COLOR IMAGE ENHANCEMENT METHODS: A COMPREHENSIVE REVIEW

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ABSTRACT- The process of modifying digital photographs on a computer is known as digital image processing, or DIP. The field of visual communication is concerned with the visual aspects of communication within the context of signals and frames. DIP, or digital image processing, is the act of configuring computers such that visual data can be successfully evaluated and modified. A digital image is supplied into the system, which subsequently transforms it using specified algorithms into a new image. Adobe Photoshop is a well-known example of this. When it comes to digital image processing, this application is widely regarded as the best. Improving a photograph entails bringing out the best in everything about it and attracting attention to the elements that stand out the most. The purpose of this research is to look into a variety of methods that have previously been employed for multi-scale retinex. Among these are histogram normalization and others.

Keywords: Image processing, Image Enhancement, Histogram Equalization (HE).Digital image processing.

1. INTRODUCTION

"Image processing" (IP) refers to a vast collection of procedures used to alter or change photographic images in modern information technology. Many activities can be done with IP, including as identifying images and patterns, extracting them, enhancing them, and assessing them. Digital image processing software modifies a digital array of pixels, whereas analog image processing software modifies a real picture. Computer vision, pattern recognition, and endoscopic image processing all do research to increase image quality. One key topic of research is how to improve the appearance of color photographs.

PRINCIPLES OF IMAGE PROCESSING

People who can visualize may perceive and grasp aspects that aren't immediately plain or noticeable. You can improve a photograph by editing it to remove defects and sharpen it.

The technique of constantly searching for a certain image in a collection is known as image retrieval. Using patterns allows you to measure various graphic aspects.

A "photographic photograph" is one that was taken with a camera and by following photography techniques. The objective at hand is to categorize the many elements visible in a photograph.

APPLICATION OF DIP

- Image sharpening & restoration
- Medical field
- Remote-sensing
- Transmission & encoding
- Machine-Robot vision
- Color processing
- Pattern recognition
- Video processing

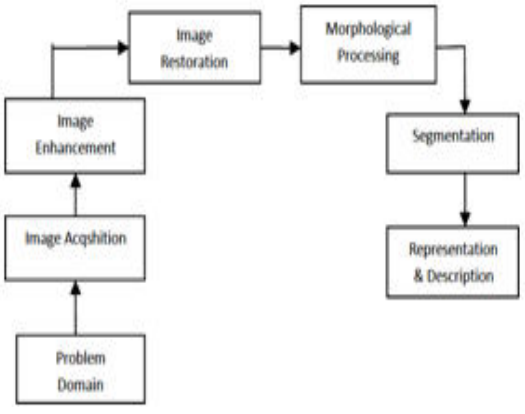

Fig. This paper is about making adjustments to digital photographs

Image enhancement is required to make an image

appear better to people who see it in person. To increase the quality of the image you provide, you can utilize a contrast enhancement method, which is an image improvement framework.

STRATEGIES OF IMAGE ENHANCEMENT

Image enhancement's primary purpose is to make it easier for automated image processing systems to interpret and understand images, as well as for individuals to perceive and grasp the information in images. This research looks into some of the most popular methods that businesspeople improve their image.

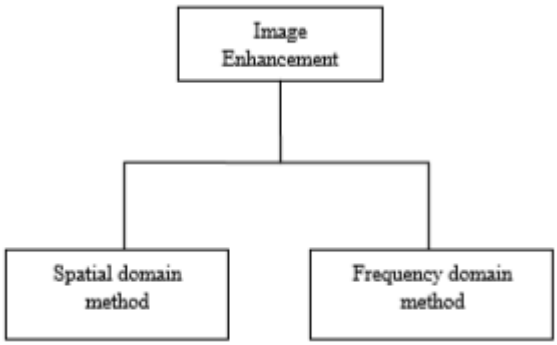

Fig.2 Image enhancement techniques

Spatial domain tools are used to compare pixels in an image directly. You must alter the pixel values to achieve the desired gain. A picture must first be converted into the frequency domain before you can utilize frequency domain procedures on it. The first step is to perform the Fourier Transform on the image. The Fourier transform is a common mathematical method that is used to improve photographs in a variety of ways. The final step is to create the image using the Inverse Fourier transform. Image enhancement is used in a variety of contexts to assist people better comprehend and evaluate images. Medical images, satellite images, and other visual data are all part of "image analysis," a field that studies how to interpret images.

