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Retraction

Retracted: Optimization of Color Enhancement Processing for Plane Images Based on Computer Vision

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) 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.

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[1] Y. Jiao, "Optimization of Color Enhancement Processing for Plane Images Based on Computer Vision," *Journal of Sensors*, vol. 2022, Article ID 3654743, 9 pages, 2022.

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Research Article

Optimization of Color Enhancement Processing for Plane Images Based on Computer Vision

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As the main carrier of information transmission, plane images play an important role in the current network era. In order to enhance the color of the plane image, optimize the image effect, and solve the problem of image distortion with large color difference, a color enhancement processing optimization method is proposed based on the technical support of computer vision. According to computer vision theory, a computer vision model for adjusting perceived color and brightness is constructed. Combining it with the bilateral filtering algorithm, a color enhancement processing optimization model is obtained, which consists of three main stages: illumination information parameter estimation and image color correction, reflection coefficient parameter estimation and image color correction, and adaptive filtering. By estimating illumination information parameters and reflection coefficient parameters, the secondary gamma correction of image color is realized. After being processed by the bilateral filtering algorithm, the final optimized image is obtained. Verified by the subjective and objective evaluation results, the positive correlation index values of this method are all high, 8.0246, 16.4526, 0.9037, and 15.0246, respectively, and the negative correlation index value is low, 49.4169. It is proved that the proposed method can effectively suppress the halo and artifacts and obtain the image color quality that satisfies the visual perception. It not only enhances the image color but also retains the details to the greatest extent.

1. Introduction

A major way for humans to obtain information is through vision [1]. According to relevant statistics, in the process of obtaining information, most of the information is realized by the naked eye [2]. The information carrier seen by the human eye is mainly based on images. As the carrier of information collection, transmission, and storage, it plays an important role in daily production and life [3]. The technology related to digital image processing has been greatly developed, and two ways of application have gradually formed: one is to change the graphic information according to people's visual habits, so as to obtain high-quality visual interpretation, and tt can handle the process of image acquisition, transmission, and storage well [4, 5].

As far as the current digital image processing technology is in many application fields such as archaeology, astronomy, medicine, national defense, biological science, and industry, for machine interpretation, the key to the application of digital image processing technology is how to use reasonable computer processing methods to extract images. Available information is in [6, 7]. Several typical aspects are as follows: automatic identification of language, fingerprints, faces, etc. and military reconnaissance of national defense [8–10]. Therefore, image quality is particularly important, and its pros and cons have a direct impact on the acquisition and effectiveness of image information and determine the satisfaction of human vision needs [11].

Image processing is an effective means to improve image quality and is a classic problem in image research. Image processing techniques are generally divided into binary image processing and color image processing [12, 13]. From the nineteenth century to the middle of the twentieth century, the color of images gradually transitioned from the era of black and white to the era of color, and in the increasing popularity, it developed into the current era of true color and wide color gamut, making human life no longer inseparable from color [14]. The authenticity of color is the main requirement of image storage and display. When processing color images, it is necessary to focus on solving the problem of color distortion [15, 16]. Therefore, the processing of color images requires a higher level of skill than grayscale images.

