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Review Image Restoration and Image Enhancement

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Abstract: Image enhancement is one of the key issues in high quality pictures such as digital cameras. Since image clarity is very easily affected by lighting, weather, or equipment that has been used to capture the image. These conditions lead to image may suffer from loss of information. The main purpose of image enhancement is to bring out detail that is hidden in an image or to increase contrast in a low contrast image. It provides a multitude of choices for improving the visual quality of images. That's why it is used in a huge number of applications with important challenges such as noise reduction, degradations, blurring etc.

Keywords: Digital Image Processing, Fuzzy gray scale enhancement, Image enhancement, MSE, PSNR, Retinex, Spatial And Frequency Domain

I. INTRODUCTION

Image enhancement problem can be formulated as follows: given an input low quality image and the output high quality image for specific applications. It is well known that image enhancement as an active topic in medical imaging has received much attention in recent years. The aim is to improve the visual appearance of the image, or to provide a "better" transform representation for future automated image processing, such as analysis, detection, segmentation and recognition. Moreover, it helps analyses background information that is essential to understand object behaviour without requiring expensive human visual inspection.

Carrying out image enhancement understanding under low quality image is a challenging problem because of these reasons. Due to low contrast, we cannot clearly extract objects from the dark background. Most colour based methods will fail on this matter if the colour of the objects and that of the background are similar. The survey of available techniques is based on the existing techniques of image enhancement, which can be classified into two broad categories: Spatial based domain image enhancement and Frequency based domain image enhancement. Spatial based domain image enhancement operates directly on pixels. The main advantage of spatial based domain technique is that they conceptually simple to understand and the complexity of these techniques is low which favours real time implementations. But these techniques generally lacks in providing adequate robustness and imperceptibility requirements. Frequency based domain image enhancement is a term used to describe the analysis of mathematical functions or signals with respect to frequency and operate directly on the transform coefficients of the image, such as Fourier transform, discrete wavelet transform (DWT), and discrete cosine transform (DCT).

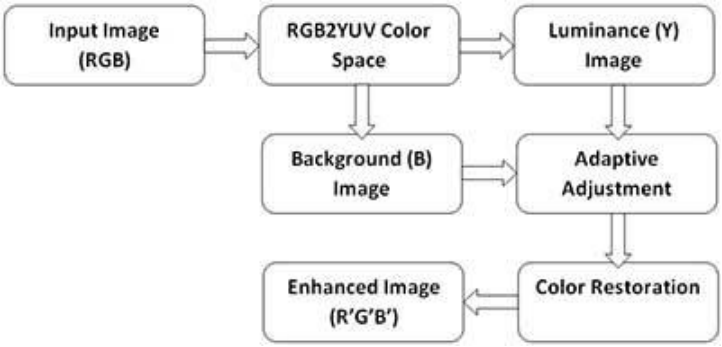
The basic idea in using this technique is to enhance the image by manipulating the transform coefficients. The advantages of frequency based image enhancement includes low complexity of computations, ease of viewing and manipulating the frequency composition of the image and the easy applicability of special transformed domain properties. The basic limitations including are it cannot simultaneously enhance all parts of image very well and it is also difficult to automate the image enhancement procedure. In this paper according to if enhanced image embed high quality background information, the existing techniques of image enhancement like spatial domain methods can again be classified into two broad categories: Point Processing operation and Spatial filter operations. Traditional methods of image enhancement are to enhance the low quality image itself. It doesn't embed any high quality background information. The reason is that in the dark image, some areas are so dark that all the information is already lost in those regions. No matter how much illumination enhancement you apply, it will not be able to bring back lost information. Frequency domain methods can again be classified into three categories: Image Smoothing, Image Sharpening, Periodic Noise reduction by frequency domain filtering.

