A Review of Image Enhancement Technique for removal of Noise Using Soft Computing Technique

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ABSTRACT
Image enhancement algorithms may be the oldest in image processing. Many methods, regardless of implementation, share the same basic idea – noise reduction through image blurring. Blurring can be done locally, as in the Gaussian smoothing model or in anisotropic filtering; by calculus of variations; or in the frequency domain, such as Weiner filters. However a universal "best" approach has yet to be found. In the enhancement process in order to achieve better enhancement effect, the system takes more time to pay; the other for color digital image processing has not been a good result. Therefore, focus on late goals and improve the efficiency of color image enhancement. However, the algorithm has a disadvantage of needing more computing time when select a larger hybrid generation. This will be a key problem to solve in the following work. In this paper we proposed a method for removing the noise in an image, and compare with different other existing methods. Furthermore we will try to get best solution and minimize the noise as much possible. In this paper we for the performance evaluation of histogram equalization method for Baby, Lena, Family and Barbara image.

Keywords: - Filters, PSNR, PCNN, HCV and ME.

INTRODUCTION
Image degradation is inevitable during the transmission and alteration of images. For example, the quality of an image shot by a camera is sometimes low due to the distortion of camera's optics scheme, the relative motion of the photographed object and the camera, the ecological change and the arbitrary disturbance [1]. The image enhancement is an important technique that can improve the quality of the degraded image and offer some interesting image features selectively. Image enhancement is basically improving the interpretability or perception of information in images for human viewers and providing better input for other automated image processing techniques. The main objective of image enhancement is to modify attributes of an image to make it more suitable for a given task and a specific spectator. For the duration of this process, one or more characteristic of the image are Customized [2]. A very popular technique for contrast enhancement of images is Histogram Equalization (HE), which is simple and has good performance compared to nearly all types of images. Histogram Equalization performs its operation by remapping the intensity levels of the image based on the probability distribution of the input intensities. Various researches have been performed on Histogram Equalization, and many methods have already been proposed. Usually, these techniques are classified into two principle categories; global and local Histogram Equalization. Global Histogram Equalization (GHE) uses the histogram information of the entire input image for its transformation. The enhancement methods can generally be divided into the following two categories one is Spatial Domain Methods and another is Frequency Domain Methods in spatial domain techniques [11], we directly deal with the image pixels. The pixel values are computed to accomplish most wanted enhancement. In frequency domain methods, the image is first transferred in to frequency domain so that Fourier Transform of the image is computed at first. All the enhancement operations are performed on the Fourier transform of the image and then the Inverse Fourier transform is performed to get the desired image. These enhancement operations are performed in order to adjust the image brightness, contrast or the distribution of the grey levels. As an effect the pixel value i.e. intensities of the output image will be customized according to the transformation function applied on the input values. Image transform is a mathematical tool which is used in image processing and image analysis for detecting the rough or unclear area and solve it. Image transformation allows us to move from frequency domain to time domain to perform the task at hand in an easier manner. There are various types of image transform methods are available such as Fourier Transform, Walsh Transform, Hadamard Transform, Stant Transform and Wavelet Transform etc. the rest of the paper is follows as. In Section II discusses image enhancement techniques, Section III discusses related work. Section IV discusses Problem formulation. And Section V discusses comparative result analysis. Finally, concluded in section VI.

II IMAGE ENHANCEMENT TECHNIQUE

Image enhancement is one of the most common and important preprocessing steps in many image and video systems. The corruption of images by noise is common during its acquisition or transmission. Thus the aim of enhancement is to remove the noise while keeping the important image features such as edges as much as possible. Recently a huge amount of papers are published in the area of image filtration and image enhancement. In current decade various method based on wavelet transform and adaptive neural network model along with soft thresholding. Some image enhancement technique discuss here based on wavelet transform and neural network model. Denoising is important for post processing methods like segmentation, classification, object recognition, pattern analysis, registration, etc. In this context the denoising of ultrasound images is particularly challenging due to the particular texture of the ultrasound images.

