PERFORMANCE OF IMAGE PIXEL INTERDEPENDENCY LINEAR PERCEPTRON NETWORK (IPILP) FOR IMAGE ENHANCEMENT

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ABSTRACT: Image enhancement is one of the challenging issues in low level image processing. Various authors proposed various methods such as histogram equalization, multipoint histogram equalizations and pixel dependent contrast preserving, but all these method are not up to marks. Now we proposed a new technique "image pixel interdependency linear perceptron network (IPILP) for image enhancement that provides a better result for contrast enhancement with brightness preservation. Image pixel interdependency linear perceptron network (IPILP) based on curve let transform and perceptron network. Through curve let image transform into multiresolution mode. Then find the pixel difference for the dependency of contrast, this difference matrix work as a weight vector for perceptron network and the perceptron network is used to adjust the weight of input image or values. Image pixel interdependency linear perceptron network (IPILP) for contrast enhancement has applied on several images and we have compared the result of our method with other image enhancement methods such as histogram equalization, multi-histogram equalization. To evaluate the effectiveness of proposed method, we have used the AMBE and PSNR. Absolute mean brightness error (AMBE) is used to measure the degree of brightness preservation. Smaller AMBE is better and Peak signal to noise ratio (PSNR) is used to measure the degree of contrast enhancement, greater PSNR is better.

KEY WORDS: image pixel interdependency linear perceptron network (IPILP), Absolute mean brightness error (AMBE), Peak signal to noise ratio (PSNR).

I.INTRODUCTION

In recent years, developments in computer vision and digital image processing are very quick. The field of digital image processing refers to deal with digital images by means of a computer. The final goal of image processing is to use data c

Contained in the image to enable the system to understand, recognize and make sense of the processed information. One part of digital image processing is image enhancement that includes edge increase, contrast improvement, and noise decline. The objective of image enhancement is to process an image so that the result is more approximately to native image. For example, it is used to process degraded images of unrecoverable objects i.e., archaeology image.

Image processing is the form of signal processing in which image is given as input and output is become either an image or set of characteristics related to image. Image processing involves the processing of image such as altering, enhancement, compressing etc the existing image. Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. It's among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too. Image Processing includes three steps:

1. Importing the image with optical scanner or by digital photography.

2. Analysing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.

3. Output is the last stage in which result can be altered image or report that is based on image analysis.

In imaging science, image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal processing techniques to it. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images referred to as imaging. Image enhancement refers to accentuation, or sharpening of image features such as edges, boundaries, or contrast to make a graphic display more useful for display and analysis. The enhancement process does not increase the inherent information content in the data. But it does increase the dynamic range of the chosen features so that they can be detected easily.

Image enhancement is used to improve the quality of an image for visual perception of human beings. It is also used for low level vision applications. Image enhancement is the mechanism to process the input image to make it more appropriate and clearly visible for the required application. Image enhancement improves the information content of the image and alters the visual impact of the image on the observer. The objective of image enhancement is to modify attributes of an image to make it more suitable for a specific task. In the image enhancement process, one or more attributes of the image are modified and processed. The choice of attributes and the way they will be modified are specific to a given task. Enhancement is pre-processing step in some computer vision applications to ease the vision task, for example to enhance the edges of an object to facilitate guidance of robotic gripper. Enhancement is also used as pre-processing step in applications where human viewing of an image is required before further processing. Image enhancement is used for post processing generate a desirable image.

II. LITERATURE SURVEY

Fan Yang et al, proposed that the input image is convolved by a Gaussian filter with optimum parameters and then the original histogram is divided into different areas by the valley values of the image histogram and finally we use the proposed method to processes images. This method has excellent degree of simplicity and adaptability in comparison of others methods. In order to reduce the noise's interference and improve the quality of input image, in this work Fan Yang and Jin Wu propose to use Gaussian filter convolving the image firstly. Gaussian filter reduces the difference in brightness between adjacent elements. It also can reduce blocking effects. P. Rajeev, proposed to enhance image contrast while preserving image brightness. The image dependent brightness preserving histogram equalization technique use the wrapping discrete curve let transforms (WDCvT) and the histogram matching technique. This technique identifies region and separation. The curve let transform is used to identify bright regions of an original image. It is also use for Histogram computation and matching. Murli D.Vishwakarma, proposed that IPILN uses Gaussian filter, curvelet transform and

perceptron network. Basically this technique involves three steps for contrast enhancement of the image. Image Filtration: The Gaussian filter is used to obtain a row image from input image.

