Image Enhancement Techniques -A Review

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ABSTRACT: Enhancement is the method of improving the ability of an electronic digital stored image. The main objective of image enhancement is to process an image and modify the attributes of given image to make it suitable than the original image for the particular application. Histogram equalization is most active and simple method of improving image quality. This paper presents a review of various image enhancement techniques such as HE, BBHE, DSIHE, MMBEBHE, MHE

KEYWORDS: Image enhancement, Contrast Enhancement Techniques, Histogram Equalization

I. INTRODUCTION

Image Enhancement plays a fundamental role to improve the visual appearance of an image and it includes various Techniques used to convert the image to better form suitable for analysis of human or machine [1]

The main idea behind enhancement techniques is to carry out detail that is hidden or to highlight certain features of Interest in an image. Image Enhancement includes the following: [4]

- Edge enhancement
- Intensity, Hue and Saturation transformations
- Density slicing
- Producing synthetic stereo images
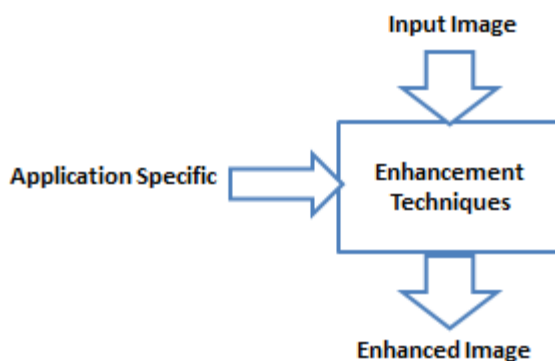- Contrast enhancement

Fig 1: Image Enhancement Technique

II. IMAGE ENHANCEMENT TECHNIQUES

These techniques used for enhancing the contrast of the image. Image Enhancement techniques are classified into two broad categories: [2]
- A. Spatial Domain Enhancement
- B. Frequency Domain Enhancement

A. Spatial Domain Enhancement
Spatial Domain Enhancement defines as image plane itself and this technique based on direct manipulation of pixels in an image

- To achieve desired enhancement manipulate the pixel values
- In the enhanced image 'F', the value of pixel with coordinates(x; y) is the result of performing operation
- on the pixels in the neighborhood of (x; y) in the input image ' f'.

B. Frequency Domain Enhancement
Frequency domain enhancement technique used to modify image brightness, contrast and distribution of grey levels. In these techniques, the image is first transferred straight into the frequency domain.

The image is first transferred into the frequency domain. For specific image, every of the enhancement operations is performed for the Fourier Transform and Reverse Fourier Transform is performed to get concomitant image

This filtering technique performs given functions: [1]
- Transform the image into the Fourier domain
- Multiply the image by the filter
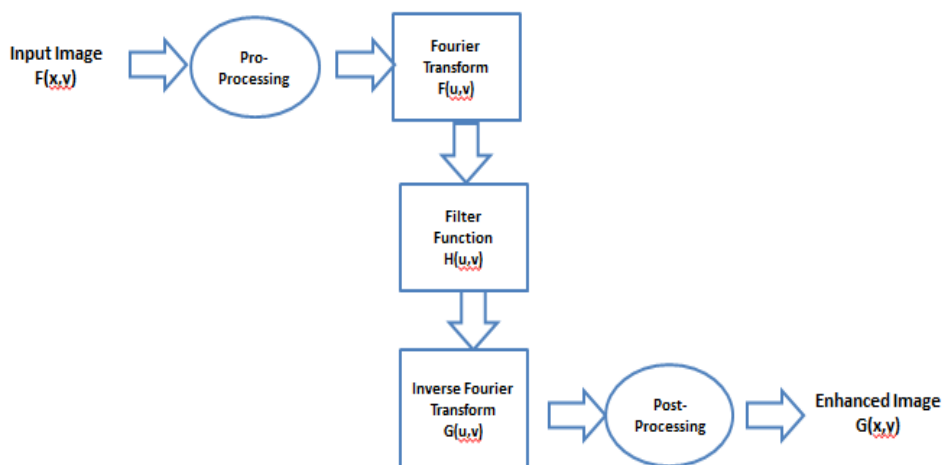- Take the inverse transform of the image

Fig 2: Frequency Domain Filtering Operations

III. IMAGE CONTRAST ENHANCEMENT TECHNIQUES

A. Histogram Equalization(HE):
Histogram Equalization is a method of image processing used to enhance the contrast of an image. It helps to show the variation of contrast of an image. It is essential to understand the two concepts before processing histogram equalization i.e. Probability Mass Function (PMF) and Cumulative Distributive Function (CDF)