2. TECHNIQUES OF IMAGE ENHANCEMENT

A lot of research has gone into strategies for making visuals clearer so that people can understand them better. Local image enhancement and global image enhancement are the two most used methods for improving photographs.

Taking better shots in the neighborhood

Local augmentation is used to ensure that pictures accurately capture minor features. This method increases the gradient's local features, providing significant information to the image analyst. The most crucial aspect here is the pixels that a worldwide plan may overlook. In this example, the unsharp masking approach [7] is used to improve some areas of the image. This approach sharpens photos by removing any blurriness or over-smoothness in the source image. This method includes the following steps: exhibiting anything visually with fuzzy or indistinct edges.

To create the mask, the blurred image is separated from the original image.

The mask is an important component of the visual image.

Global Enhancement (GE)of the Image

To improve contrast, use the image's global enhancement approach. To achieve this look, our approach modifies each pixel in the image to make it as clear as possible. The method is directly applied to pixels to highlight the differences between them. The pixel pattern ensures that the pixels are evenly distributed across the optimal range of intensities. Many people utilize a method known as "global contrast stretching" to improve the appearance of their images. Histogram equalization (HE) and contrast-limited adaptive histogram equalization are two of the various transformation methods used in global processes. Other examples include the discrete cosine transform (DCT), the discrete shearlet transform (DST), and the adaptive inverse hyperbolic tangent function transformation. The global approaches used in this study did not take into account the image's local characteristics. Instead, they examined all of the visible data at once. So, before using any local augmentation approaches, the main heuristic evaluation (HE) is utilized to verify how effectively the algorithm works.

3. IMAGE COLOR IMAGE ENHANCEMENT METHOD

The image depicts a simple block structure that is intended to convey the main purpose of the color picture-improving technology. This procedure is divided into two steps: color reproduction and image enhancement. The RGB endoscopic image

is converted into a two-dimensional spectral image. The spectral image with the best grayscale enhancement is then chosen using entropy-based selection. By faithfully reproducing the brightness and texture information of the source image, the improved gray scale spectral image accurately reflects the general color mood of the source RGB image.

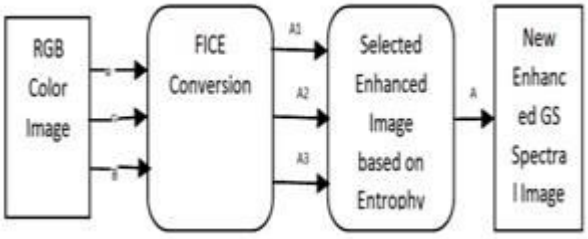

Fig.3 A basic diagram of how to improve your appearance

Fuji Intelligent Color Enhancement (FICE) is a key component of the approach. It is critical to recall that the FICE conversion matrix was employed to improve the photos in our proposed solution. The FICE matrix is used to convert endoscopic images taken in RGB color space into two-dimensional spectral images. The technique is based on the concept of spectral estimation. The matrix is used to approximate the spectra of many pixelated images.

HISTOGRAME QUALIZATION

Histogram equalization (HE) is a popular technique for improving images. The method alters the intensity distribution of the pixels in the original image to create a new image with a more even distribution. The image's histogram is more uniformly spread out after employing this procedure, and the sharpness is also improved. You can apply this procedure to the entire image or only a portion of it. The histogram of the image clearly shows how the various colors relate to one another. To make things simple, we'll refer to this new image as f. Each cell in the matrix represents the pixel intensity from 0 to L 1. The number of possible intensity readings is usually determined to be 256. Histogram equalization is a technique for making the probability distribution of an image's intensity numbers more equal.

4. LITERATURE SURVEY

KambamBijen Singh et al. [2017] used both local and global image enhancing algorithms in their research. To improve a photograph while retaining its natural illumination, two steps must be taken. After being processed locally, the image is treated again using the GE approach. We compare simulated findings with real-world assessments of picture quality in MATLAB to see how well this strategy works.