Based on the above research background, many scholars have paid close attention to the processing technology of color images and have carried out extensive discussions. For example, in order to make the contrast and color fidelity of the image more balanced, the reference [17] uses the adaptive weight Retinex model to enhance the low frequency band of the image and remove the noise in the high frequency band of the image. The luminance component is reconstructed using inverse wavelet transform. After gamma correction, the enhancement processing of color images is realized. The experimental results verify the balanced effect of the algorithm on contrast and color fidelity. In [18], an enhancement method is proposed for the problem of light attenuation of underwater color images. The red and blue channels are masked by color correction, the contrast is improved according to the color constancy, and the distorted color is restored by adaptive histogram equalization. Image edges and details are processed with fast local Laplacian filters and rolling guided filters, respectively. The results show that this method is superior in enhancing the naturalness of images. Reference [19] generates a color projection image according to the designed nonlinear mapping function and the initial image, instructs the generative adversarial network to learn the inverse function of the nonlinear mapping function, and restores the color projection image. Reference [20] utilizes a progressive collaborative representation framework consisting of offline training and online optimization to remove mosaics from color images. Evaluated on two commonly used test datasets, the framework helps improve image demosaicing performance. Reference [21] uses the K-means method to determine the color set of the image, builds a color image segmentation variational model, and obtains the most suitable color for each pixel. Through the l1 and l2 regularizers, the step effect is overcome, and the segmentation accuracy is improved. The experimental results demonstrate the effectiveness and robustness of the method. By summarizing the above literature methods, it is found that image processing techniques can be roughly divided into denoising, segmentation, enhancement, and other means. Although the existing method can restore the overall color of the image, it still cannot effectively solve the problem of image distortion with severe distortion and large color deviation. Most methods based on image color enhancement apply certain prior knowledge to solve the enhancement problem of flat images, but they often have limitations, such as dust, smoke concentration in the environment, and changes in lighting conditions. Assumptions are challenged, thus affecting the color enhancement of flat images. Evaluation metrics for image enhancement algorithms are a challenging problem. Although there are some indicators for evaluating image quality, the evaluation results of these indicators are far from the perceived quality of the human eye. The index value evaluates a certain aspect of the enhanced image, and the subjective evaluation of the human eye will comprehensively consider various details of the image, such as whether the image is distorted, whether there is a color cast, and whether the occluder is completely removed. Therefore, summing up the scientific evaluation index for the color enhancement problem of plane image is also a difficult point worth studying. In order to facilitate the postprocessing of the image, it is necessary to perform color enhancement on the color image. In particular, the color enhancement of images acquired in special scenes is more realistic. This has important practical implications for many key areas, for example, the images collected by the traffic monitoring system, security monitoring, observation of patient behavior changes in night wards, shooting in modern military reconnaissance, and military intelligent human/vehicle image transmission and other scenarios.

Most of the existing research methods use more traditional algorithms or models. Or use adaptive weight Retinex model and wavelet transform algorithm to process images in frequency bands or use adaptive histogram equalization and Laplace filter to restore distorted colors.

With the development of information technology, computer vision is always in an advanced stage, both in theory and technology, and can meet the needs by processing and analyzing digital images. Therefore, based on the theory of computer vision, this paper constructs a computer vision model according to the relationship between the ambient illumination, the reflected light of the object, and the observed image. Taking this as the basic model structure, a processing optimization model for enhancing the color of plane images is formed by using parameters such as illumination information parameter estimation and image color correction, reflection coefficient parameter estimation and image color correction, and adaptive filtering. In order to increase the color clarity and vividness of the image, the image is more convenient for subsequent analysis and identification operations, and the effectiveness of the image in the fields of monitoring, medical image detection, and military reconnaissance is improved.

2. Construction of an Optimization Model for Image Color Enhancement Processing Based on Computer Vision

2.1. Computer Vision Model. According to computer vision theory [22], a set of adjustment models that can completely describe the human visual system's perception of color and brightness to the naked eye is constructed, as shown in Figure 1. The model reflects why the same object maintains a constant color under different lighting conditions. Whether it is in weak sunlight, strong sunlight, or night light, the perceptual effect of the color feedback of the same object to the human visual system is the same. Since the interaction of light and matter is the decisive factor in human vision's perception of color, the human eye perceives color only directly by the reflection properties of the surface of the object. If the reflectivity of the surface of the object is low, the visually perceived color is darker; otherwise, it is brighter.

The computer vision model divides the image that can be seen by the naked eye into two parts, namely: the illuminance image and the reflection image. The product of the ambient illuminance and the reflected light of the object is the image

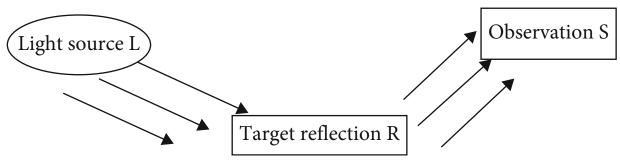

Figure 1: Schematic diagram of computer vision model.

pixel point. Therefore, the following expression is used to represent the z image $S(x, y)$ seen by human vision:

$$S(x, y) = L(x, y) * R(x, y)(1). \tag{1}$$

In this formula, L represents the ambient illuminance, covering the illuminance near the object, and R represents the reflected light of the object, which refers to the detailed information of the target, where L is used to describe the slow-changing low-frequency information in the image, and R is used to describe the high-frequency detail information that accounts for a large proportion in the image.

