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A hybride méthode of image enhancement Using pulse coupled neural network and Genetic Algorithm

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ABSTRACT:- Image enhancement is an important task in image processing, use of wavelet transform improves the quality of an image and reduces distortion level. Image enhancement is an important step for any complicated algorithms, in computer vision and image processing. Denoising is necessary and the initial step to be taken prior to the image data is analyzed. It is essential to apply an efficient enhancement technique, to compensate such data corruption. The effort of image enhancement is to improve an image that is cleaner than its distortion observation. Therefore, a substantial technology in image analysis is noise reduction and the initial step to be taken prior to images is analyzed. In this paper proposed a hybrid method for image enhancement for improvement of image analysis. The process of raw image gets the high component value of noise in environment. For the reduction of these noise used wavelet domain method. The wavelet method is well recognized method for voice noise reduction. In wavelet method the local noise component value are not considered. Then after the enhancement process noise are still remain in raw image. For these low components value collection used genetic algorithm. And finally used PCNN.

KEYWORDS:- Image Enhancement, Wavelet Methods, Image Denoising.

I. 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]. The alternative of attributes and the way they are customized are specific to a given problem. Image enhancement techniques to enhance the original image: Edge Enhancement and Clarification. Edge enhancement reveals the subtle details in the image that might otherwise go undetected. It provides insight into the shape and outline of object and offers vital information to the human visual system. Image Enhancement helps in differentiating features by making an improvement to the visual quality perception and is used in many fields. SAR images [10] are edge enhanced to help in surveillance, navigation, moving target indication and environment monitoring. While in medical imaging ultrasound images [11] are enhanced to help in detecting organ boundaries and in subsequent diagnosis and treatment of the disease. While in the Clarification technique helps in reducing such problems by adding a crisp focused look to the image and brightening it. In oceanography, astronomy, atmospheric sciences, etc., images suffer from light pollution and hence are brightened to identify and capture objects of interest. 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. The noise, often referred to as "speckle", is a multiplicative signal-

dependent noise. Ultrasound is a medical imaging modality suited for many applications, since the image acquisition is real-time. Therefore, ultrasound can be used for surgical guidance and robotic assisted interventions. For surgical applications, ultrasound overs a light, real-time, inexpensive, non-ionizing capability to image the surgical field and update the pre-operative planning [9]. To fully benefit from this real-time capability, image processing methods also need to be real-time, which is also crucial for surgical applications. Image denoising still remains a challenge for researchers because noise removal introduces artifacts and causes blurring of the images. A traditional way to remove noise from image data is to employ spatial filters. Spatial filters can be further classified into non-linear and linear filters. In this paper we used wavelet transform for decomposition of image in terms of layer. Wavelet transform basically two types one is continuous wavelet transform and another is discrete wavelet transform. Wavelet transforms have been one of the important signal processing developments in the last decade, especially for the applications such as time-frequency analysis, data compression, segmentation and vision. During the past decade, several efficient implementations of wavelet transforms have been derived [5]. The theory of wavelets has roots in quantum mechanics and the theory of functions though a unifying framework is a recent occurrence. Wavelet analysis is performed using a prototype function called a wavelet. Wavelets are functions defined over a finite interval and having an average value of zero. The basic idea of the wavelet transform is to represent any arbitrary function f (t) as a superposition of a set of such wavelets or basis functions. These basis functions or baby wavelets are obtained from a single prototype wavelet called the mother wavelet, by dilations or contractions (scaling) and translations (shifts) [16]. Efficient implementation of the wavelet transforms has been derived based on the Fast Fourier transform and short-length fast-running FIR algorithms in order to reduce the computational complexity per computed coefficient. All wavelet packet transforms are calculated in a similar way. In Section II state the problem. The Section III Related work IV discusses proposed methodology. In section V discuss performance evaluation and result analysis followed by a conclusion in Section VI.

II. PROBLEM STATEMENT

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 neighborhood 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.

III. RELATED WORK

In this section we discuss the 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 pre-processing 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] They propose 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. The results are then adaptively mixed, by considering the human vision system characteristics, to boost the details in the image.

[2] They presents 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.

[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 thresholding function of wavelet transform-based thresholding 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 thresholding 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.

[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.

