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Enhancement Techniques of Medical Images- A Review

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Abstract: Improving the clinical capabilities medical image enhancement plays vital role for analysis of image. To gain the accuracy of an image enhancements technique is used.The additional information which is gained by enhancement is used for medical diagnosis and analysis. This method improves the quality of that image and preserves the accuracy. In image enhancement the result is more visible and suitable than the original image for specific information. When images are enhanced for human viewers the objective may be to improve the image quality, intelligibility for visual appearance.

Keywords: Image enhancement, Medical image.

I. INTRODUCTION

In recent years, the demand for enhancement of medical images has been increased in order to assist clinicians to make accurate diagnosis so medical image processing gives relief to enhance the medical images for proper diagnosis of disease. Improve the quality of images has always been one of the central tasks of medical image processing. Medical image plays important role in clinical applications. Image enhancement improves the clarity of images for human viewing. Blur and noise of an image is remove which increase contrast and gives details of an image are examples of enhancement operations. While capturing the image some information of an image loss and the image make blur or less informative and sometime not so clear also. Medical image are poorly illuminated, many important part are not visible so, Uncertainties which are present in images and makes the image blur and contrast which is difficult to detect.

So, to increase the accuracy of that image firstly enhanced that image. The demand for enhanced the medical images has been increased in order to comfort experimenter to make accurate diagnosis. The tasks of enhancement in medical images are generally to enlarge a region of interest. The main issue of concern is preserving the details of an enlarged image. Generally images contain problems such as losing the contrast and image gives blurring details. Thus, a robust medical image with these two issues. Rapid increase in the use and applications of medical images, it become a essential to develop tools and methods for medical image processing. There are various enhancement techniques and methods to enhance the images. These techniques use many denoising algorithms, filtering, interpolation, wavelets etc. for enhancing the images.The most commonly used algorithms in the medical imaging (image registration, image denoising, image segmentation).Various medical imaging modalities, such as magnetic resonance imaging (MRI), Computerized Tomography (CT), have been developed and widely used for clinical diagnosis. Many image functions of an image are used to enhance the geometric features such as edges, corners and ridges of that image.

II. LITERATURE REVIEW

For studying the concepts of image enhancement I have surveyed some papers in medical image enhancement. As we know the medical images are sometimes not capture clearly due to some noise, artifacts, loss information, blur image and many more. But it is difficult to deal with all problems together. Here I am discussing some previous papers. Due to the importance of image enhancement of medical images, researchers have proposed a number of methods which can be coarsely classified below.

Bibo Lu, Hui Wang, Chunli Miao et. al [1] proposed a method which is based on wavelet of coefficient which merge the coefficients in an appropriate way in order to obtain the best quality in the fused image. In This method first source images are decomposed into low frequency and high frequency sub-bands then the wavelet coefficients are combined to obtain the new coefficients of the fused image. Different strategies are performed for low and high frequency coefficients. In low frequency coefficient, most of image information is concentrated and combined with weighted average to yield new coefficients. Wavelet method is an efficient tool for image enhancement. The critical task in image fusion is the combination rules for high frequency coefficients, which contain an abundance of image edge information.

In this paper Amir Yavariabdi, Chafik Samir, Chafik Samir et.al [2] proposed a method for 3D image resolution enhancement based on discrete stationary wavelet transforms to generate sharp high resolution images. They first increase the quality of edges using a shape function and then use both the discrete and stationary wavelet transforms to decompose the resulting image into low and high frequency sub-bands. The proposed method shows that the results obtained in [2], in the 2D case. To assess the efficiency of our method, we have considered comparisons with some conventional and state-of-art image resolution techniques such as bi-linear, WaveletZero Padding (WZP), Discrete Wavelet Transform Based Image Enhancement and Image Enhancement by using Discrete and Stationary Wavelet Decomposition [2]. In this Paper the 2D version of the

proposed method outperforms.The proposed method preserves more high frequency components after the corrections obtained by computing the mean of high frequency sub-bands than interpolating the input image directly.

N. Mohanapriya et.al [3], B. Kalaavathi, takes the comparative study of enhancement technique, described the Spatial domain method briefly. Spatial domain refers to the aggregate of pixels composing an image and it is denoted by P (X, Y) = output image, input image is a transformation operator; it is to define the some near point of (x, y). To defining the near point of (X, Y) can use a square or rectangular sub image at (X, Y). The centre of image is moved from pixel to pixel and starting at the top left corner. T is the transform operator applied to each location (X, Y) to yield the output of that location. Spatial Enhancement methods are mainly used in different field like satellite image and medical image analysis. The results showed that improved image quality, structural appearance of input image and also noises were removed from an image. This method implemented only for grey level images. The same process can be extended for the color images too.