For the changes of illuminance and reflected light, it is generally possible to identify and distinguish the illuminance in the image from the reflection change of the surface of the object by the naked eye and to see the color of the image that changes due to different illuminance. After the brain's reverse deduction, the color constancy of the image is maintained [23]. To sum up, the ambient illuminance L is the main basis for limiting the variation range of the image brightness, and the essential characteristics of the image object are determined according to the reflected light R of the object. Fundamentally speaking, the computer vision model obtains the reflection properties used to express the essence of the target object by removing the ambient illumination in the image, so that the object presents its original appearance.

2.2. Optimization Model for Color Enhancement Processing of Plane Images. Since the computer vision model does not have a good processing effect on images with severe distortion and large color deviation, in order to greatly improve the quality of such flat images, this section combines the computer vision model with the bilateral filtering algorithm to design an adaptive filtering optimization model for planar image color enhancement processing as shown in Figure 2. After three stages of processing: model illumination information parameter estimation and image color correction, reflection coefficient parameter estimation and image color correction, and adaptive filtering, the color of the plane image can be enhanced.

The specific methods of each key component in the model when realizing the color enhancement processing of the plane image are as follows:

(1) Estimation of illumination information parameters and image color correction: use the following two-dimensional zero-mean discrete Gaussian function to estimate the illumination information component:

$$G(x, y) = \frac{1}{2\pi\sigma^2} e^{-x^2+y^2/2\sigma^2} \tag{2}$$

The Gaussian distribution parameter σ in this function plays a decisive role in the width of the Gaussian filter. In the plane image, there is a large correlation between the RGB color space channels, which is easy to cause the image correction deviation based on the reflection coefficient component; so, the HSV color model (i.e., hue (H), saturation (S), and lightness (V)) is used to collect illumination information of images [24, 25]. It is corrected for the V channel (i.e., lightness) in HSV space by gamma correction [26]. After some gray values are integrated together, the fused lighting information has a more ideal brightness. Assuming that the gamma correction coefficient is ∂, the gray value of the image in the color channel after gamma correction is obtained by the following formula:

$$X_{\text{new}} = 255 \times \left(\frac{X}{255}\right)^{1/\partial}. \tag{3}$$

In the above formula, X is the initial gray value of the image in the color channel.

(2) Estimation of reflection coefficient parameters and image color correction: from the perspective of HSV color space, the reflection coefficient parameters of the lightness channel and the hue and saturation channels of the initial image constitute the gray of the image hue, saturation, and lightness channels degree value. From formula (1), the calculation formula of the reflection coefficient $R(x, y)$ of the image in the lightness channel can be deduced, as follows:

$$R(x, y) = \frac{S_i(x, y)}{L(x, y)}. \tag{4}$$

Among them, $S_i(x, y))$ represents the initial image of the luminance channel; $L(x, y)$ represents the image lighting information in this channel.

In the image obtained according to the reflection coefficient, the gray levels of the dark parts and the bright parts show a form of gathering toward the center point. Therefore, when the pixel values of the dark parts increase, the gray levels of the bright parts can be effectively suppressed. Therefore, the following equation is used to correct the image grayscale to prevent the occurrence of false halo and obtain the image grayscale value after gamma correction [27]:

$$X_{\text{new}} = 255 \times \left(\frac{X}{255}\right)^{1/g} \tag{5}$$

In this formula, X is the initial gray value of the reflection coefficient image, X_{new} refers to the gray value of the image after gamma correction, and "G" refers to the gamma coefficient [28].