IV. PROPOSED METHODOLOGY

In this section, we discuss image enhancement methodology based on PCNN neural network model comprised of pulse coupled neural network (PCNN). The image features are extracted from the image using DWT function. PCNN acts as a clustering mechanism that projects N-dimensional features from the DWT function into an M-dimensional feature space. The resulting vectors are fed into PCNN that categorizes them onto one of the relearned noise classes. The proposed scheme is work along with genetic algorithm. The genetic algorithm process the collection task of local intensity of input image data. The collected noise value combined with high intensity image value and generates vector value for the process. They mapped features from each frame of the word onto the PCNN output to form a trajectory of winner nodes for a given word. The PCNN learns this trajectory for each denoising constraints value is comprised of a hierarchical organization of PCNN and PCNN. PCNN receives inputs from the DWT function bank and maps onto an M-dimensional space where M is the dimensionality of the PCNN output node distribution. The transformed feature vectors are fed into the PCNN, which classifies them. We call the feature space generated from the DWT function output as primary feature space and M-dimensional feature space from PCNN output as secondary feature space. The vectors from the secondary feature space are called secondary feature vectors.

Processing of proposed Algorithm

Step1. Initially input image passes through DWT function and decomposed into two layers different value.
Step2.the layers value different higher and lower part.
Step3. The collection of lower intensity value used genetic algorithm
step4. Genetic algorithm collects the local noise value after that combined with high intensity value.
Step5. After collecting total noise value convert into feature vector image data passes through PCNN network
Step6. In phase of feature mapping in feature space of PCNN network create a fixed cluster according to threshold of details of image part.
Step7. Here show steps of processing of PCNN network

Initialize each node's weights.

1) Choose a random vector from training data and present it to the PCNN.
2) Every node is examined to find the Best Matching Unit (BMU).
3) The radius of the neighborhood around the BMU is calculated. The size of the neighborhood decreases with each iteration.
4) Each node in the BMU's neighborhood has its weights adjusted to become more like the BMU. Nodes closest to the BMU are altered more than the nodes furthest away in the neighborhood.
5) Repeat from step 2 for enough iteration for convergence.
6) Calculating the BMU is done according to the Euclidean distance among the node's weights (W_1, W_2, … , W_n) and the input vector's values (V_1, V_2, … , V_n).
7) This gives a good measurement of how similar the two sets of data are to each other.
8) The new weight for a node is the old weight, plus a fraction (L) of the difference between the old weight and the input vector… adjusted (theta) based on distance from the BMU.
9) The learning rate, L, is also an exponential *decay* function.
10) This ensures that the PCNN will converge.
11) The lambda represents a time constant, and t is the time step

Steps 8. After processing of PCNN network out data of image is also passes through PCNN two stage network

Step 9. Finally gets enhanced image and calculate the value of PSNR and AMBR value.

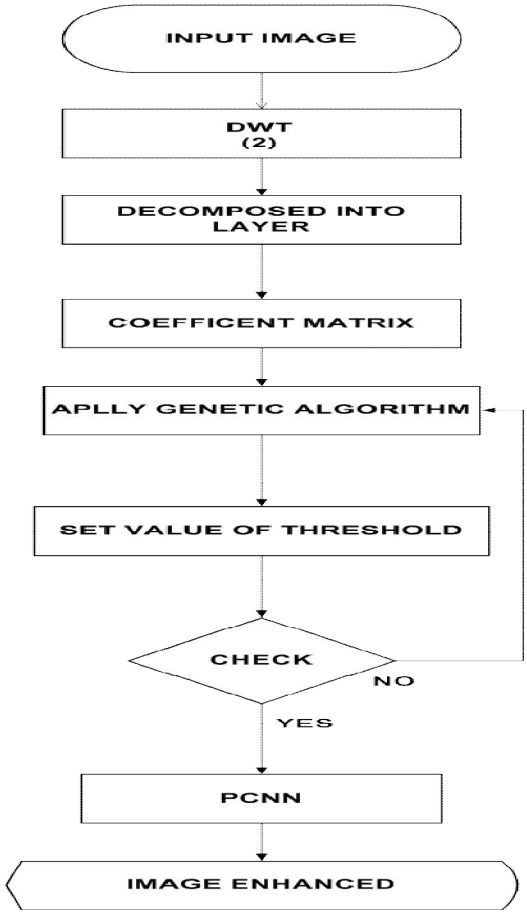

Figure 1: Proposed Model of our Algorithm.

