A Significant Methods for Image Enhancement

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Abstract: ***Image enhancement plays a vital role in the field of image research. The image quality and its visual appearance thereby providing a better transform representation can be obtained by image enhancement technique. In General,Because of poor contrast and unusual noise different type of images such as medical images, satellite and also the real life photographs are affected. It is difficult to enhance the contrast and clear off the noise in the image, thereby improving the clarity of images for human viewing. The classification of image enhancement are Spatial Domain and Frequency Domain Enhancement. In this proposed method, Image Enhancement Processing Techniques in Spatial Domain is discussed. Specifically, the processing methods is based on quantitative approach of the corresponding tehcniques. Here in the proposed method employs several noises and engaged in analyzing the effect of each and also applied various filters for efficiently removing the noises.For recognizing the removal of noise in the image ,the values obtained in PSNR and MSE are compared, from this we can able to find which filters are suitable for removing specific types of noises. It will be useful and easier to detect the filters for future research.***

Keywords: Filters, Image Enhancement, MSE, PSNR, Spatial based Domain Enhancement Methods, Types of Noises in medical image.

I. INTRODUCTION

Generally digital image processing designed at manipulation of an image for the purpose of either extracting information from the image or producing an alternative representation of the image. Recently, there is a wide spread interest in handling of digital images and image sequences in different areas such as space exploration, medicine, surveillance, authentication, automated industry inspection and many others[1]. In each case, there is an underlying object or scene which is wished to observe, analyze and make decisions. Such as to improve the quality of the pictures by enhancement and restoration, extract information for analysis and recognition and change their structure for composition and image editing. Hence visual quality improvement is one of the research areas that are currently attracting the interest of many researchers for efficient interpretation of the image.

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A novel dictionary pruning algorithm is presented to obtain a better convergence speed and performance of the decomposition algorithms[4,5]. An image sequence denoising is based on sparse and redundant representation. By optimizing the dictionary with K means clustering algorithm besides the decomposition algorithm[2], a better denoising results were obtained than dictionary learning algorithms with fixed dictionary.In the bad weather condition the rain streaks can also be revomoved by using sparse coding to get improved image[3].

In this paper,digital images and its processing techniques, specifically various enhabcement algorithms were studied. The handling of digital images is a subject of widespread interest.Image processing is employed in reforming images(enhancement, restoration), information extraction (analysis, recognition) and alter their structure (composition, image editing.

The enhancement techniques are divided into two types: 1. Spatial domain methods: In which the operation directly affcets the pixels of the image which , 2. Frequency domain methods:In which , the operation takes place on the Fourier transform of the image. Real-time image processing is mostly carried out in spatial domain, because of its simplicity and easy interpretation.Spatial domain lacks imperceptibility and robustness. Frequency domain works on Fourier transform, discrete cosine and sine trans- form of the image. It suffers a drawback of not producing clear picture of background. Noise removal in an image plays a vital role because removing noise from a medical image helps in diagnosis,so noise free images are considered as much important in applications such as medical field. Filtering is a technique for removing the noise present in the image. This paper proposes the narration of spatial domain techniques, various type of noises and the filters applied to the imagesd. The comparison has been carried out with respect to the performance of the filters (Median Filter, Gaussian Filter, Mean Filter, Wiener filter) to de-noise the salt pepper noise, Gaussian noise, Poisson noise and Speckle noise is presented.

The rest of the sections are organized as follows: details about the proposed system along with all the components of the framework then results obtained based on the experiment performed, briefs the various enhancement technique and the performance. Finally discussed the conclusion of the work.

II. PROPOSED SYSTEM

In Image enhancement methods the feature of an image like the image's contrast, brightness characteristics, reducing its noise content, and sharpen the edge details etc are enchanced.

In this, denoising plays a vital role. This is due to the emergence of noisy image sequences, such as those captured by cellular phones, recorded by webcams and old archive movies. In many cases, the noise is assumed to be zero mean Gaussian noise, is also common in the still image denoising literature.In the proposed method ,a qualitative image ehnacement approaches were used for improving the quality of the image.Figure 1 shows the block diagram of the enchancement technique carried in the proposed method for bio medical images.

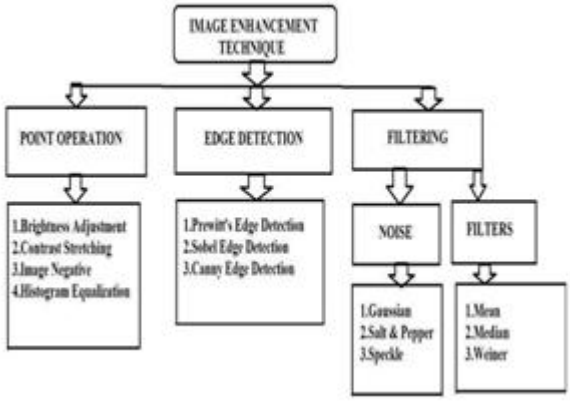


Fig. 1 Proposed Method

Point Operation

The various image processing operations P{ } are applied to the digital input image f[x,y] to obtain a different output g[x,y]. From this point on, all images may be considered as sampled data and thus the subscript s will be ignored and the coordinates will be labeled by [x, y]. The general operator has the form (Eq(1))