(3) Adaptive filtering: when correcting flat images, it is inevitable to increase the noise of different degrees [29]. After using the computer vision model to

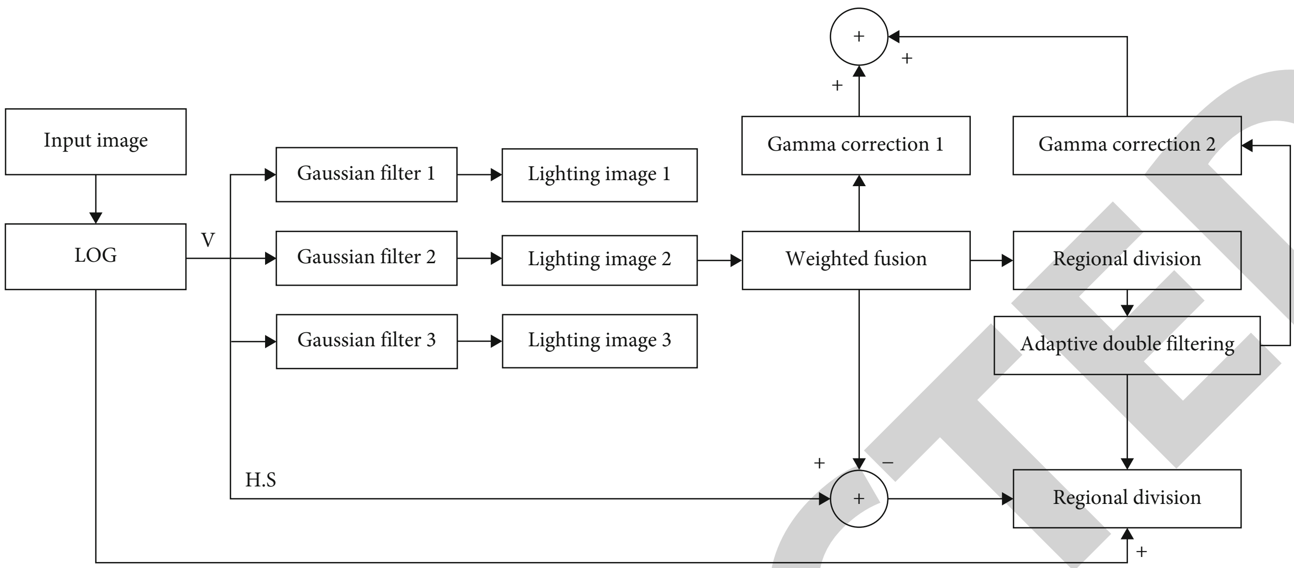

Figure 2: Schematic diagram of the optimization model for color enhancement processing of plane images.

process the flat image, even if the noise amplitude in the dark part does not change much, it will be highlighted and reduce the image quality. Therefore, based on the bilateral filtering algorithm, a noise reduction and enhancement processing method suitable for reflection coefficient images is constructed. By processing different brightness areas in the image in a targeted manner, most of the image details and texture information can be retained as high as possible [30]. The implementation process of the proposed method is shown in Figure 3

The adaptive filter color enhancement method of bilateral filtering has a smoothing and denoising function similar to other algorithms. However, by using a certain weighted average of adjacent pixel values, the new method introduces two different forms of weight consideration factors, that is, the similarity between pixel values and the spatial distance relationship between adjacent pixels, which greatly preserves the texture details of the image. A transition area is added between the bright area and the dark area, and the method uses mesoscale bilateral filtering for the transition brightness area. For the dark area, bright area, and transition area of the reflection coefficient image R, large-scale, small-scale, and medium-scale bilateral filters are used for filtering, respectively. Ultimately, the filtering effect of the entire image is more natural.

3. Enhanced Processing Optimization Model Performance Detection Experiment

3.1. Experiment Preparation Stage. From the commonly used image database, 100 plane images of the same specification with large depth of field, containing a lot of details and color information, and colors with different degrees of distortion were randomly selected as detection samples to verify the generalization ability and color enhancement ability of the model. In order to improve the persuasiveness of the image evaluation results and the reliability of the data, an evaluation method combining subjective and objective is adopted to comprehensively evaluate the enhanced processing ability of the model for image color. Among them, the subjective evaluation method generally makes judgments based on the visual perception of the naked eye. This method is simple and intuitive and can quickly complete the evaluation; the objective evaluation method generally extracts the statistical value of the image and uses numbers for quantitative analysis. Since only one indicator cannot accurately describe the output image effect, the following objective evaluation indicators are selected to make a more comprehensive and accurate judgment on the optimization results of color enhancement processing of flat images from various aspects:

(1) Information entropy: this indicator reflects the amount of information contained in the image. The larger the information entropy value, the more information it contains, and the higher the image quality. It can be solved by the following calculation formula:

$$E = -\sum_{i=0}^{n} P_{(i)} \log_2 P_{(i)}. \tag{6}$$

In the above formula, n refers to the gray value range, and $P_{(i)}(i = 1, 2, \cdots\cdots n)$ refers to the information contained in each pixel in the image.