V. IMPLEMENTATION DETAILS

It is simulating on mat lab 7.14.0 and for this work we use Intel 1.4 GHz Machine. MATLAB is a high level technical computing language and interactive environment for algorithm development, data visualization, data analysis, and numeric computation MATLAB is a software program that allows you to do data manipulation and visualization, calculations, math and programming [12]. For the performance evaluation of histogram equalization method for Camera man, Normal, Lena 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 are using various types of image enhancement techniques such as ME, MHE, Channel filter and proposed algorithm.

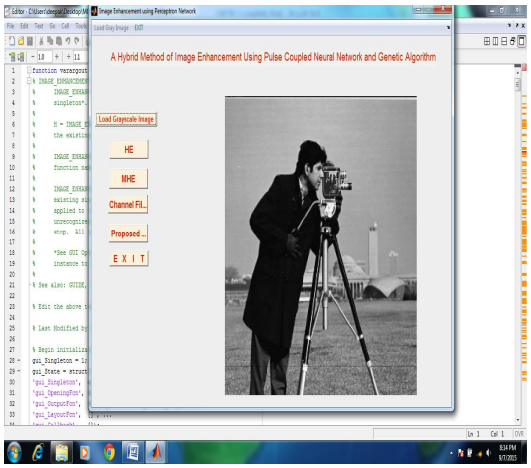

Figure 2: Shows that the selected image the camera man for the implementation.

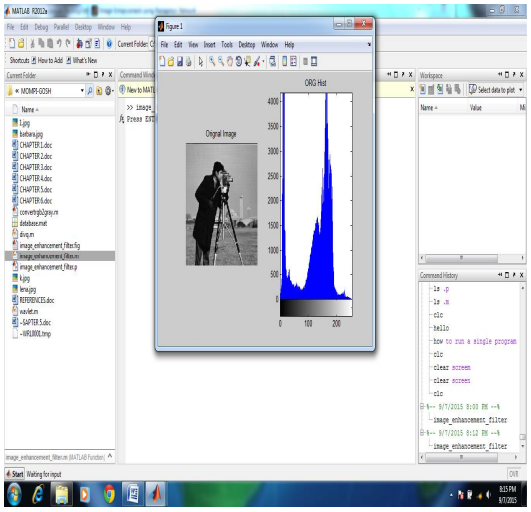

Figure 3: Shows that the original image with their histogram image for the selected image camera man using HE method.

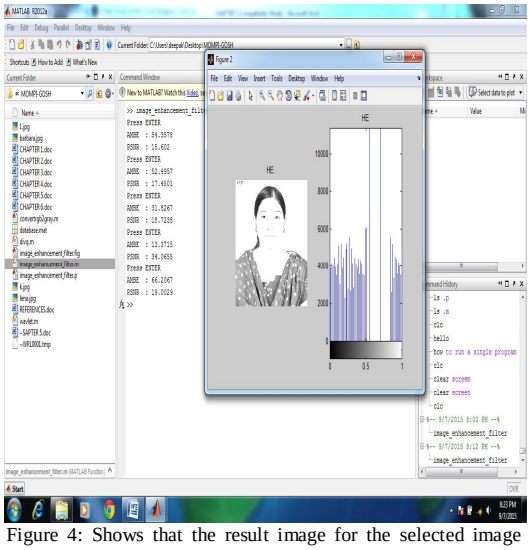

Figure 4: Shows that the result image for the selected image normal using HE method.

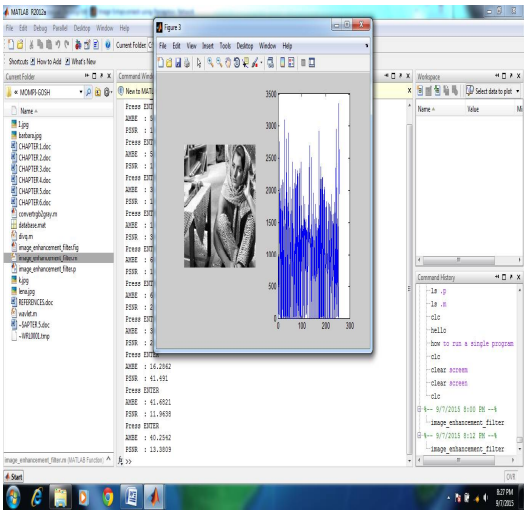

Figure 5: Shows that the result image for the selected image Barbara using MHE method.

