroom stunt simulation artistic effect recognition was built. The results of the study found that the composite image based on the movement calculation across the selected area of the image is better than the composite image of other algorithms, and the quality of hue and saturation is more than 30% higher than other synthesis methods. It should be verified by experiments. The results are significantly different. This shows that the composite image based on moving calculation across the selected area of the image can achieve good results in the photographic darkroom stunt simulation artistic effect.

1. Introduction

Which are the basic information of society, are a bridge between 3D objects and 2D information. It allows people to simply build three-dimensional shapes in their consciousness through images. Images are mainly divided into analog images and digital images. The images that can often be seen in life are analog images, such as books, advertisements, televisions, and pictures [1, 2]. Digital image is a form of functional expression that converts analog images into information that can be processed by a computer. The analog images obtained by various devices such as cameras and scanners can be processed into digital information. The form of the digital information of an image is usually a two-dimensional function, where the parameter domain of the function is the coordinate of the pixel of the image, and the value domain is the value of the image pixel, which often represents its color information [3].

As an important branch of information fusion, image fusion integrates the disciplines of sensor technology, signal processing, image processing, and artificial intelligence and is an effective way to accurately obtain image information. Multifocus image fusion is the focus of research in the field of multisource image fusion, overcoming the problem of single images in terms of spectral, shape, and spatial resolution [4–6]. Among them, pixel-level fusion information is less lost, and more detailed information is acquired, which has become the mainstream direction of multifocus image fusion research. However, pixel-level fusion requires high registration accuracy, and a large amount of image details need to be processed in the fusion process, and the real-time performance is poor. With the continuous improvement of information technology, various image fusion technologies will be widely used in various fields. In the continuous application and research process, it will also continue to develop and improve. Detailed research on the basic theory, methods,

and applications of image fusion technology proves to have very important practical significance for the development of the national economy, defense construction, and follow-up work of image processing [7, 8].

For the research of synthetic images, experts at home and abroad have also done long-term research. Image synthesis is first carried out in the analysis and processing of remote sensing images. Since then, the fusion of infrared images and visible light images has gradually become a new research hotspot [9]. Abroad, MChandana et al. proposed a multifocus medical image fusion method based on wavelet transform and conducted experiments on CT, MRI, and X-ray photographs. Experiments show that it has ideal performance. HZMa et al. proposed a new multifocus image fusion method, which considers the energy of low-frequency coefficients instead of focusing on the fusion rules of high-frequency coefficients. The simulation results prove the feasibility of this method. However, image fusion based on wavelet transform has two main shortcomings: lack of translation invariance of various scales and poor direction selectivity [10]. In order to make the image effect more natural and the visual effect more realistic, Cohen may propose a color-coordinated color migration algorithm. The algorithm uses a suitable palette to perform color migration on the reference image, and the color of the image is balanced and coordinated by changing the foreground or background hue [11]. In China, Xiang Shiming et al. proposed a pyramid model of color migration. The idea of this algorithm is to realize the offset between the reference image and the corresponding subblock information of the target image through comparison, so as to achieve the purpose of color offset between images [12]. In addition, Teng Shenghua et al. proposed a color migration algorithm by analyzing the extended nature of color from local to global and solving the Laplace equation [13]. When performing color migration on text images, Ru Chao proposed a color migration algorithm for text images, such as unclear text borders and weak text edge fonts. By using the guided filtering enhancement algorithm on the original image and the reference image to increase the proportion of the text in the image, and then using the color shift algorithm to calculate the color shift coefficient of the enhanced source image and the reference image, the color shift effect of the text image is obvious to improve [14]. Su Xinjun proposed color migration based on texture similarity. Through the principal component analysis of the texture features extracted from the image, the feature texture space is constructed, and the image is segmented on this basis. The region formed after segmentation establishes the mapping relationship between texture information and color information and realizes the color shift. The diffusion problem of color shift at the boundary [15].

This article is based on existing group photos and manages the group photo image set. The image registration process slows down the calculation due to the inaccuracies in the initial matching point pairs. This paper proposes a feature matching method based on disparity constraint and cluster analysis. The cluster analysis is introduced into the feature point image registration method, and this stage is improved. Real-time and accuracy of registration results. The feature point detection and edge detection are used to mark the feature points in the photo, and different methods are used to synthesize the characteristic area and the non-characteristic area, which not only achieves the effect of feature synthesis but also shortens the synthesis time.