(2) Average gradient: this indicator is used to express the degree of change of image pixels. By averaging the gradient values of each pixel, it can be known, as

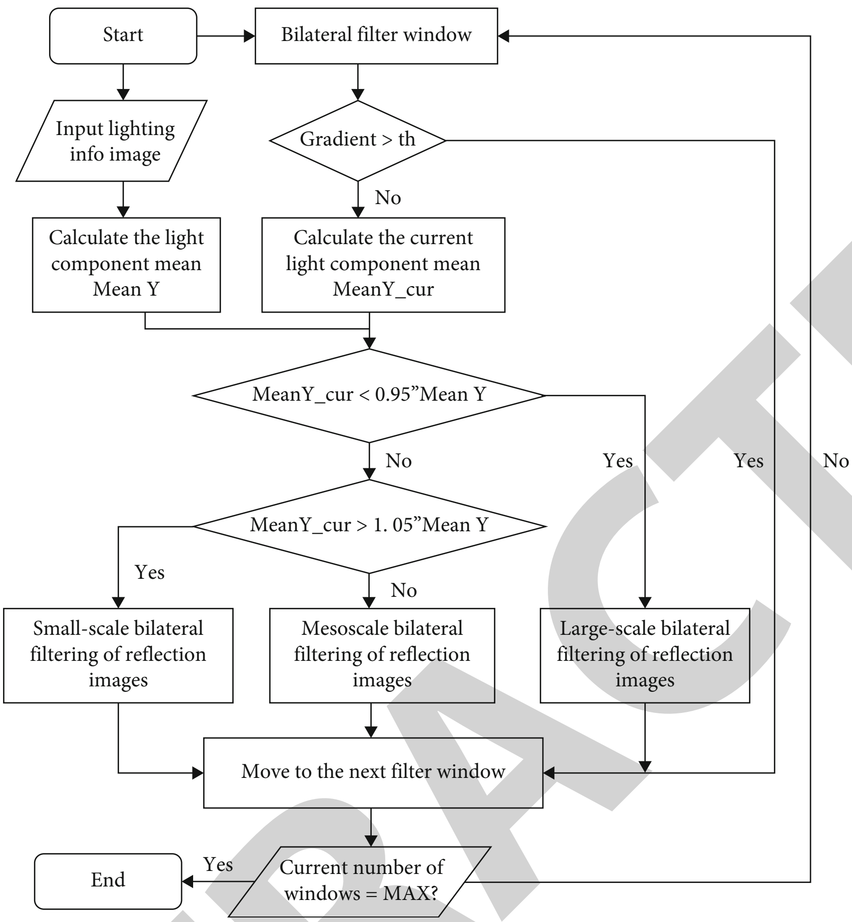

FIGURE 3: Flow chart of adaptive filtering color enhancement based on bilateral filtering.

shown in the following expression. The larger the index value, the clearer the image

$$\bar{G} = \frac{1}{m \times n} \sum_{i=1}^{M} \sum_{j=1}^{n} \left(\left(\frac{\partial f_{i,j}}{\partial x_i} \right)^2 + \left(\frac{\partial f_{i,j}}{\partial y_j} \right)^2 \right) /2 \right)^{1/2}. \quad (7)$$

In the formula, m and n are the width and height of the plan image, respectively, and $f_{i,j}$ refers to the gray value of the pixel point (i, j).

(3) Standard deviation: this indicator is the dispersion of the image relative to the mean. The larger the value, the more dispersed the image. According to statistical knowledge, the standard deviation of the image is obtained by the following formula:

$$\sigma = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \mu)^2}. \quad (8)$$

(4) Peak signal-to-noise ratio: this indicator is further defined based on the mean square error indicator. The defining formula is as follows:

$$\text{PSNR} = 10 * \log \left(\frac{\text{MAX}_1^2}{\text{MSE}} \right). \quad (9)$$

In the above formula, MSE is the mean square error, and MAX_1 is the maximum chroma of the image, which is 255.