Table 1: Shows that comparative performance value of AMBE and PSNR on the basis of HE, MHE, Channel Filter and Proposed methods for the image Camera man Image.

TYPES OF AN IMAGE	IMAGE	AMBE	PSNR
CAMERAMAN IMAGE	HE	54.35	15.60
	MHE	52.49	17.45
	CHANNEL FILTER	31.82	18.72
	PROPOSED ALGORITHM	13.37	34.06

Table 2: Shows that comparative performance value of AMBE and PSNR on the basis of HE, MHE, Channel Filter and Proposed methods for the image Normal Image.

TYPES OF AN IMAGE	IMAGE	AMBE	PSNR
NORMAL IMAGE	HE	66.20	19.00
	MHE	63.93	21.25
	CHANNEL FILTER	38.76	22.80
	PROPOSED ALGORITHM	16.28	41.49

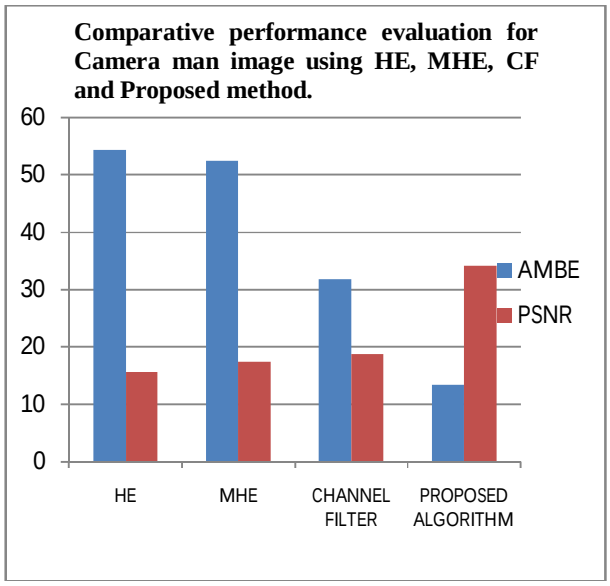

Figure 6: Shows that the comparative performance evaluation for Camerman image using ME, MHE, Channel Filter and Proposed method, here we find the value of AMBE and PSNR. Here our results shows that the our proposed method is better than the existing method and shows the less AMBE and Higher PSNR value.

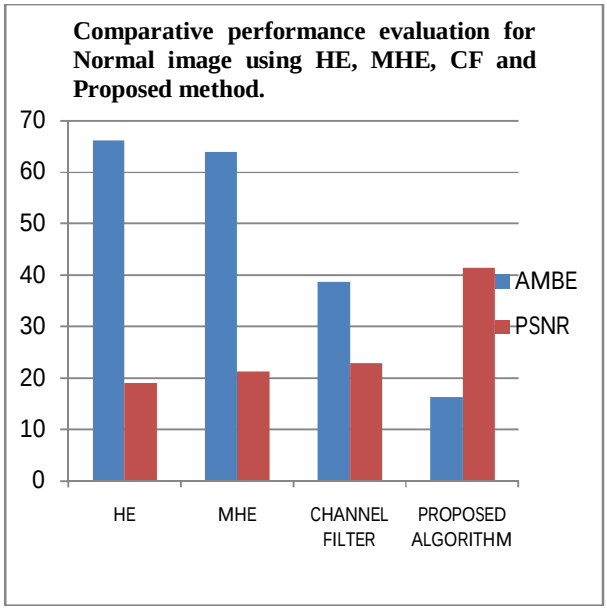

Figure 7: Shows that the comparative performance evaluation for Normal image using ME, MHE, Channel Filter and Proposed method, here we find the value of AMBE and PSNR. Here our results shows that the our proposed method is better than the existing method and shows the less AMBE and Higher PSNR value.

VI. CONCLUSION AND FUTURE WORK

In this paper 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. 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 hybrid method for image enhancement for normal image. Our experimental result shows that better result in compression of old and traditional method of image enhancement. But the computational time of process is increase. In future we used optimizations method for the reduction of time and improvement of quality of image.

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