LINER AND NON-LINEAR FILTERS

Any attempts to explicitly identify it. Spatial filters employ a low pass filtering on groups of pixels with the assumption that the noise occupies the higher region of frequency spectrum. Generally spatial filters remove noise to a reasonable extent but at the cost of blurring images which in turn makes the edges in pictures invisible. In recent years, a variety of nonlinear median type filters such as weighted median [8], rank conditioned rank selection [9], and relaxed median [10] have been developed to overcome this drawback. A mean filter is the optimal linear filter for Gaussian noise in the sense of mean square error. Linear filters too tend to blur sharp edges, destroy lines and other fine image details, and perform poorly in the presence of signal-dependent noise. The wiener filtering [11] method requires the information about the spectra of the noise and the original signal and it works well only if the underlying signal is smooth. Wiener method implements spatial smoothing and its model complexity control correspond to choosing the window size.

SPATIAL-FREQUENCY FILTERING

Spatial-frequency filtering refers use of low pass filters using Fast Fourier Transform (FFT). In frequency smoothing methods [14] the removal of the noise is achieved by designing a frequency domain filter and adapting a cut-off frequency when the noise components are de correlated from the useful signal in the frequency domain. These methods are time consuming and depend on the cut-off frequency and the filter function behavior. Furthermore, they may produce artificial frequencies in the processed image.

III RELATED WORK

This chapter gives an extensive literature survey on the existing digital image enhancement technique. They study various research and journal paper related to digital image enhancement along with artificial neural network and some other technique such as interpolation method. Neural network propose an efficient preprocessing of image enhancement. In the review of enhancement seen that enhancement technique loss the contrasts and brightness of image. Brightness preserving in image enhance is critical phase. Here they discuss different method of image enhancements with brightness preserving and contrasts.

[1] In this paper author proposes a content-aware algorithm that enhances dark images, sharpens edges, reveals details in textured regions, and preserves the smoothness of flat regions. The algorithm produces an ad hoc transformation for each image, adapting the mapping functions to each image's characteristics to produce the maxi-mum enhancement. They analyze the contrast of the image in the boundary and textured regions, and group the information with common characteristics. These groups model the relations within the image, from which they extract the transformation functions.

[2] In this paper, a fuzzy nonlinear enhancement algorithm for the infrared image based on Curvelet transform, in the Curvelet there's non-linear processing respectively towards the low frequency coefficients domain sub-band and the direction of the band-pass sub-band coefficients, and the image is enhanced through the inverse transform. The results show that this method can effectively enhance the low contrast infrared image, when regarding to the visual effect, it is better than the rest of several traditional methods. Considering the low contrast and strong noise and without obvious distinction between target and background of infrared images, an enhancement algorithm is proposed.

[3] Author presents a new approach has been proposed to improve the computational performance of denoising in which adaptively defined learning step size has been used for tuning the parameter of the thresh holding function of wavelet transform-based thresh holding neural network (WT-TNN) methodology. In this approach, steepest gradient-based learning step size of WT-TNN methodology are changed to the proposed adaptively defined learning step size for tuning the parameters of thresh holding function. The results of the image enhanced by such adaptive learning step size exhibit the increase in the speed of learning and improved edge preservation feature.

[4] In this paper two transform based super resolution methods are presented for enhancing the resolution of a stationary image. In the first method, neural network is trained by wavelet transform coefficients of lower resolution of a given image, and then this neural network are used to estimate wavelet details sub bands of that given image. In this way, by using these estimated sub bands as wavelet details and the given image as the approximation image, a super-resolution image is made using the inverse wavelet transform. In the second proposed method, the wavelet transform is replaced by contour let transform and the same mentioned procedure is applied.

[5] In this paper, they propose an improved pulse coupled neural network (PCNN) for image enhancement. They apply the passive membrane equation, which is known as a model for describing the ON-OFF opponent property of the receptive fields of the retinal ganglion cells, as the linking field to modulate feeding field input of the PCNN and obtain the enhanced neural pulse as the output image. Initially, the RGB image is converted to luminance and chrominance images. Only the achromatic image is enhanced. Finally the RGB image is reconstructed from the enhanced luminance component along with the original chrominance components. The experimental results show the effectiveness of the method.

[6] This paper addresses the image registration problem applying genetic algorithms. The image registration's objective is to define mapping that best match two set of points or images. In this work the point matching problem was addressed employing a method based on nearest-neighbor. The mapping was handled by affine transformations. This paper presents a genetic algorithm approach to the above stated problem of mis-registration. The genetic algorithm is an iterative process which repeatedly modifies a population of individual solutions. At each step, the genetic algorithm selects individual at random from the current population to be parents and uses them to produce the children for the next generation.