Image Transformation: Transformation is a process that is used to convert a signal from one domain to another without the loss of information. Perceptron Network: To adjust the weight of input image, the concept of perceptron network is used. In perceptron network to adjust the weight, the learning factor is used which vary from 0 to 1. Xiaoying Fang et al. proposed a method to improve the enhancement result with image fusion method with evaluation on sharpness. As we know that Image enhancement can improve the perception of information. In this algorithm at first an image is taken from a real scene and then it should be divided into several regions according to the need for enhancement. Adin Ramirez Rivera et al. proposed a content-aware algorithm that enhances dark images, sharpens edges and details present in textured regions and give high degree of preservation to the smoothness of flat regions. This algorithm produces an ad hoc transformation for each image, by adapting the mapping functions to each image characteristic to produce the maximum enhancement. They specially analysed the contrast of the image in the boundary and textured regions, and then grouping of the information done with common characteristics. This algorithm Enhance the appearance of human faces, blue skies with or without clouds without introducing artefacts but it is unable to recover information from the shadowed or dark areas of images that had near black intensities.

S.C.F. Lina et al, proposed that the objective of this approach is increasing the image contrast while keeping the mean brightness of the output image unaltered as much as possible. First, a colour channel stretching operation is performed allowing the full coverage of the permitted dynamic ranges in order to convey the richest set of colour information to the viewer. Then, a histogram averaging process is carried out before it is used in the equalization operation. The purpose is to increase the information content that is obscured by the image capturing conditions. Finally, a histogram re-mapping process is conducted together with the HSI to RGB conversion stage to generate the output image. This method is able to release the need to separate the input image into sub-images and equalized independently. It also does not need to clip histograms to prevent artefacts. Instead, a histogram averaging strategy was adopted to produce the target distribution used in the histogram equalization process. Furthermore, an intensity remapping stage was included to alleviate the generation of artifacts. Together with the colour channel stretching pre-processing, the proposed approach is able to produce contrast enhanced images that are more desirable than current available methods in terms of brightness preservation, increased information content, object gradient sharpness and global contrast.

III. TECHNIQUES IN IMAGE ENHANCEMENT

Image enhancement process consist to improve the appearance of an image or to convert the image to a form better suited for analysis by a human or a machine. Enhancement of image is very challenging issue in many research and application areas. Image enhancement techniques are used to improve certain features by modifying the colours or intensities. Technique applied for enhancing is applicable for medical image processing and image processing application areas like satellite image processing, biometric image processing etc. Histogram equalization is a very common technique for enhancing the images. Suppose we have an image which is predominantly dark. Then its histogram would be skewed towards the lower end of the grey scale and all the

image detail is compressed into the dark end of the histogram. If it could `stretch out' the grey levels at the dark end to produce a more uniformly distributed histogram then the image would become much clearer. Histogram equalization stretches the histogram across the entire spectrum of pixels (0 – 255).

It increases the contrast of images for the finality of human inspection and can be applied to normalize illumination variations in image understanding problems. Histogram equalization is one of the operations that can be applied to obtain new images based on histogram specification or modification. Histogram equalization is considered a global technique. This process is quite simple and for each brightness level j in the original image, the new pixel level value (k) is calculated. Histogram equalization expand active range of strength value while squash the histogram. On many images, histogram equalization provides suitable results, but suitable to its global treatment of the image, sometimes it more than enhance the Image. It's used to enhance difference in images. Histogram equalization highlight only on local compare place of overall compare. Adaptive histogram equalization overcomes from this topic, this technique appropriate for general techniques. Once the image contain region that are expansively lighter and dark, the contrast in those regions will not be sufficiently enhanced. So adaptive histogram equalization compute correctly image region.

Adaptive histogram equalization enhances the contrast of images by transform the values in the intensity image. The contrast transform meaning is calculating for each of these regions independently. The optimal size of region depends on the type of the input image, and it is superlative determined during experimentation. Fuzzy-logic has been efficiently found in different elements of image processing. Recently fuzzy based algorithms for image enhancement have been developed with better performance com-pared to conventional and other advanced techniques. Fuzzy image processing includes mainly three stages: image fuzzification, modification of membership Values, and, if necessary, image DE fuzzification. After the image data are transformed from grey-level domain to the fuzzy membership domain (fuzzification), appropriate fuzzy techniques modify the membership values. Neuron-fuzzy systems are the Artificial Neural Network (ANN) based fuzzy systems. ANN determines the properties of data samples by processing it. Predictive power of ANN is more than that of signal analysis techniques. Fuzzy set theory is essential, for dealing with uncertainty. Neuro-Fuzzy system is a system where the fuzzy rules and sets are adjusted using neural network techniques in iterative manner with the set of pair of input and output data vectors. First such system behaves like a neural network where learning of parameters occurs and at the time of execution it behaves like a fuzzy.

