An Analysis of Various Techniques of Color Image Enhancement

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Abstract - Digital image processing (DIP) contracts with manipulation of digital images during a digital computer. It's a sub-field of signals & frameworks but point particularly on images. DIP focuses on growing a computer system that is able to perform processing on an image. The i/p of that system is a digital image and the system procedure that image using well-organized algos, and gives an image as an o/p. The main familiar example is Adobe Photoshop. It's one of the extensively used applications for processing digital images. Image enhancement is to get better elements of an image & high-light the useful information. This survey plans to study about a range of existing methods such as histogram equalization & various existing method of histogram equalization etc. and used for multi-scale retinex.

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

I. INTRODUCTION

Image processing (IP) is a somewhat broad term in modern IT that refers to using various means to process or enhance images. IP is completed for different purposes, including the recovery of specific information from an image, image recognition, image clarity or enhancement & pattern measurement. Sorts of IP can also be divided into digital image processing, where programs effort on a digital array of pixels, and analog image processing, where the software must work from a physical image. Color image enhancement is a well-liked re-search reason for the improvement of visual quality of computer vision, pattern recognition and the processing of endoscopic images. [1]

II. PRINCIPLES OF IMAGE PROCESSING

- Visualization - Detect the objects that aren't visible.
- Image sharpening & re-storation - To make a better image.
- Image recovery - Seek for the image of interest. Measurement of pattern – Measures unlike objects in an image.
- Image Re-cognition – Differentiate the objects in an image.

III. APPLICATION OF DIP

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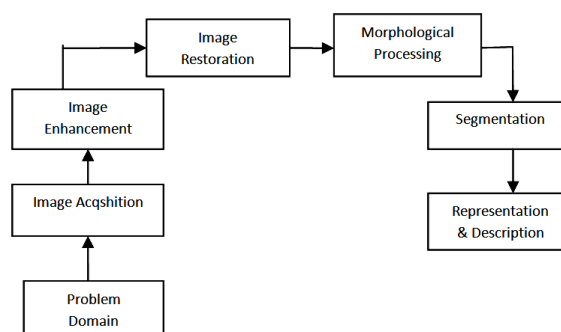- Video processing

Fig. 1 Digital Image Processing

Image enhancement is a vital process, where an image is transform to other image to improve visual quality for human viewers [2, 3]. A contrast enhancement practice is one of the image enhancement frameworks by which the input image feature can be im-proved [4].

IV. STRATEGIES OF IMAGE ENHANCEMENT

Image enhancement is fundamentally improving the Interpretability or perception of information in images for human viewers & providing enhanced i/p for further automated image processing methods [5].
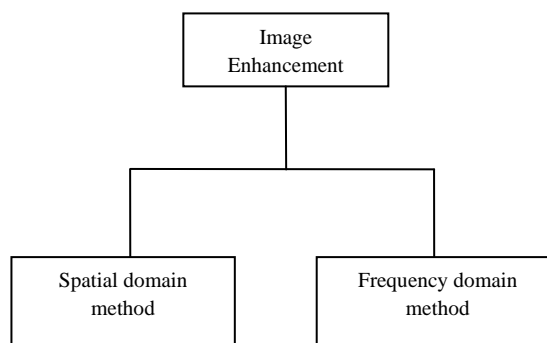

Fig. 2 Methods of Image enhancement

In spatial domain strategies, we straight contract with the image pixels. The pixel values are manipulated to accomplish desired enhancement. In frequency domain

methods, the image is initial moved into frequency domain. It implies that, the Fourier Transform of the image is evaluated first. All the enhancement activities are performed on the Fourier transform of the image & then the Inverse Fourier transform is performed to acquire the resultant image. Image enhancement is applied in each field where images are should be understood & analyzed. For e.g., medical-image analysis, analysis of images from satellites and so on.