According to the formula structure, it can be seen that the value of the peak signal-to-noise ratio is inversely proportional to the mean square error value. That is to say, the smaller the pixel difference between the target image and the reference image, the smaller the mean square error value, the larger the value of the peak signal-to-noise ratio, and the better the effect of image color enhancement processing.

(5) Structural similarity: the similarity is judged by comparing the structure, brightness component, and contrast component of two images. When the two images are identical, the structural similarity value is 1. The fewer similarities between the optimized image and the reference image, and the smaller the structural similarity value, the worse the output image effect is. If the value of the structural similarity value is larger, the structural similarity of the image is higher, and the processing effect is better. The evaluation result of this indicator is calculated using the following mathematical formula:

$$\text{SSIM}(x, y) = \frac{\left(2\mu_x\mu_y + C_1\right)\left(2\sigma_{xy} + C_2\right)}{\left(\mu_x^2 + \mu_y^2 + C_1\right)\left(\sigma_x^2 + \sigma_y^2 + C_2\right)}. \quad (10)$$

In this formula, μ_x and μ_y represent the mean of the processed and optimized image and the reference image, respectively, σ_x and σ_y are the corresponding variances of the two images, and $\sigma_{xy} + C/\sigma_x\sigma_y + C$ are the structural components of the two images.

4. Results and Analysis

4.1. Analysis of Subjective Evaluation Results. The purpose of this paper is to enhance the color of flat images through processing optimization. Regarding the image quality evaluation method, it can better evaluate the quality of image processing, and it has also become an indispensable auxiliary scheme in the research and development of digital image processing technology. Generally, image quality evaluation is divided into subjective evaluation and objective evaluation. Among them, the subjective evaluation method generally makes judgments based on the visual perception of the naked eye. This method is simple and intuitive and can quickly complete the evaluation. The objective evaluation method is generally to extract the statistical value of the image and perform quantitative analysis with numbers. Combining the subjective evaluation method and the objective evaluation method, the image quality and the processing performance of the method can basically be accurately evaluated.

A sample image is arbitrarily selected from the selected 100 images as the operation object of different image processing methods. Using the two methods based on adaptive weight Retinex model and adaptive histogram mentioned in the literature method (i.e., literature [17] and literature [18]) and the method in this paper, the image is enhanced to verify this paper: the superiority of the method. After the target image is processed by different color enhancement methods, the color enhancement processing optimization result of the sample image is obtained.

By comparing the color enhancement effects of plane images processed by each method, it can be seen that all three methods have certain enhancement and optimization effects on the color of plane images, but the degree is different. Although the reference [17] achieved color enhancement for the sample image, it caused color distortion in the sky area, resulting in color deviation and obvious halo and artifacts. The greater the depth of field, the more halo and artifacts. Obviously, the information loss is also serious, especially at the junction of color conversion, the degree is even worse, and the visual effect is poor. Reference [18] has slightly improved; although, the halo and artifacts are reduced to a certain extent, but the details in the image are still not revealed, the enhanced image has the problem of overexposure, and it is not well demonstrated in the image color quality that can satisfy the visual perception of the human eye. To sum up, the contrast methods are not good for the color enhancement processing of flat images. By summarizing the above literature methods, it is found that image processing techniques can be roughly divided into denoising, segmentation, enhancement, and other means. Although the existing method can restore the overall color of the image, it still cannot effectively solve the problem of image distortion with severe distortion and large color deviation.

In this paper, the HSV color model (i.e., hue (H), saturation (S), and lightness (V)) is used to collect the illumination information of the image. It is corrected by the V channel (i.e., lightness) in HSV space by gamma correction. After some gray values are integrated together, the fused lighting information has a more ideal brightness. According to the image obtained by the reflection coefficient, the grayscale of the image is corrected by the gamma correction method, which effectively prevents the occurrence of false halo. Based on the bilateral filtering algorithm, the noise in the reflection coefficient image is suppressed to a great extent. Therefore, it not only enhances the overall color of the plane image but also obtains a color enhancement effect that is significantly better than the contrast method on the premise of maintaining the detail information to a great extent and effectively suppresses halo and artifacts. Even when the depth of field of the image is large, high-level enhancement processing results are still obtained. Whether it is the color information of trees or the detailed information of roads and plants, they can be well enhanced and completely preserved. The texture and details are very close to the real situation, which greatly optimizes the visual experience of the human eye. Most of the existing research methods use more traditional algorithms or models, use adaptive weight Retinex model and wavelet transform algorithm to process images in frequency bands, or use adaptive histogram equalization and Laplace filter to restore distorted colors.

