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# Image Enhancement using Contrast Limited Adaptive Histogram Equalization and Wiener filter

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**Abstract:** ***This paper presents the Image Enhancement using Contrast Limited Adaptive Histogram Equalization method and Wiener filter to remove the noise that might be presented in image. Gamma correction technique is used to transfer the image in to a suitable dynamic range. To avoid amplifying any noise that might be present in an image we use contrast limited adaptive histogram equalization parameter to limit the contrast especially in homogeneous area.***

**Keywords:** Histogram Equalization, Gama correction, wiener filter**.**

## 1. Introduction

Image enhancement is among the simplest and most appealing areas of digital image processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. A familiar example of enhancement is shown in Figure1 and Figure2. In which when we increase the contrast of an image and filter it to remove the noise "it looks better." It is important to keep in mind that enhancement is a very subjective area of image processing. Improvement in quality of these degraded images can be achieved by using application of enhancement techniques. Histogram equalization (HE) is a simple and widely used image contrast enhancement technique. The basic disadvantage of HE is it changes the brightness of the image. In order to overcome this drawback, various HE methods have been proposed. These methods preserve the brightness on the output image but, do not have a natural look.

Figure1. Image

In order to overcome this problem the, in present paper we demonstrate the idea of histogram equalization technique for image enhancement using contrast limited adaptive histogram equalization (CLAHE) method and wiener filter. In this concept we demonstrate the idea of de-noising of image using wiener filter and using this concept we take the histogram. In contrast limited adaptive histogram equalization we limit the contrast and take the histogram.

Figure 2. Enhanced image

## 2. History and Background

Hongteng Xu, Guangtao Zhai, Xiaolin Wu, and Xiaokang Yang[1] proposed a generalized equalization model for image enhancement. Based on analysis on the relationships between image histogram and contrast enhancement/ white balancing, first establish a generalized equalization model integrating contrast enhancement and white balancing into a unified framework of convex programming of image histogram. They show that many image enhancement tasks can be accomplished by the proposed model using different configurations of parameters. With two defining properties of histogram transform, namely contrast gain and nonlinearity, the model parameters for different enhancement applications can be optimized.

Tarun Kumar Agarwal, Mayank Tiwari, Subir Singh Lamba[3] proposed a method named "Modified Histogram Based Contrast Enhancement using Homomorphic Filtering" (MH-FIL) for medical images. This method uses two step processing, in first step global contrast of image is enhanced using histogram modification followed by histogram equalization and then in second step homomorphic filtering is used for image sharpening, this filtering if followed by image normalization. To evaluate the effectiveness of method choose two widely used metrics Absolute Mean Brightness Error (AMBE) and Entropy.

David Menotti, Laurent Najman, Jacques Facon, Arnaldo de A. Araujo and Gisele L. Pappa [8] proposed two methodologies for fast image contrast enhancement based on histogram equalization (HE), one for gray-level images, and other for colour images. For gray-level images, they propose a technique called Multi-HE, which decomposes the input image into several sub-images, and then applies the classical HE process to each one of them. In order to decompose the input image, we propose two different discrepancy functions, conceiving two new methods. Experimental results show that both methods are better in preserving the brightness and producing more natural looking images than other HE methods. For colour images, they introduce a generic fast hue-preserving histogram equalization method based on the RGB colour space, and two instantiations of the proposed generic method, using 1D and 2D histograms.

## 3. Proposed Methodology

In proposed method, we apply HE method for contrast enhancement on modified histogram i.e. Contrast Limited Adaptive Histogram Equalization (CLAHE), after that use wiener filtering for image sharpening and then to minimize the difference between input and processed image mean brightness. The method has the ability to control the level of contrast enhancement in the output image.