[8] A novel HVS-directed neural network- based adaptive interpolation scheme for natural image is proposed. A fuzzy decision system built from the characteristics of the human visual system (HVS) is proposed to classify pixels of the input image into human perception no sensitive class and sensitive class. High-resolution digital images along with supervised learning algorithms are used to automatically train the proposed neural network. Simulation results demonstrate that the proposed new resolution enhancement algorithm can produce higher visual quality of the interpolated image than the conventional interpolation methods. The fuzzy decision rules inspired by human visual system (HVS) are proposed to analyze the sensitivity of human eyes to the image for interpolation.

[10] Proposed a method for image resolution enhancement from multiple image frames using an integrated recurrent neural network (IRNN) [4]. The IRNN is a set of feed-forward neural networks working collectively with the ability of having feedback of information from its output to its input. As such, it is capable of both learning and searching the optimal solution in the solution space for optimization problems. In other words, it combines the advantages of both the Hopfield network and the multilayered feed-forward network in solving the enhanced image reconstruction problem. Simulation results demonstrate that the proposed IRNN can successfully be used to enhance image resolution. The proposed neural network based method is promising for real-time applications, especially when the inherent parallelism of computation of the neural network is explored.

IV PROBLEM FORMULATION

The basic idea behind this thesis is the estimation of the uncorrupted image from the distorted or noisy image, and is also referred to as image "enhancement". There are various methods to help restore an image from noisy distortions. Selecting the appropriate method plays a major role in getting the desired image. The enhancement methods tend to be problem specific. For example, a method that is used to denoise. Satellite images may not be suitable for enhancement medical images. Each method is compared and classified in terms of its efficiency. In order to quantify the performance of the various enhancement algorithms, a high quality image is taken and some known noise is added to it. This would then be given as input to the enhancement algorithm, which produces an image close to the original high quality image. The performance of each algorithm is compared by computing Signal to Noise Ratio (SNR) besides the visual interpretation. Also we find in general problem in image denosing process used wavelet transform and artificial neural network model.

1. The mean template approach: The original gray value of one pixel and its surrounding neighbouring pixel gray value are divided by the sum of these pixels, the average value will be the gray value of the corresponding pixel of new image. This method has the advantage: not only easy to understand, and computation easy, suitable for small image and noise less situation. But when the image is larger and more noise, the use of the mean template and cannot effectively remove the noise, and the average operation, will have some degree of blurred images'".

2. The neighbourhood smoothing method: Using the average gray value of the pixel and its neighborhood look upon as the gray value of the pixel, this method is simple, but it will make the image blurred boundaries. Therefore, in order to better image enhancement. After some research enhancement algorithm. Proposed a threshold based on digital image enhancement hybrid algorithms. It has several features:

3. Bad PSNR in images of rich textures and higher visual quality in the region of texture area.

4. Difficult to design adaptable size of coded blocks according to the level of wavelet packet decomposition.

V EXPERIMENTAL RESULT ANALYSIS

In this section discuss the comparative result analysis of pervious algorithm used for the image enhancement process used soft computing approach and optimization technique. For

the performance evaluation of histogram equalization method for Baby, Lena, Family and Barbara image. This all image is gray scale image size is 512 * 512. Histogram equalization is basic method for image enhancement. The performance measuring parameter is PSNR and AMBE. Here we use various types of image enhancement techniques such as ME, MHE, Channel filter and proposed algorithm.