2. Synthetic Image Method

2.1. Image Registration. Normally, the original image cannot be directly used in the vision system, so preprocessing becomes an indispensable process in image fusion. Commonly used preprocessing methods in image fusion include image grayscale transformation, size transformation, and image registration. In image fusion processing, especially pixel-level image fusion processing, the fusion quality drops sharply due to slight differences in pixel positions and pixel gray level noise contamination. This is important for the overall performance of the image fusion system as a whole. Therefore, image registration has become an indispensable preprocessing step in image fusion [16–18].

Image registration can be understood as the process of matching (corresponding, overlapping, etc.) images of the same scene obtained by one or more sensors (usually different types of sensors) under different time and space conditions, that is, establishing feature correspondence. Make the spatial positions of the same target information in different images overlap as much as possible. It can usually be regarded as a key step in the preprocessing stage of technology such as image fusion and target recognition. At the same time, it has been widely used in medical image processing [19]. Among them, the feature point matching method is the key direction, which mainly includes feature point detection and matching, transformation model estimation, image resampling, and transformation. Among them, feature point detection and matching is the most difficult and research hotspot in registration technology. These two links are related to the real-time and accuracy of image registration [20].

As the basic carrier of recorded information, images play a huge role in daily life production. Various image processing and applications are gradually being valued by researchers in various fields. For example, the colorization of medical images can be realized by a variety of algorithms based on color shift, which improves the accuracy of diagnosis and treatment and the efficiency of image segmentation; the color shift of multilevel region matching can realize the natural transition color of the video; structural texture decomposition uses color shifts to perform detailed processing on fabric images. Color shifts based on texture similarity can achieve better texture fusion and achieve the desired objectives for better results in 3D reconstruction [21].

According to the different multisource image acquisition channels, multisource images can be roughly divided into multisensor image sources, remote sensing image sources, and similar sensor image sources (including multifocus images, multiexposure images, and time series images). The system functions of the image sources are different, and it is impossible to establish a general fusion scheme and quality evaluation mode. Because of this, scholars in the field of image fusion are still looking for a general theoretical

framework. Therefore, it is difficult to classify image fusion technology uniformly and clearly [22]. As far as pixel-level image fusion is concerned, the existing algorithms are mainly based on image fusion in the transform domain and image fusion in the space domain. Image fusion based on the transform domain first needs to transform the multisource images and, then, complete the fusion at the pixel level, while the image fusion based on the spatial domain is usually directly fused at the pixel level of the image. The two pixel-level image fusion methods are not independent of each other. In fact, according to different purposes and different images, various methods are usually used in combination [23, 24].

2.2. Image Embedding. Clustering usually means splitting a particular set into multiple classes. This increases the correlation within the class and makes the correlation between the classes uncorrelated or low. Clustering uses "correlation" as a measurement. For example, in zoology, animals are divided into viviparous and oviparous animals according to the way they reproduce their offspring. This is a simple clustering method based on certain characteristics. To put it simply, clustering is based on a certain classification standard, and the data is summarized and classified according to the classification standard, so that the objects within the class have greater relevance, and the objects outside the class have greater differences [25]. Clustering is usually divided into three steps. First, select the features of the object, extract them, and describe the correlation between the objects according to the extracted features. In group image coding, the correlation between images is determined by the distance between the images. Description: second, select the appropriate clustering algorithm and cluster the given objects to get the clustering results; third, test the clustering results [26].