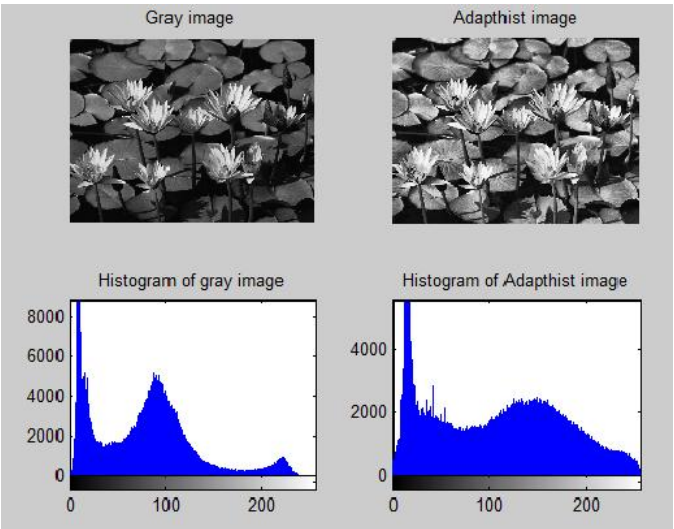


Figure3. Enhancement of image using CLAHE method and its histogram

The process of adjusting intensity values can be done automatically by the 'histeq' function. 'histeq' performs histogram equalization, which involves transforming the intensity values histogram. Figure 4 illustrates using 'histeq' to adjust a gray scale image. In this proposed method we use 'adapthisteq' to adjust the contrast in a grayscale image. The original image has low contrast, with most values in the middle of the intensity range. 'Adapthisteq' produces an output image having values evenly distributed throughout the range . Figure 4 shows noise introduced image in which high frequencies noise presents in 'nose image gi' where as additive noise, such as Gaussian noise present 'noise image agi'.

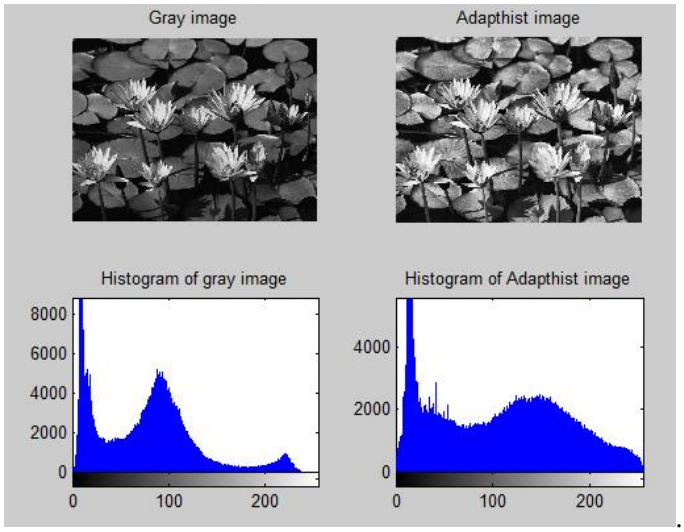


Figure4. Noise introduced image and its histogram

In this approach we use two wiener filter parameter and that are 'wiener1' filter and 'wiener2' filter which produces better results than other linear filtering. The 'wiener1' function applies a wiener filter which is a type of linear filter removes all high frequencies nose. The 'wiener2' function applies a Wiener filter (a type of linear filter) to an image adaptively, tailoring itself to the local image variance. Where the variance is large, wiener2 performs little smoothing. The wiener2 function works best when the noise is constant-power ("white") additive noise, such as Gaussian noise