V.   TECHNIQUES OF IMAGE ENHANCEMENT

Image enhancement techniques have been widely used to get a good quality of an image for the human interpretation. Image enhancement strategies are generally divided as local image enhancement & global image enhancement. [6]

A. Local Enhancement of the Image

The local enhancement is employed to get the minute details of an image. It enhances the local details in terms of the gradient of the image which gives useful information to the analyzer of the image. It addresses those pixels which would be ignored by the global method. The local enhancement method employed here is unsharp masking [7]. In this method the image is sharpened by subtracting an unsharp image, that is a blurred or smoothed from the original image, so the name unsharp masking is derived. In this method the following steps are involved:

- Blurring of the image.
- Subtracting the blurred image from the original image to make the mask.
- Adding the mask to the unique image.

B. Global Enhancement (GE) of the Image

The GE of the image is used to enlarge the contrast of the image. In this process, each pixel of the image is adjusted so that it gives an improved visualization of the image. In spatial contrast enhancement, the process is performed straightforwardly on the pixel. The pixels are arranged in such a way that it is distributed throughout the range of desired intensity level. Global contrast stretching way is utilized as global method of enhancing the image. There are many global techniques like histogram equalization (HE), contrast limited adaptive histogram equalization and many other transformation methods like discrete cosine transform (DCT), discrete shearlet transform (DST), adaptive inverse hyperbolic tangent function transformation, etc. In all the global methods they did not consider the local details of the image and look for the global information of the image. So we first apply the local enhancement in order to verify the algorithm, the simple HE is used.

VI.   IMAGE COLOR IMAGE ENHANCEMENT METHOD

In Fig. demonstrates a simple block diagram that describes the main function of the proposed color image enhancement method. The proposed method comprises by two interrelated steps: Image enhancement and Color reproduction. At primary, it changes RGB endoscopic image into 2-D spectral image & selects maximum enhanced gray scale spectral image based on entropy. Afterwards, the entire color mood from a source RGB image is transferred into the enhanced gray scale spectral image by matching luminance and texture information.
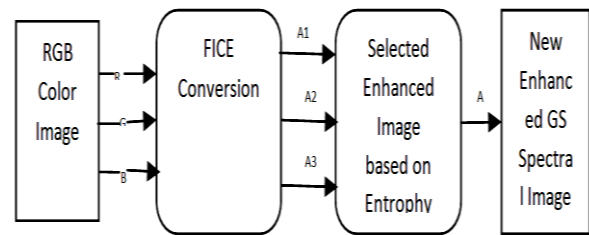

Fig. 3 Block diagram of image enhancement algorithm

The image enhancement method is established on FICE (Fuji Intelligent Color Enhancement). It is important to mention that in our proposed method, only FICE conversion matrix has been used for image enhancement. The FICE matrix converts RGB endoscopic image into 2-D spectral images. The algorithm is built on Spectral Estimation Technology. Various pixelated spectrums of the images are estimated using this conversion matrix. [8]

VII.   HISTOGRAM EQUALIZATION

Histogram Equalization (HE) is one of the stratgies which are used for Image enhancement. HE allocates the intensity values of pixels in the i/p image such that the o/p image encloses a regular allocation of intensities. It improves contrast & obtain a consistent histogram. This technique can be used on a entire image or just on a element of an image. Histogram of the image is the graphical representation of the probability of occurrences of the intensities versus Intensity values in the given image. Let f be a given image re-presented as a mr by mc matrix of integer pixel intensities ranging from 0 to $L-1$. L is the no. of possible intensity values, frequently 256. Histogram equalization of the image is a way to equalize the distribution of probability of occurrence of intensity values in the image [9].