IV. PROPOSED IMAGE PIXEL INTERDEPENDENCY LINEAR PERCEPTRON NETWORK (IPILP) METHOD

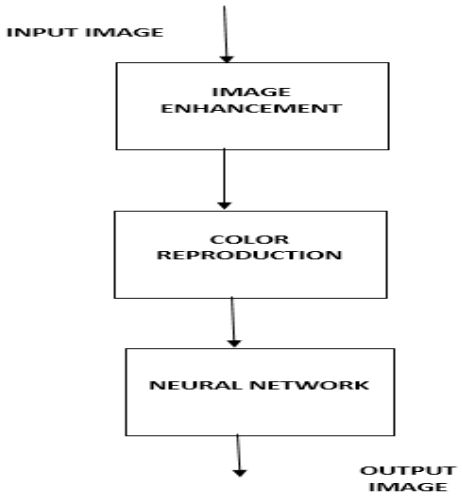

Fig. 1: EXISTED SYSTEM

The above figure (1) shows the block diagram of existed system. The blocks

used in this system are image enhancement, colour reproduction and neural network. This disadvantage of this system is it produce huge noise and brightness error. So to overcome this problem a new system is proposed which is shown in below figure (2). Basically, in digital image processing various techniques have proposed to enhance the quality of image such as histogram equalization, multi-histogram equalization and pixel dependent contrast preserving. Now we proposed a novel image enhancement technique "image pixel interdependency linear perceptron network (IPILP) for image enhancement that provides a better result for contrast enhancement with brightness preservation. The proposed Image Pixel Interdependency Linear Perceptron Network (IPILN) technique uses Gaussian filter, curvelet transform and perceptron network. Basically our proposed technique involves three steps that are below. Image Filtration: The Gaussian filter is used to obtain a row image from input image. Image Transformation: Transformation is a process that is used to convert a signal from one domain to another without the loss of information. In our approach we are using a multiresolution curvelet transform. To transform the row image, the curvelet transform is used that is a multidirectional transform. Perceptron Network: To adjust the weight of input image, the concept of perceptron network is used. In perceptron network to adjust the weight, the learning factor is used which vary from 0 to 1. A simple block diagram of proposed method is shown in figure (2).

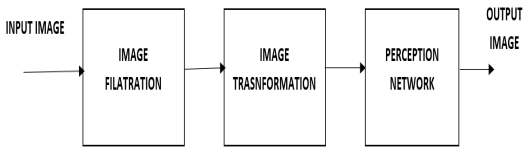

Fig. 1: PROPOSED SYSTEM

The image filtration is a pre-processing step in image enhancement that reduces the noise from input image and obtains a row image. In this work Gaussian filter is used to reduce the noise interference from input image. Gaussian filter is windowed filter of linear class; by its nature is weighted mean. Gaussian distribution, or normal distribution, is really a function of probability theory. Often this function is referenced as bell-function because of its shape. To transform a row image into multi-resolution mode, the curvelet transform function is used. It enables directional analysis of images in different scales. The curvelet transform, like the wavelet transform, is a multi-scale transform, with frame elements indexed by scale and location parameters. Unlike the wavelet transform, it has directional parameters, and the curvelet pyramid contains elements with a very high degree of directional specificity.

Image transformation is done in many steps that are as follows. (A) Row image is converted in a matrix form by using the curve let transform that is a multi-directional transform. (B) Calculate the mean value of matrix and the mean value are used as a threshold value. Perception network Calculate the pixel difference by using gradient decent method. The gradient decent is based on minimization of error E defined in terms of weight and activation function of network. Compare the pixel difference with mean value .If pixel difference is greater than mean vale then, pixel difference value is selected for weight matrix, otherwise is rejected.

V. RESULTS

Fig. 3: COMPARISION OF ABSOLUTE MEAN BRIGHTNESS ERROR (AMBE)

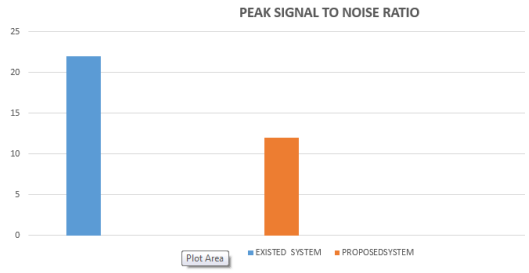

FIG. 4: COMPARISION OF PEAK SIGNAL TO NOISE RATIO (PSNR)

VI. CONCLUSION

In image enhancement field various techniques have proposed to enhance the quality of image such as histogram equalization, multi-histogram equalization and pixel dependent contrast preserving. We proposed a novel image enhancement technique "image pixel interdependency linear perceptron network (IPILP) for image enhancement that provides a better result for contrast enhancement with brightness preservation. IPILP uses the curvelet and perceptron network for image enhancement. The curvelet transform is used to transform an image into multi-resolution mode and perceptron network is used to adjust the weight of input image or values. Our proposed method for contrast enhancement has applied on several images and compared the result of our method with other image enhancement methods.

VII. REFERENCES

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