4.2. Analysis of Objective Evaluation Results. The subjective judgment method is usually affected by the evaluators themselves. Therefore, the objective evaluation method based on mathematical statistics is adopted, and the evaluation method can optimize the color enhancement processing ability of the plane image. After calculation, the evaluation index data corresponding to the three methods are obtained, as shown in Figure 4.

According to the quantitative evaluation results of the enhancement ability of different methods in processing 100 sample images in Figure 4, it can be seen that the information entropy, standard deviation, average gradient, structural similarity, and peak signal-to-noise ratio of the literature [17] are 7.5137, 59.2867, 9.1673, 0.4567, and 10.0897, respectively. The information entropy, standard deviation, average gradient, structural similarity, and peak signal-to-noise ratio of the literature [18] are 7.7743, 67.7835, 12.3749, 0.6214, and 10.8967, respectively. The information entropy, standard deviation, average gradient, structural similarity, and peak signal-to-noise ratio of the method in this paper are 8.0246, 49.4169, 16.4526, 0.9037, and 15.0246, respectively. The obtained experimental data is sufficient to prove that, compared with the two comparison methods, the values of the positive correlation indicators of the method in this paper are all higher (i.e., 8.0246,

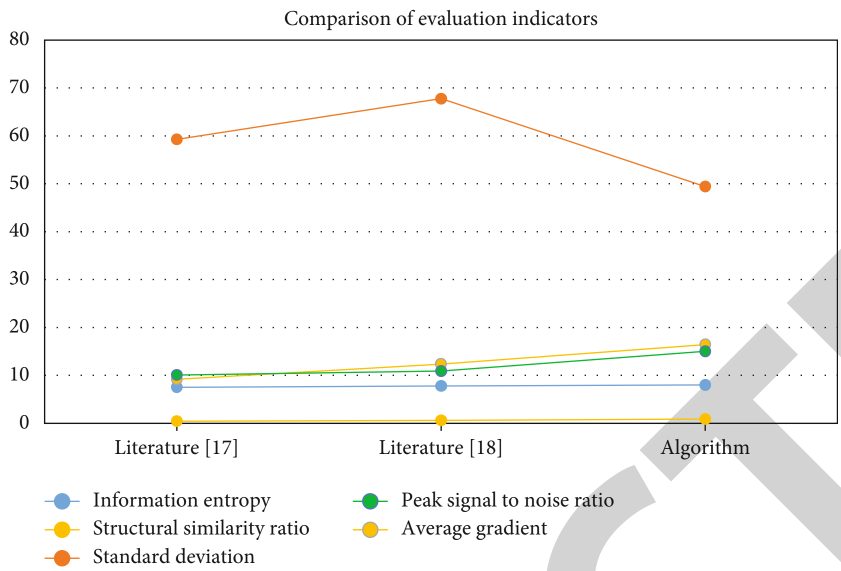

Figure 4: Schematic diagram of objective evaluation index values for different methods.