After the reference image is determined, a series of transformations need to be performed on it to generate a transformed image. The transformed image has a stronger correlation with the reference image, and better coding efficiency can be obtained. Then, use the model obtained after screening to perform perspective transformation and photometric transformation on the reference image to obtain the final transformed image. The formula is

$$P(f_1, \cdots, f_n) = P\left(f_1 \middle| f_{n(i)}\right), \tag{1}$$

where $f(i)$ refers to the neighborhood node of the ith node in the image. The test photo and output portrait can be expressed as

$$\begin{aligned} P\left(I_s, I_p\right) &= P\left(I_s^1, \cdots I_s^n, I_p^1, \cdots I_p^n\right), \\ &\varepsilon \prod_{(i,j)} \psi\left(I_s^i, I_s^j\right) \prod_k \phi\left(I_s^i, I_p^i\right). \end{aligned} \tag{2}$$

The formula (i, j) represents that i and j are two adjacent positions. According to the Markov weight field model, the relationship between the photo block and the corresponding weight is shown in the following formula:

$$P\left(I_p^1, \cdots, I_p^n, w^1, \cdots, w^n\right) \varepsilon \prod_{i=1}^{n} \varphi \prod_{(i,j)} \varphi\left(w^i, w^j\right). \tag{3}$$

Among them, similar to the MRF algorithm

$$\begin{aligned} \phi &= \left(I_p^i, w^i\right) = \exp\left\{-\frac{\left\|I_p^i - \sum_{k=1}^{k} w_k^i I_{pk}^i\right\|^2}{2\sigma_d^2}\right\}, \\ \varphi\left(w^i, w^j\right) &= \exp\left\{-\frac{\left\|\sum_{k=1}^{k} w_k^j o_k^{ji}\right\|^2}{2\sigma_s^2}\right\}. \end{aligned} \tag{4}$$

Similarly, i and j are two adjacent image blocks, which o_k^{ij} represent the pixel vector on the ith block in the overlapping area when the ith block and the jth block overlap.

2.3. Image Color Processing. With the advent of the Internet information age, all kinds of information are transmitted to the Internet at all times, and the number of pictures that can be obtained has increased significantly. With the acquisition of massive picture information, more and more channels are available for obtaining pictures. Many, convenience has also been significantly improved [27]. As the basic carrier of recorded information, images play a huge role in daily life production. The various processing and applications of images are gradually being valued by researchers in various fields. For example, colorization of medical images can be achieved by a variety of algorithms based on color transitions. This improves the accuracy of diagnosis and treatment and the efficiency of image segmentation. Color transitions with multilevel region matching allow you to achieve natural transition colors in your video. By structural texture decomposition. The color migration can be used for deep processing of cloth images; and the color migration based on texture similarity can achieve better texture fusion, so that it can get better results in three-dimensional reconstruction and achieve the desired purpose [28]. It plays an important role in life, health, security control, satellite, industry, entertainment, and commerce. Since most of the obtained original images are meaningless, in order to meet different needs, people need to process the colors of the obtained images.

With the rapid development of image processing technology in recent years, color migration is an important research issue in the field of image processing. It still has very important application value in image segmentation and texture style changes. Color migration is currently widely used in various fields. For example, in various styles of picture apps, the seasonal information expressed by the image can be easily changed through color migration, and the rendering of the scene and the production of special effects can be achieved through color migration [29]. In the field of remote sensing, continuously collected images cannot maintain color consistency due to light temperature and other reasons. Through color migration, the collected pictures can be unified, so that the stitched panoramic image has a natural transition. In terms of image texture style, color migration can

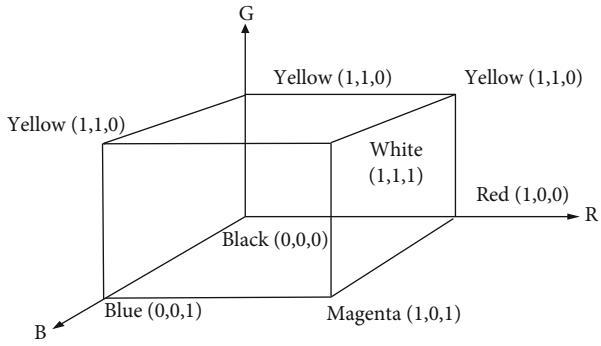


Figure 1: Color RGB color space.

make the transition and fusion of texture more natural; in terms of the expression style after image stitching, a consistent effect can be obtained. With the development of virtual reality technology, color migration will also have important application value in this field. Because users need to get a high degree of natural feedback in the simulation environment, in the 3D real-time modeling, the required scene can be quickly changed through color migration, making the constructed scene more natural, and the virtual reality and color scenes are enhanced. All aspects have significant significance [30].