II. PREVIOUS WORKS REVIEW

The term spatial domain [2] means working in the given space i.e. the image. It implies working with the pixel values or in other words, working directly with the raw data.The pixel values are altered to achieve desired enhancement. Image enhancement [8] is applied in every field of science where images are understood and analyzed. For example, medical image analysis, satellite image analysis etc.We get low contrast images because of insufficient illumination, lack of dynamic range in the image sensors and wrong setting of a lens aperture during image acquisition. Contrast stretching [8][14] is a process that expands the range of intensity levels in an image so that it spans the full intensity range of the recording medium or display device. The reason behind this is to increase the contrast of the images by making the dark portions darker and the bright portions brighter. The figure below shows the transformation used to achieve contrast stretching.

KIM (1997) [1] has discussed that the intensity of scene can be altered following the histogram equalization, which is because of the flattening attribute of the histogram equalization. KIM (1997) proposed histogram equalization referred to as mean preserving bi histogram equalization to conquer the disadvantage of the histogram equalization. The essence of the proposed algorithm is to conserve the mean intensity of an image while the contrast is enhanced. Given method initially break an input image into two sub-images based on the mean of the input image. One of the sub images is the set of specimens that are less than or equal to the mean whereas the other one is the
set of specimens greater than the mean.

Tae et al. (1998) [2] has discussed a block overlapped histogram equalization system for improving the contrast ofan image sequences using numerous applications.The conventional histogram
based contrast enhancement technique is limited in real time application due to a large computational and storage requirements and it also exhibit quality degradation caused by possible loss of infrequently distributed pixel intensities, which may result in terrible loss of vital information.



Yueet et al. (2005) [3] has discussed a nonlinear image enhancement method based on Gabor filters, which allows selective enhancement based on the contrast sensitivity function of the human visual system. The image enhancement of the given approachis especially appropriate for digital applications to enhance the perceive visual feature of the images due to numerous reasons, including interpolation.

Saibabu et al. (2006) [4] has proposed an image enhancement algorithm for digital images captured under such tremendously non uniform lighting conditions. The new technique constitutes three issues viz, adaptive intensity enhancement, contrast improvement and color restoration which were considered separately to make the algorithm more adaptable to the image characteristics. The adaptiveness of the transfer function, depending on the mean of each pixel's neighborhood makes the algorithm more flexible and easier to control.

Nyamlkhagva et al. (2008) [5] has proposed a new method called Brightness Preserving Weight Clustering Histogram Equalization that can simultaneously preserve the brightness of the original image and enhance visualization of the original image. Given method assigns each nonzero bit of the original image's histogram to a separate cluster and computes each cluster's weight. To reduce the number of clusters, three criteria are used (cluster weight, weight ratio and widths of two neighboring clusters) to merge pairs of neighboring clusters. The clusters obtain the equal partitions as the result image histogram. At last transformation functions for each cluster's sub histogram are calculated, and the sub histogram's gray levels are mapped to the result image by the equivalent transformation functions.