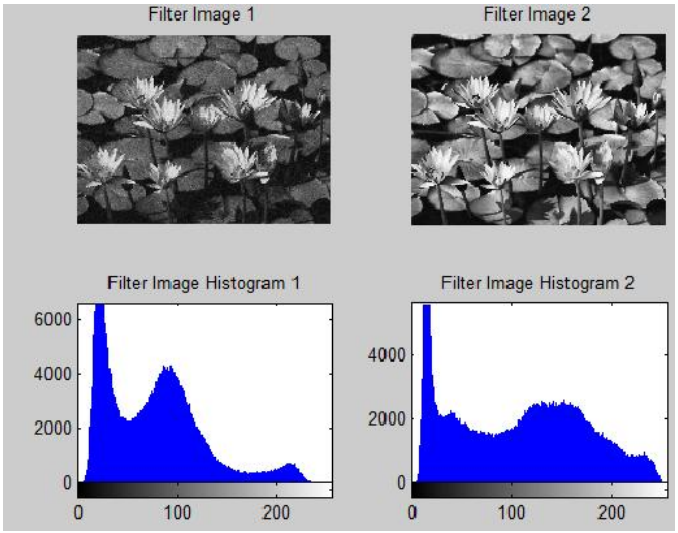


Figure5. Filtered image using wiener and wiener2 filter

. In figure 4 we apply 'wiener2' to an image of Saturn that has had Gaussian noise added. Filtered image 1 shown in figure 5 was de-noised using 'winer1' filter and preserving edges and other high-frequency parts of an image and Filtered image 2

shown in figure 5 was de-noised by 'wiener2' filter works best when the noise is constant-power ("white") additive noise, such as Gaussian noise.

## 4. Conclusion

The Contrast Limited Adaptive Histogram Equalization method and Wiener filtering provides optimum contrast enhancement while preserving the brightness of given image and suitable for images enhancement. Wiener filter is suitable for image sharpening and Limited Adaptive Histogram Equalization method is good for contrast adjustment of the image.

## References

[1] Hongteng Xu, Guangtao Zhai, Member, Xiaolin Wu, Fellow, and Xiaokang Yang, "Generalized Equalization Model for Image Enhancement," IEEE TRANSACTIONS ON MULTIMEDIA, 2014, VOL. 16, NO. 1, pp. 68-82.

[2] Gagandeep Singh and Sarbjeet Singh, "An Enhancement of Images Using Recursive Adaptive Gamma Correction," Gagandeep Singh et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, 2015, Vol. 6 (4), pp. 3904-3909.

[3] Tarun Kumar Agarwal, Mayank Tiwari and Subir Singh Lamba, "Modified Histogram Based Contrast Enhancement using Homomorphic Filtering for Medical Images," International Advance Computing Conference (IACC) , 2014, pp. 964-968.

[4] Mandeep Kaur and Ishdeep Singla, "A Dualistic Sub-Image Histogram Equalization Based Enhancement and Segmentation Techniques with NN for Medical Images," Research Inventy: International Journal Of Engineering And Science, 2015, Vol.05, Issue 01, PP: 15-19.

[5] Oakar Phyo and AungSoe Khaing, "AUTOMATIC DETECTION OF OPTIC DISC AND BLOOD VESSELS FROM RETINAL IMAGES USING IMAGE PROCESSING TECHNIQUES," IJRET: International Journal of Research in Engineering and Technology, 2014, Volume: 03 Issue: 03, pp. 300- 307.

[6] Chahat Chaudhary and Mahendra Kumar Patil, "REVIEW OF IMAGE ENHANCEMENT TECHNIQUES USING HISTOGRAM EQUALIZATION," International Journal of Application or Innovation in Engineering & Management (IJAIEM), 2013, Volume 2, Issue 5, pp. 343-349.

[7] 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 (SIPIJ), 2013, Vol.4, No.5, pp. 11-25.

[8] David Menotti, Laurent Najman, Jacques Facon, Arnaldo de A. Araujo and Gisele L. Pappa, "Contrast Enhancement in Digital Imaging using Histogram Equalization," Phd thesis, submitted to the Department of Computer Science, UFMG- Universidade Federal de Minas Gerais, 2008.

[9] Abdullah-Al-Wadud M, Kabir Md.H, Dewan MAA, and Chae O, "A Dynamic Histogram Equalization for Image Contrast Enhancement", IEEE Trans. Consumer Electronics, May (2007), vol. 53, no. 2, pp. 593-600.

[10] Pei-Chen Wu, Fan-Chieh Cheng, and Yu-Kumg Chen, "A Weighting Mean-Separated Sub-Histogram Equalization for Contrast Enhancement", IEEE Trans. Biomedical Engineering and Computer Science, 2010.