B. Brightness Bi-Histogram Equalization (BBHE):
This method provides mean brightness on the resultant image which lies between input mean along with the middle gray level. BBHE method is used to decompose the original image into to sub-images

Histogram vary from 0 to L-1 and BBHE technique divides the whole picture into two parts where First histogram provides the variety of 0 to and the second histogram has the selection of L-1[5]

C. Dualistic Sub Image Histogram Equalization (DSIHE):
DSIHE technique used to decompose original image into two sub- images; one is coloured, other one is bright based on its gray level probability density function and equalizes the histograms of sub- images distinctly [5]

Decomposition of image in this method aim at the maximization of the Shannon's entropy of the output image. In the end, the result of the dualistic sub-image histogram equalization is achieved after the two processed sub-images are composed into one image

D. Minimum Mean Brightness Error Bi-Histogram Equalization (MMBEBHE):
The basic principle of MMBEBHE method of decomposing an image and then applying the HE method to equalize the resulting sub-images independently. MMBEBHE technique helps to achieve the minimize the brightness between input image and output image [6]

This technique consists of given three steps:
- For each threshold level, calculate the AMBE
- Find the threshold level, XT that yields minimum MBE
- Based on the XT, separate the input histogram into two and then equalized it independently as in BBHE

E. Multi Histogram Equalization (MHE):
MHE technique consists of decomposing the input image into several sub-images and then applying the Histogram equalization process to each one.

MHE technique consists of three steps: [2]
- Multi histogram decomposition.
- Finding the optimal thresholds.
- Automatic thresholding criterion.

IV. CONCLUSION

This paper present different technique used for image enhancement in digital image processing. In this paper, review on image enhancement is based on prior knowledge of image contrast enhancement techniques. After the review it is concluded that there are still many improvements required in enhancement techniques to handle the images. From the paper it is also concluded that no particular technique is effective for every kind of images

REFERENCES

1. Ramandeep Kaur, Asst.Prof. Navleen Kaur,' A Review on Image Enhancement Techniques, International Journal of Latest Trends in Engineering and Technology', Vol.4 ,Issue 1, pp. 171-176, 2014.
2. Vijay A. Kotkar, Sanjay S. Gharde,' Review Of Various Image Contrast Enhancement Techniques', International Journal of Innovative Research in Science, Engineering and Technology, Vol. 2, Issue 7, pp. 2786-2793 , 2013.
3. Er. Mandeep Kaur Er. Kiran Jain Er Virender Lather, 'Study of Image Enhancement Techniques: A Review', International Journal of Advanced Research in Computer Science and Software Engineering , Vol. 3, Issue 4, pp. 846-848, 2013.
4. S.S. Bedi, Rati Khandelwal,'Various Image Enhancement Techniques- A Critical Review', International Journal of Advanced Research in Computer and Communication Engineering, Vol. 2 , Issue 3, pp. 1605-1609, 2013.
5. Omprakash Patel, Yogendra P. S. Maravi and Sanjeev Sharma ,'A Comparative Study Of Histogram Equalization Based Image Enhancement Techniques For Brightness Preservation And Contrast Enhancement', Signal & Image Processing : An International Journal, Vol. 4, Issue 5, pp. 11-25, 2013.

6. Dinesh Sonker, M. P. Parsai, 'Comparison of Histogram Equalization Techniques for Image Enhancement of Grayscale images of Dawn and Dusk', International Journal of Modern Engineering Research, Vol. 3, Issue 4, pp. 2476-2480, 2013.
7. Vinay Kumar and HimaniBansal, 'Performance Evaluation of Contrast Enhancement Techniques for Digital Images', International Journal of Computer Science and Technology, Vol. 2, Issue 1, pp. 23-27, 2011.
8. HasanulKabir, Abdullah Al-Wadud, and OksamChae, 'Brightness Preserving Image Contrast Enhancement Using Weighted Mixture of Global and Local Transformation Functions', International Arab Journal of Information Technology, Vol. 7, Issue 4, pp. 403-410, 2010.
9. Maragatham, G., S. MdMansoorRoomi, and T. Manoj Prabu. 'Contrast enhancement by object based Histogram Equalization." Information and Communication Technologies (WICT)', 2011 World Congress on. IEEE, 2011.
10. Menotti D., Najman L., Facon J. and Araujo A., "Multi-Histogram Equalization Methods for Contrast Enhancement and BrightnessPreserving", IEEE Transactions on Consumer Electronics, Vol. 5, Issue 3, pp. 1186-1194, 2007.