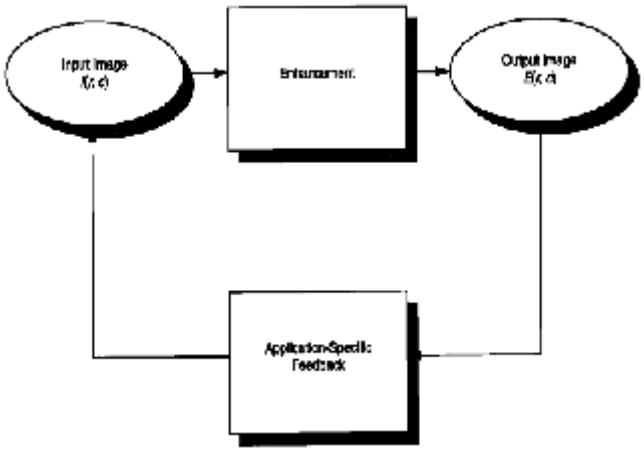
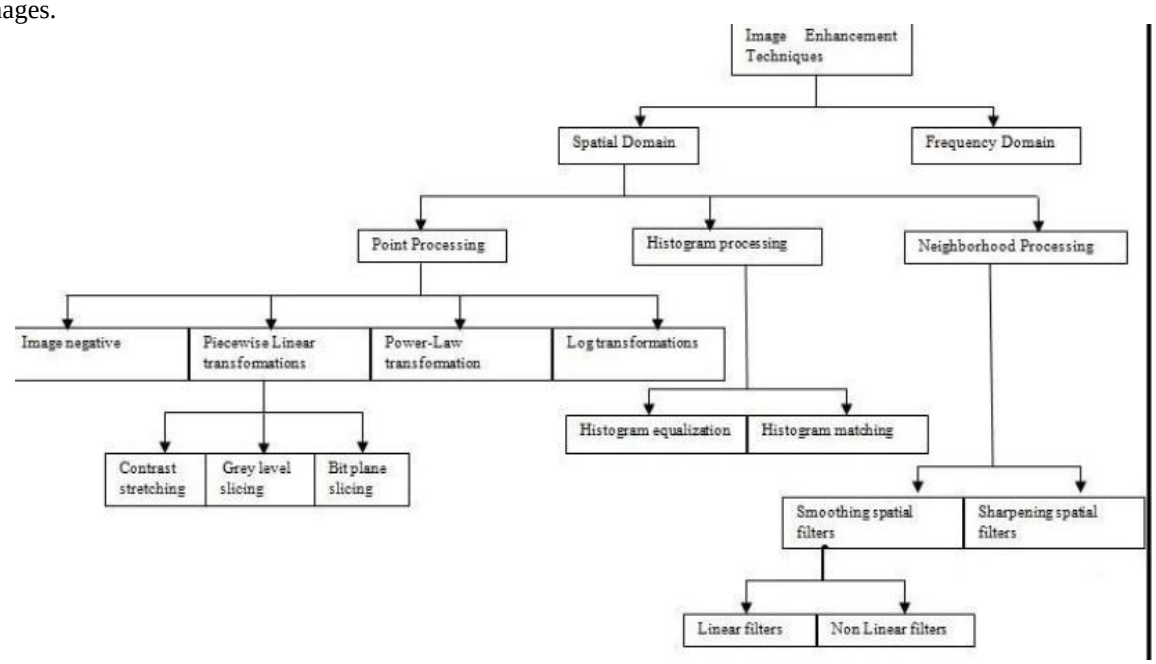


Fig: flow chart of Image Enhancement

Fan et al. (2010) [6] has proposed a new method for image contrast enrichment which is especially suitable for multiple peak images. The given method has been used to remove the two disadvantages of HE algorithm i.e. firstly the input image has been convolved by a Gaussian filter with optimum parameters. Then the original histogram has been divided into various areas by the valley values of the image histogram. The given method out performs others on the aspects of simplicity and adaptability. The result demonstrates that the proposed algorithm has good performance in the area of image enrichment. Due to its simplicity, it can be realized by simple hardware and consumer electronics.

Md. Foisal et al. (2010) [7] has proposed a method of medical image enhancement based upon non linear technique and the logarithmic transform coefficient histogram equalization. Logarithmic transform histogram matching uses the truth that the relation between stimulus and perception is logarithmic. A measure of improvement based on the transform has been used as a tool for evaluating the performance contrast measure with respect of the proposed enhancement technique. This method improves visual quality of images that contain dark shadows due to limited dynamic range of imaging like x ray images.



III. CONCLUSION

This paper presents a short description of various image enhancement techniques in order to make familiar with the enhancement of a blurred image, noise removal, setting the brightness, contrast and other degradations in images in image processing. Critical review concludes that Modern techniques Retinex (SSR &MSR) performs much better than Histogram Equilization, Homomorphic filtering because it is based on the colour constancy theory, but it still suffers from colour violation and unnatural color rendition problem, as The Wavelet transforms is the very good technique for the image denoising and input images always faces the noise during image processing so in future work there is scope of applying Wavelet transform with Retinex to improve the image enhancement results such as colour rendition problem. Content Aware technique was unable to enhance the dark areas of image but image fusion technique overcomes this limitation and enhances all regions of an image

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