Color is a color that is perceived through light, brain, and life experience. Color space is the basis for studying the color migration of pictures. This article briefly introduces the RGB color space. As shown in Figure 1, the RGB color space obtains different colors through different coordinate values of R, G, and B, that is, by comparing red, green, and yellow. The coordinate value of each color produces the corresponding color value. But in fact, the superposition of the three primary colors cannot produce all the colors. The colors contained in the RGB space are located in the area as shown in the figure, and the corresponding coordinate points are different colors. The diagonal line means that the three components of the point have the same value, which means that the image based on the diagonal line color is a grayscale image without color.

Color is expressed mainly through hue, saturation and intensity. Color conversion as formula

$$H = \begin{cases} \theta & B \le G, \\ 360 - \theta & B > G. \end{cases} \tag{5}$$

Here,

$$\theta = \arccos\left\{ \frac{1/2[(R-G)+[R-B]]}{(R-G)^2 + (R-G)(G-B)^{1/2}} \right\}. \tag{6}$$

The saturation is as follows:

$$S = 1 - \frac{3}{(R+G+B)}[\min(R, GB)]. \tag{7}$$

Intensity component is as the following:

$$I = \frac{1}{3}(R+G+B). \tag{8}$$

Perform brightness regulation processing on the image, and determine the mapping relationship between the input image color area to which the pixel belongs and the reference image color area by calculating the matching similarity between the reference image pixel point and the input image color area, and get A one-to-one mapping relationship between the reference color area of each image and the input area.

$$\begin{aligned} l_{ref(n)} &= \frac{\sigma^l_{\text{in}}}{\sigma^l_{ref(n)}} * \left(l_{ref(n)} - \mu^l_{ref(n)} \right) = \mu^l_{ref(n)}, \\ f(\text{in}_i, ref_i(n)) &= \frac{1}{p^i_{ref}} * \left| \mu_{ref_i(n)} - \mu_{\text{in}_i} \right|. \end{aligned} \tag{9}$$

Because the color migration based on the optimal transmission theory does not depend on the color space, and the theory does not require a single point-to-one mapping in color matching mapping. When the image is relatively large, it stores more pixels and more color values. Optimal transmission between the reference image and the shape image will consume a lot of time. Therefore, it can be performed by clustering the image colors. Processing to improve the efficiency of transmission matching. The algorithm flow chart is shown in Figure 2:

The key to color migration is to choose a suitable and superior color matching mapping relationship. When various algorithms establish color mapping, they consider the direct transmission between colors. When there are more color pixels in the image, the time complexity of the algorithm processing will increase [31]. After clustering the image colors, when matching, it is easy to cause unnatural color transitions and other phenomena. Therefore, the algorithm in this chapter proposes a color matching strategy based on the optimal transmission theory on this basis and considers that when the color difference of different reference images changes greatly, it is hoped that the color change of the target image is not very obvious, so that it can be independent the purpose of finding a variety of different reference images to obtain colorful result pictures [32, 33].

3. Image Synthesis Experiment

3.1. Subjects. In this paper, we process the images selected for image features to resemble the color distribution between the images, reducing the color noise caused by discrete optimal transmission multimapping and increasing the number of reference images. The phenomenon can be reduced. It can be adjusted sensitively to changes. In order to normalize the color of the image, the similarity of the color distribution between the images needs to be measured. Use relative entropy to measure the similarity between two color distributions. The selected image is shown in Figure 3:

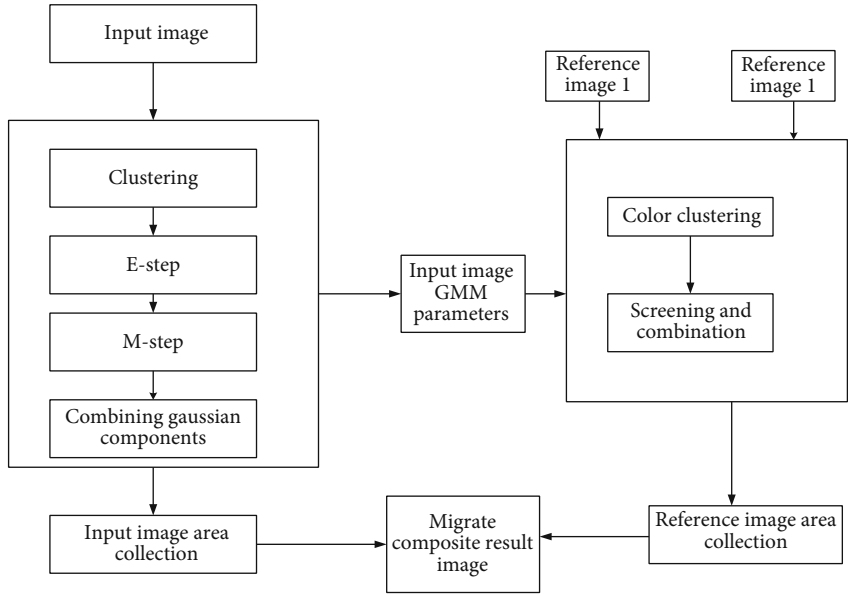


Figure 2: Image color migration process.

Figure 3: Selected picture.

3.2. Image Preprocessing. Because the color migration based on the optimal transmission theory does not depend on the color space, the theory does not require a single point-to-one mapping in color matching mapping. When the image is relatively large, it stores more pixels and more color values. Optimal transmission between the reference image and the shape image takes a lot of time. Therefore, it can be done by clustering the colors of the image, processing to improve the efficiency of transmission matching. When the image is large, the stored color information value is large, and the mapping and matching between pixels will consume a lot of time. Therefore, clustering the image colors can simplify the optimal transmission and mapping and matching between image colors and time.

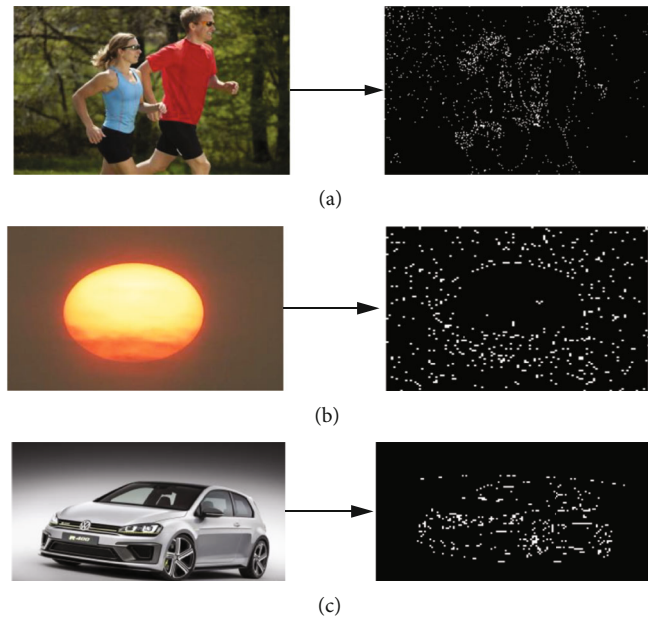
3.3. Image Clustering. First, randomly select the initial cluster points of a given number of clusters, and update the information of the cluster center points through each iteration. This paper takes the cluster centers obtained by the K-means algorithm and their proportions in the color space as the new cluster center. Reclassify the pixel to the cluster to which the closest center point belongs, recalculate the updated cluster center, and the number of pixels contained in each cluster, and perform the above operations on all points in the cluster until the center point of the cluster class obtained after a certain iteration is consistent with the center point of the last cluster class, or the maximum number of iterations is reached. Stop the iteration at this time and save the clustering results, otherwise repeat the operation.

3.4. Statistics. All data analysis in this article uses SPSS19.0, statistical test uses two-sided test, significance is defined as 0.05, and $p < 0.05$ is considered significant. The statistical results are displayed as mean ± standard deviation ($x \pm SD$). When the test data complies with the normal distribution, the double T-test is used as the comparison within the group, and the independent sample P test is used as the comparison between the groups. If the regular distribution is not sufficient, two independent samples and two related samples will be used for inspection.