Chaira et.al [4] author proposed a type II fuzzy set method. In this first upper and lower membership functions are calculated by using eq. Fuzzy linguistic hedges generate lower and upper membership function of type I fuzzy membership function. In this proposed method used a function alpha with some values. When the value of the function is increased then the quality of the image is also increased and the obtained enhanced image has a better contrast. Thus, with a higher value of function the membership values are feasible and so enhanced image are also better. In this method enhanced image is less than original image.

III. ENHANCEMENTTECHNIQUE

A. Wavelet Transform & Histogram Equalization

Histogram equalization techniques which make advance change in the dynamic range of an image and contrast level of an image. Histogram equalization [9] individually operates nonlinear & non-monotonic transfer function for input and output images pixel intensity values. Histogram equalization handle a non-linear mapping for uniform distribution of intensities to the different intensity pixels values in the output image as well as input image. This technique is using for image comparison & correction in the nonlinear process because it is use to enhance the image quality.

Steps to calculate the Histogram of an image.
1. Take an original image.
2. Make the histogram of an image.
3. Smooth the histogram using filter.
4. Detect local minima's.
5. Divide the Histogram.
6. Equalize the histogram.
7. Assign the grey level to each part.

Wavelet transform: Wavelet transform is used for the time and frequency. In this technique the signal is passed through low pass and high pass filter. The levels of the wavelet made for the repeating the filtering. The process which is carried out finite number of level are called as wavelet coefficient but sometimes we don't know the spectral components exist or not. So, the best way to investigate spectral components exist at any given interval of time i.e. High frequencies are to be resolved in time and low frequencies are resolved in frequency. This means that, a certain high frequency component located in time with less error than a low frequency component & component of low frequency located better as compared to high frequency component. The discrete wavelet transform (DWT) is used to set the discrete wavelet scales for numerical analysis and functional analysis. In the discrete wavelet transform cut-off frequencies of different filters are used to analyse the signal. The resultant coefficients discrete wavelet are called as discrete wavelet transform (DWT)[9].

$$f[n] = \frac{1}{\sqrt{M}} \sum_k W_\varphi[j_0, k] \varphi j_{0,k}[n] + \frac{1}{\sqrt{M}} \sum_{j=j_0}^{\infty} \sum_k W_\psi [j,k] \Psi_{j,k}[n]$$

To observe the frequencies signal is calculate by a high and low pass filters.

B. Spatial domain technique

Spatial domain techniques refer the pixels of an image. Spatial domain techniques like the logarithmic transforms, histogram equalization are directly transformation of the pixels in the image. This technique are particularly use for directly changing the gray level values of separate pixels and the need of image to be analysed, like medical image analysis but they usually enhance the whole image in a uniform manner. The approaches categories in two way. Point Processing operation. This is an Intensity transformation function and spatial filter operations. Point processing operations is the simplest spatial domain operation performs on single value. It can be given by the expression g(x, y) = T [f(x,y)], where T is grey level transformation in point processing. The Point processing approaches can be divided into four sub types as Image Negatives in which grey values of the pixelsin image are inverted to get its negative image. Consider a 8 bit digital image of size and then each pixel value from original image is subtracted from 255 as g (x, y)=255- f(x, y) for $0 \leq x < M$ and $0 \leq x < N$ .Second technique is Image thresholding transformation in which let rth be a threshold value in f(x, y). This technique is also named as binary image. This technique useful in image segmentation to isolate the background of an image. Third transformation is the Log transformation which maps a narrow range of low grey levels into wider range of grey levels. Logarithmic Transformations can be used to brighten the intensities of an image like the Gamma Transformation.

The medical image is applying as input image to obtain output as enhance image. In medical image first take input image.The image which takes somewhat blur, noisy and colorless image. In denoising of image make that image clear. For that takes the R, G, B values of pixels and maintain each pixel in average range (0 to 255).To remove

the black and white spot in that image to detect the crack clearly. In third step for enhancing use filter. Wavelet filter use enhance factor for set the values of pixels used.

IV. CONCLUSION

This enhancement process is used for detect the noise and get clear image using various enhancement to remove the noise of that image.These techniques enhance the lower & higher contrast area of an image in both spatial & frequency domain. Wavelets is use for sharpen the contrast, detect the edges. Discrete wavelet Transform enhanced the edges of the image, used for denoising.

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BIOGRAPHIES

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