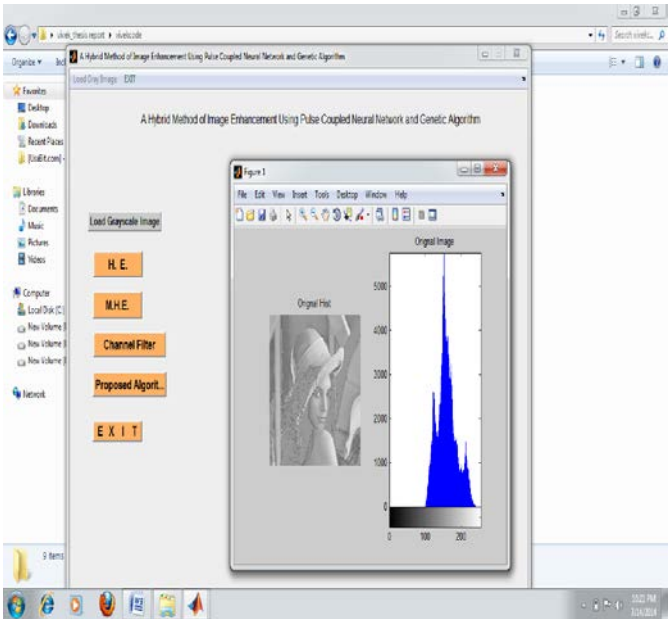

Figure 1: shows that enhanced image by histogram equalization method and equalized histogram map for channel filter method.

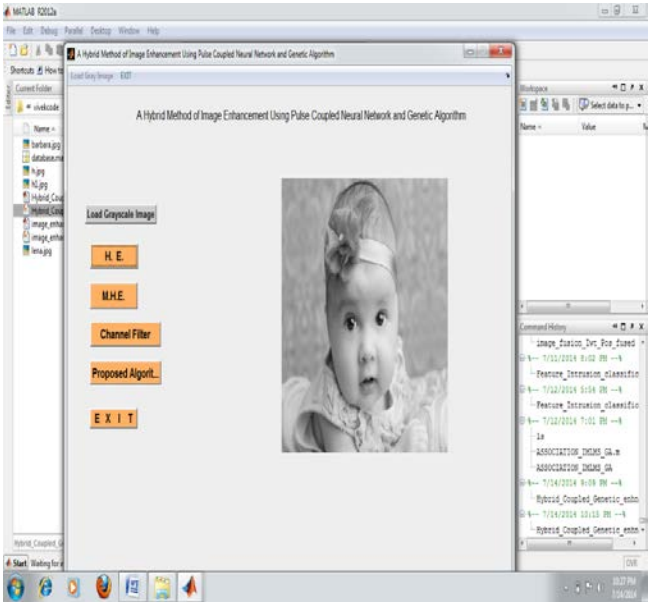

Figure 2: Shows that the upload grayscale image of baby for the performance evaluation using various methods.

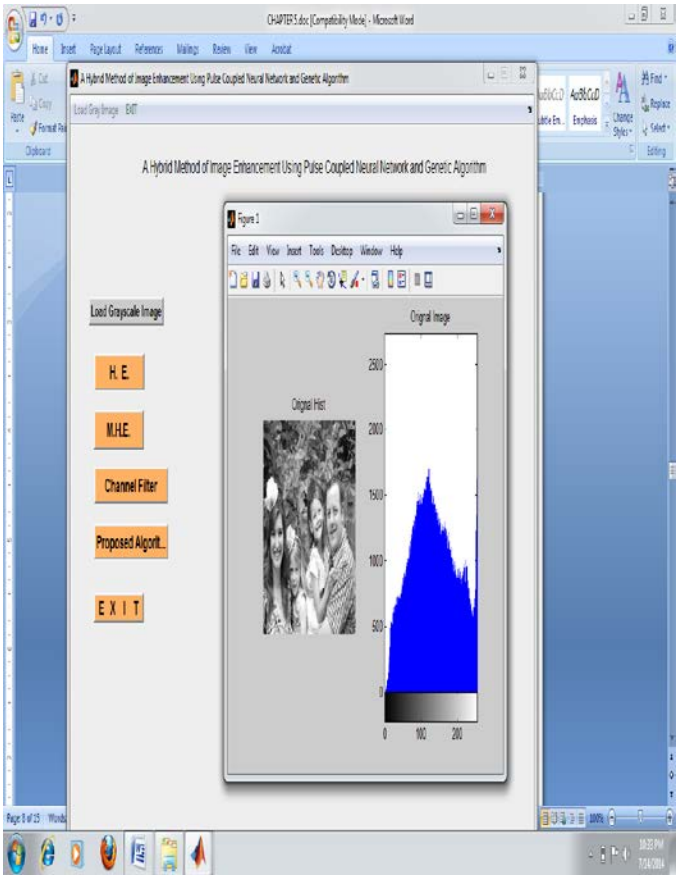

Figure 3: shows that enhanced image by histogram equalization method and equalized histogram map with MHE method.