2017 is the current year. This article describes how Manas Sarkar and his colleagues used well-known techniques such as Homomorphic filtering, the discrete wavelet transform (DWT), and unsharp masking (USM) in their research. The beneficial outcomes from the preceding methods were then combined with the dynamics of Artificial Bee Colony (ABC) methods. One of the goals of this collaborative endeavor was to increase contrast enhancement. Another goal was to preserve essential and recognizable characteristics.

Hardeep Kaur and Jyoti Rani published a study in 2016 stating that image enhancement is the practice of modifying a picture on purpose to make it better for a specific task. This technique is used to improve a photograph by increasing its contrast and brightness, decreasing noise, and making it simpler to detect. Magnetic resonance imaging (MRI) is a relatively new and advanced diagnostic technique that has greatly simplified the detection and description of serious conditions such as cancer and stroke.

The Discrete Hartley Transform (DHE), proposed by JananiPurushothaman et al. in 2016, is used to handle color images in this work. Color images can be improved by examining hue and intensity data. Intensity processing makes use of the chroma component. You can detect where an object's edge is if you maintain its brightness constant but change its hue. After the strength component has been addressed, the chroma component is addressed. Combining data from the intensity and color components improves output accuracy. The proposed method has only one parameter that governs how good the corrected image is. This article also discusses the methods used to determine whether or not the human senses agree on a certain metric.

Jinwen Yang et al. were born in 2016. This study's primary points are higher education (HE),

histogram processing, and developing improved approaches. This study compares pre- and post-processing methods utilizing tried-and-true algorithms and ordinary digital photos. Image processing procedures such as histogram equalization and specification help to improve contrast and visual effects by reducing the amount of dense gray in the original image.

Yan-Tsung Peng and his colleagues conducted a study in 2015 that demonstrated how picture blurring may be utilized to identify the depth map and improve underwater photographs. Things will look better in an underwater photograph if they are closer to the camera. Adding blurriness to the image formation model (IFM) allows for the capture and improvement of underwater photos. The test results of these photographs shot in varied lighting circumstances show that the suggested method works better than previous IFM-based enhancement methods.

Histogram equalization was utilized as a preprocessing method by Liangping Tu and Changqing Dong (2013) to extract more valuable information from an image. The SIFT and ASIFT algorithms are used to discover and match feature points after the image has been cleaned up. The purpose of image preprocessing is to increase the frequency with which related picture features occur and to make those features appear more frequently overall. Histogram equalization (HE) is a method in image analysis that, as demonstrated by real-world data, can significantly enhance the number of connected image feature points.

According to Lei Zeng et al. [2013], several applications employ histogram equalization (HE) to improve contrast since it is simple to use and effective. If utilized excessively, extra contrast enhancement can alter the appearance of a photograph by generating phony visual artifacts. To address the issues with traditional HE methods for grayscale photos, a novel method based on histogram similarity was developed. The proposed method outperforms a variety of popular histogram equalization methods in terms of contrast and overall picture quality.

5. PROPOSE FUTURE

We describe a novel approach to overcoming this issue in image processing. The Multi Scale Retinex (MSR) approach is used in the proposed work. This research describes a new multi-scale retinex approach for image enhancement that is more dependable and requires less computer resources. The algorithm does not select the initial approximation picture using the maximum value strategy. Instead, it considers both the pixel values and the maximum value in the image. Discrete wavelet transformation is a technique for making computers more user-friendly.

This paper proposes a novel approach to tackling the image processing challenge. The Multi Scale Retinex (MSR) technique is employed in the paper you mentioned. This research describes a new multi-scale retinex approach for image enhancement that is more dependable and requires less computer resources. The algorithm does not select the initial approximation picture using the maximum value strategy. Instead, it considers both the pixel values and the maximum value in the image. Using discrete wavelet processing makes computations easier.

In this article, we'll look at a variety of image altering techniques. The approach for upgrading images described above is simple to learn and apply. This characteristic can significantly alter an image's brightness, making it appear brighter than it is. Histogram-based methods for increasing contrast were investigated as a possible solution. Normal HE approaches, on the other hand, do not perform well with images that have limited brightness levels. In the near future, new approaches will be developed to address this issue.

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