4. Experimental Analysis of the Artistic Effect of Image Synthesis

4.1. Image Processing. We first perform relevant processing on the selected pictures, use MATLABR2010a version software to write programs, process moving pictures and non-moving pictures, and compare different experimental results. The results are shown in Figures 4 and 5.

From the picture, we can see that in the traditional method of detecting moving targets, when the target and background colors are similar, problems such as incomplete

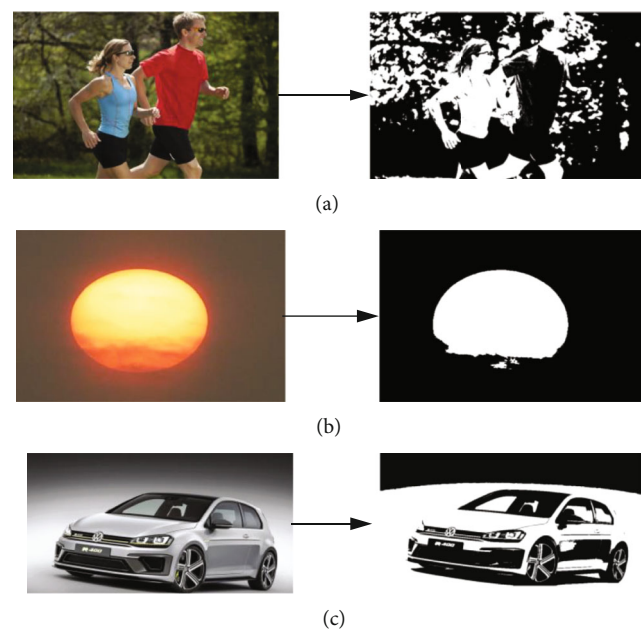


(a)

(b)

(c)

Figure 4: Traditional filter processing.



(a)

(b)

(c)

Figure 5: Using the algorithm of this article.

detection of the target, discontinuous contour or even no detection of the target will occur, as shown in the detection result in Figure 4. The improved method significantly improves this problem, makes the detected contour of the moving target clearer than the traditional method, and enriches the internal content of the contour. It can extract the moving target better and completely and segment the target area more accurately. In the traditional algorithm and the algorithm in this paper, the image parameters are shown in Tables 1 and 2:

Through comparative analysis, the most similar image set selected by the optimal insertion image set selection method is consistent with the subjective judgment of the human eye. The optimal insertion image set selection is shown in the table. Moreover, the cosine similarity between the most similar image set and the subsimilar image set generally has a big difference. Therefore, the optimal insertion image set selection method based on the packet model is suitable for selecting the image set with the highest similarity for the insertion image in the group image.

Table 1: Image parameters of traditional algorithms.

Insert picture	The most similar image set selected by the algorithm	Cosine similarity	The most similar image set selected by the algorithm	Cosine similarity	Subjectively judged set of most similar images
A	Corner	0.7713	Sculpture	0.6441	Corner
B	Defense	0.7197	Xidian	0.3025	Defense
C	Sculpture	0.6331	Corner	0.4965	Sculpture

Table 2: Image parameters of the algorithm in this paper.

Insert picture	The most similar image set selected by the algorithm	Cosine similarity	The most similar image set selected by the algorithm	Cosine similarity	Subjectively judged set of most similar images
A	Corner	0.9213	Sculpture	0.8341	Corner
B	Defense	1.0197	Xidian	0.5139	Defense
C	Sculpture	0.8246	Corner	0.6532	Sculpture

(a)

(b)

Figure 6: Synthetic picture effect.

4.2. Image Synthesis. Regularization processing is mainly used in the field of image restoration. Because regularization usually repairs jump edges in image restoration, and the optimal transmission mapping obtained based on the discrete optimal transmission, the color transfer is irregular in the performance of the color result image density. We can use the regularization of the pixel area to perform denoising processing on the obtained optimal transmission mapping result to improve the quality of the result of the color shifted picture. As shown in Figure 6, we combine Figures 6(a) and 6(b).

From this figure, you can see that the distances between the inserted and referenced images in the two image sets are quite different. This is because the inserted image and the corresponding image of the node in the image are completely different. The A image set is compared to the nodes in the B image. The corresponding image difference is small, so the distance difference to the reference image is small. The parameters between the two figures are shown in Table 3.