16.4526, 0.9037, and 15.0246), and the standard deviation of the negative correlation is lower (i.e., 49.4169). It shows that the method can effectively enhance the color of the plane image, also shows excellent performance in preserving the details of the image, and has greater universality. Because this paper integrates the computer vision model and bilateral filtering algorithm, according to the estimated illumination information parameters and reflection coefficient parameters, using the gamma correction method, the color of the plane image is corrected twice in the brightness channel in the HSV space, respectively. Make the fused lighting information that have more ideal brightness. While suppressing the gray level of the bright part, the noise contained in the reflectance image is reduced. By specifically processing different brightness areas in the image, most of the image detail texture information is preserved as high as possible. Therefore, it not only avoids the defect of loss of detail information generated in the process of enhancement processing and optimization but also makes the plane image carry more high-definition information. Moreover, the color of the image is greatly improved, and the halo phenomenon and color distortion are effectively prevented, so that the enhanced image is closer to the real clear image. The above indicators further illustrate that the planar image processed and optimized by the method in this paper is more in line with the human visual perception. At the same time, the method in this paper also has ideal generalization and adaptability. If only one of the indicators is used, it cannot accurately describe the output image effect. Therefore, five objective evaluation indicators are selected: information entropy, standard deviation, average gradient, structural similarity, and peak signal-to-noise ratio. The five evaluation metrics describe different aspects and angles of the image. For example, information entropy reflects the amount of information contained in an image. The average gradient reflects the degree of change in image pixels. The standard deviation reflects the dispersion of the image relative to the mean. The peak signal-to-noise ratio is further defined based on the mean square error index, which reflects the evaluation value of the difference between the pixel value of the image to be evaluated and the standard reference image. Structural similarity is a similarity judgment based on the comparison of the structure, brightness components, and contrast components of two images. After synthesizing the objective evaluation results of the five indicators, it is enough to accurately determine the difference between the color enhancement processing optimization results of the plane image and each model.

5. Discussion

As the most important link in image processing, image enhancement is in an urgent development stage as people's requirements for image quality continue to increase. Although the enhancement processing optimization method proposed in this paper has significant advantages in color enhancement and detail preservation, this method is more suitable for color processing of flat images, and the current image types have already been upgraded from flat images to stereo images. Therefore, it is still necessary to carry out further optimization from the following directions in the future to expand the application scope and prospects of the method.

(1) With the rapid development of computer technology, a large number of high-tech science and technology and innovative algorithms and models have emerged. More advanced techniques should be tried for better processing optimization

(2) There are various types of images, and the next research focus will be on different types of images to develop a processing optimization method that also has better performance for other types of images

The innovation of this paper is to combine the computer vision model with the bilateral filtering algorithm to design an adaptive filtering optimization model for color enhancement of planar images. The model first uses a two-dimensional zero-mean discrete Gaussian function to estimate the illumination information component. It is corrected by the *V* channel (i.e., lightness) in HSV space by gamma correction. Then, according to the computer vision model, the reflection coefficient of the image in the lightness channel is derived. The gamma correction method is used to correct the grayscale of the image to prevent the occurrence of false halo. Referring to the bilateral filtering algorithm, the different brightness areas in the image are processed by targeted noise reduction, the subjective and objective evaluation results are verified as high as possible at 15.0246, and the negative correlation index value is lower at 49.4169. It is proved that the proposed method can effectively suppress the phenomenon of halo and artifacts and obtain the image color quality that satisfies the visual perception. It not only enhances the image color but also retains the detail information to the greatest extent. The data listed by the author can well support the point of view and are worthy of publication, but there are still several issues that need to be confirmed.

6. Conclusion

As a kind of information carrier in the current network age, image has huge use value. The computer vision technology derived from the human eye model has been widely used in modern life and work through gradual development, among which image processing is the most common. Therefore, this paper builds a model based on computer vision theory for the color problem of flat images and obtains a processing optimization model for enhancing image color by combining computer vision model and bilateral filtering algorithm. After subjective and objective evaluation, the following three conclusions are drawn:

(1) Different methods have a certain enhancement and optimization effect on the color of the plane image, but the degree is different. In this paper, the color of the image is corrected twice, and the processing optimization effect is the best

(2) Using the HSV color model and gamma correction method, combined with the estimated illumination information and reflection coefficient, the pseudo-halo phenomenon is effectively prevented. The average gradient and structural similarity of the image are 16.4526 and 0.9037 higher than those of the contrast method

(3) The noise in the reflection coefficient image is effectively suppressed by the bilateral filtering algorithm. Among the three methods, the highest peak signal-to-noise ratio value was obtained, namely, 15.0246

Although the enhancement processing optimization method proposed in this study has significant advantages in color enhancement and detail preservation, this method is more suitable for color processing of flat images, and the current image types have already been upgraded from flat images to stereoscopic images. Therefore, it is still necessary to carry out further optimization from the following directions in the future to expand the application scope and prospects of the method. More advanced techniques should be tried for better processing optimization. The next research focus will be to develop a processing optimization method that can perform well for other types of images for different types of images.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares no conflicts of interest regarding this work.

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