VIII.   LITERATURE SURVEY

1. Kambam Bijen Singh, et al. [2017] in this paper, that uses both local and global enhancement methods on the same image. Initial, the image is nearby enhanced and the o/p is again processed by the GE method thus giving a properly enhanced image without losing the

brightness of the image. This enhancement method is simulated in MATLAB and results are verified on the parameters of image quality. [10]

2. Manas Sarkar, et al. [2017] This paper shows the implementation of various renowned methods such as Homomorphic Filtering, Discrete Wavelet Transform (DWT), Unsharp Masking (USM) to improve the intensity and sharpness of the input images and finally the effective output of these methods has been implemented with the search dynamics of Artificial Bee Colony (ABC) strateiges to acquire better contrast enhancement while optimizing the objective function designed towards preserving the important uniqueness of the distorted images. [11]

3. Hardeep kaur and Jyoti Rani, [2016] in this paper Image enhancement is a procedure of changing or adjusting image in order to make it more suitable for certain applications & is used to enhance or improve contrast ratio, brightness of image, remove noise from image & make it simpler to identify. Magnetic resonance imaging (MRI) is astounding medical technologies provide more appropriate information regarding Human brain soft tissue, cancer, stroke and various another diseases. [12]

4. Janani Purushothaman et al. [2016] in this paper, we extend the DHE to color image processing. Then, hue and intensity information are taken into account for color image enhancement. Hue component is used for intensity processing. Even by keeping the intensity constant we can capture the edge by changing the hue. First the processing is done with intensity component and then with hue component. Finally intensity and hue component results are combined to produce better results. The proposed method has one parameter which controls the enhancement property of the color image. The guideline for the decision of the parameter which is agreed by the human sense is also described. [13]

5. Jinwen Yang, et al. [2016] This article mostly initiates two aspects, namely, HE, histogram processing & provision of enhanced methods. Meanwhile, compared the pre-processing with post-processing, the qualified formulas & standard digital images have been shown in this paper. According to the algorithm of histogram equalization and specification, intensive gray distribution of the original image has become more sparse, so the image processing visual effects and its contrast can be improved. [14]

6. Yan-Tsung Peng, et. al [2015] In this paper, we propose to utilize image blurriness to estimation the depth map for under-water image enhancement. It's based on the examination that objects farther from the camera is further blurry for underwater images. Adopting image blurriness with the image formation

model (IFM), we can assess the distance between scene points & the camera and thus recover & enhance underwater images. Experimental Outcomes on enhancing such images in dissimilar lighting conditions display the proposed method performs superior than other IFM-based enhancement methods. [15]

7. Liangping Tu and Changqing Dong [2013] in this paper, the histogram equalization method is adopted to preprocess the original image to enhance the useful information. Then the preprocessed image is used respectively to the SIFT algo and the ASIFT algo to accomplish the extraction & matching of the image feature points. The reason of image pre-processing is to enlarge the matching no. of image feature point, & improve the matching rate of image feature. The experimental outcomes show that the image processed by the HE can improve obviously the matching no. of the image feature point. [16]

8. Lei Zeng et. al [2013], Histogram equalization (HE) is widely used for contrast enhancement in a variety of applications due to its simple function & effectiveness. yet, it typically outcomes in excessive contrast enhancement, which origins the un-natural look & visual artifacts of the processed image. A novel method based on histogram similarity is expanded to over-come the draw-backs of the classic HE algorithms for gray scale images. Compared to some of the conventional HE methods, the proposed method produces better contrast and image quality. [17]

IX. PROPOSE FUTURE

In this effort we have proposed a new view that will effectively solve problem of image processing. In proposed paper used Multi Scale Retinex (MSR) technique is used. A multi-scale retinex algorithm for image enhancement is presented, which has better robust and less computation cost. In the algorithm, the initial approximation image is selected by consider both each pixel value and maximum value about their logarithmic image instead of selecting maximum value method, and discrete wavelet transformation is used for decreasing computation complexity.

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discrete wavelet transformation is used for decreasing computation complexity.

X. PROPOSE FUTURE

In this paper, we have study about a variety of strategies of image enhancement. HE a simple & useful image enhancing technique. However, in some cases, it tends to change significantly the brightness of an image and leads to over enhancement. We have looked into dissimilar improved contrast enhancement ways, based on histogram equalization, to over-come the problem. But these classic HE methods are also disappointed when process images with low luminance. In future to overcome this problem used new techniques solve this problem.

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