Table 3: Differences in image parameters.

	A	B
Sculpture	40.75	90.38
Defense	85.50	87.95
Patheon	69.20	91.71

It can be seen from the table that when only one image is inserted, the coding structure generated by the new coding structure adjustment method for image insertion selects a reference image for the inserted image, and uses the selected reference image to encode the inserted image. The efficiency is better than the node-based structural adjustment method.

4.3. Different Filtered Synthetic Picture Artistic Effects. We compare the parameters of pictures synthesized by different methods. Different image synthesis algorithms are prone to synthesis errors and inaccurate synthesis when facing unclear image edges. Through comparison, we can find the best synthesis method, and improve the artistic effect of the image. The details are shown in Table 4.

From the table, we can see that the quality of the composite image is different in different algorithms. From the table, we can see that in terms of image parameters, whether it is hue, saturation, etc., the image quality of the method used in this article is all. The parameters are higher than other methods, which shows that the method used in this article can have certain advantages in image synthesis. In order to verify the superiority of the method in this paper, we have performed multiple statistics on the relevant parameters and calculated the error between them, as shown in Figure 7:

From Figure 7, we can see that the errors between the data used in this experiment are all less than 0.05, which proves that the experimental data is within the error and there is no significant difference, so it can be used. This shows that the image synthesis method used in this article is better than other image synthesis methods.

Table 4: Image synthesis under different algorithms.

	Tone	Saturation	Brightness	Transparency	Pixel
Group image synthesis	2.02	2.16	2.36	2.28	2.44
Multi-focus image synthesis	2.03	2.46	2.47	2.23	2.04
High dynamic image synthesis	2.06	2.09	2.5	2.14	1.82
Fast processing of image synthesis	2.03	2.31	2.24	2.22	2.12
Move composition across images	4.94	5.29	4.9	5.16	5.11

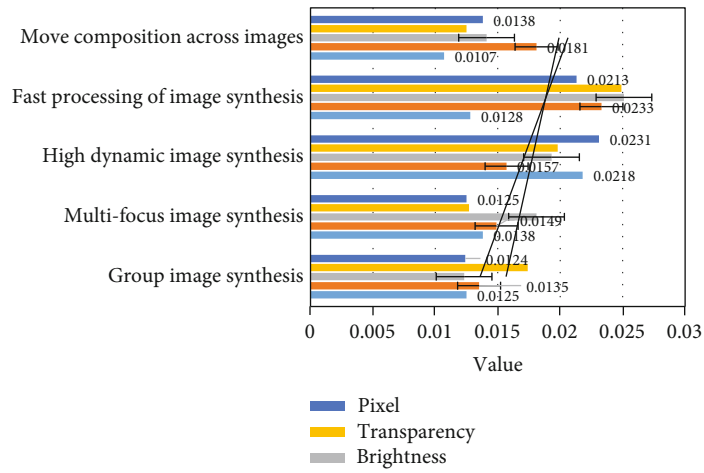


Figure 7: Parameter difference value.

5. Conclusion

Graphic image composition is an important method in information processing, pattern recognition, and artificial intelligence. Composite images also have many application areas such as cultural relic restoration, styling, 3D texture fitting, and graphic search. Image color is not only used in traditional application areas, such as changing the color to make it richer and fuller, and coloring pictures and videos such as black and white fading. In emerging computer fields such as artificial intelligence, image retrieval, and art, 3D reconstruction still plays an important role. This paper has done an in-depth study on the color migration between color images and the color migration of grayscale images in the composite image, and the color transformation of video images is also studied. Because the information contained in the grayscale image is less than the information contained in the color image, the coloring of the grayscale image is researched, even if the algorithm results show a good grayscale image color migration result, and there is no in the running time. But for the coloring of grayscale images, the richness of colors is still a problem that needs to be solved. The evaluation method of image synthesis still relies on subjective methods. Different subjective evaluation standards may result in different evaluation results. With the development of algorithms such as machine learning, image migration algorithms can obtain the desired color migration more objectively result.

Data Availability

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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