IMAGE	PSNR (HE)	PSNR (MHE)	AMBE (HE)	AMBE (MHE)
BABY	28.99	32.43	86.02	68.56
FAMILY	15.65	17.50	54.53	52.66
LENA	12.10	10.82	36.42	37.71
BARBARA	23.65	24.59	44.38	45.36

Table 1: Shows that value of PSNR, AMBE on the basis of method HE and MHE for the image BABY, FAMILY, LENA and BARBARA.

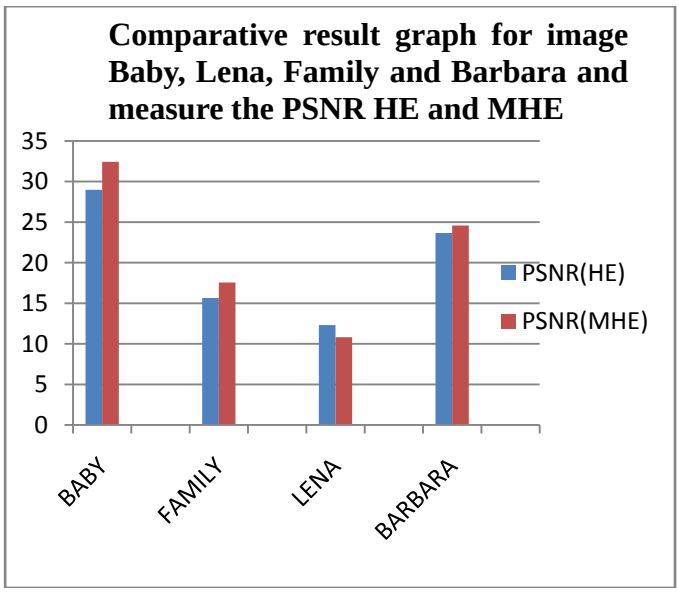

Figure 4: Comparative result graph for image Baby, Lena, Family and Barbara and measure the PSNR HE and MHE.

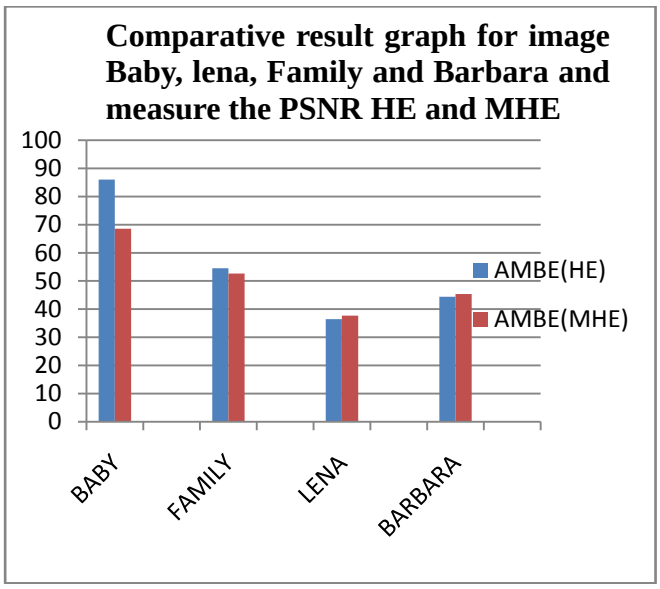

Figure 5: Comparative result graph for image Baby, Lena, Family and Barbara and measure the AMBE HE and MHE.

VI CONCLUSION AND FUTURE WORK

In this paper we study a various research paper and proposed a solution for the problem. In proposed method a hybrid PCNN-GA method based on Wavelet transform function and neural networks is proposed. PCNN were used to find correlation between noised and original WT coefficients and approximation. Experimental results showed capability of proposed method to remove noise in terms of PSNR and visual quality. Different architectures and different activation functions is considered. The experimental results show the mean with the traditional enhancement methods, the proposed threshold-based enhancement digital image enhancement algorithm for mixed digital image enhancement is relatively clear, especially in the more noise, more complex cases", can show its good performance.

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