P {f [x, y]} = g [x , y] ----------(1)

Brightness Adjustment

Brightness is an characteristic that defines visual perception by the source that radiates or reflects a exact amount of light. Brightness of an object decides whether it is able to be traced or not due to the exposure levels (amount of light) Thus ,the proper brightness levels are of great importance when capturing a video or image so the object is properly visible and can be traced.In two ways the brightness can be adjusted either by increasing or decresing in order.Eq 2 shows the brightness adjustment

g[x,y]= f[x,y]±k ----------(2)

Where g[x,y] is the output image,f[x,y] is the input image,k is a constant

Contrast Adjustment

Contrast is the visual property of an object that separates it from other objects in a image. The contrast of objects can be adjusted by scaling all the pixel of the image by a constant k.It is given in eq.3

g[x,y]= f[x,y]*k ----------(3)

Where g[x,y] is the output image,f[x,y] is the input image,k is a constant

Image Negative

One of the methods is in image enhancement process is negative of the image or inverting the pixel of an image. The negative transformation is used to calculate the image negatives with the intensity level exists in the range of *[0, L-1]*.It is represented by the formula Eq. 4.

g[x,y]=(L-1) -f[x,y]----------(4)

Where g[x,y] is the output image,f[x,y] is the input image,Lis the grey value of the original image

By inverting the intensity level of the negative image is obtained. In an image, if the darker areas are predominant and large this technique to improve the grey or white information that are combined with darker parts of the image.

Edge Detection

Edge can be defined as a set of frequently occurring positions of pixel where a change in intensity, color or texture value occurs suddenly. Significantly, an edge depicts the local variations of intensity in an image. Edge detection is the process of detecting the edges and the important goal of it is to extract important details from the edges of an image such as lines,corners and curves; that will be evaluated by high level computer vision algorithms such as recognition.In the proposed method perwitt edge detection,sobel edge detection and Canny edge detection are used.

Filters and Noise Removal

The random variations in image intensity is known as noise. It looks like as grains in the image Noise should be removed from the image in order to recover the original details of image.There are many factors that contributes in the introduction of noise in an image. The quantification of noise specifies the number of pixels in the image which is corrupted.In the propsed method various noise as Gaussian Noise,Salt and Pepper Noise and Speckle Noise noise were removed by mean filter,median filter and weiner filter respectively.By using the filters the high frequency or low frequency of an image can be removed. Wiener filters are considered to be the linear filters which generate optimum values from other related sequence of signals. Mean filter or averaging filter is a simple linear filter and easy implementation method of smoothing images. Average filter is used to reduce noise .It also reduces the amount of intensity variation from one pixel to another. Take an average that is sum of the elements and divide the sum by the number of elements. Next, replace each pixel in an image by the average of pixels in a square window surrounding this pixel.The median filter also follows the moving window principle similar to the mean filter.The median of the pixel values in the window is calculated, and the center pixel of the window is replaced with the calculated median value. Median filtering is done by value. In this method , all the pixel values from the surrounding neighborhood are sorted into numerical order and the pixel being considered with the middle pixel value is replaced.Main objective of this technique is to filter out the corrupted signal.It is a kind of statistical approach. For designing this filter, the spectral properties of the original signal,the noise and linear time-variant filter should be known.

Its output should be as close as to the original as possible . The Wiener filter minimizes the mean square error between the estimated random process and the desired process.

III. RESULTS AND DISCUSSION

To test the image enhancement method on Bio medical image ,various CT and MRI images of size 512x512 were taken .Figure 2 Shows the original Image of size 512x512.The result of increased and decreased by a constant value of 100 is shown in figure 3.The contrast adjusted image by a value 5 is shown in figure 4.Figure 5 shows the result of the negative image for 8 bit depth image.Figure 6 shows the result after applying the perwitt ,sobel and canny edge detector.The noisy images are shown in the figure 7.After applying the filter in all the noisy image the result for the mean filter,median filter and Weiner filter is shown in the figure 8,9,10 respectively.

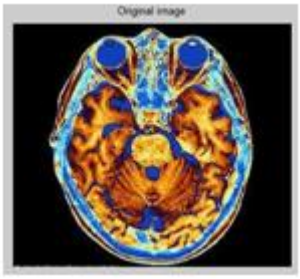


Fig.2 Original Image

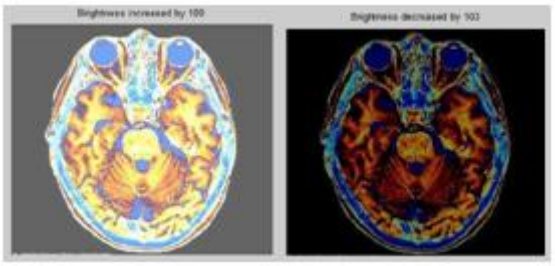


Fig. 3 Result for Brightness increased and decreased by 100

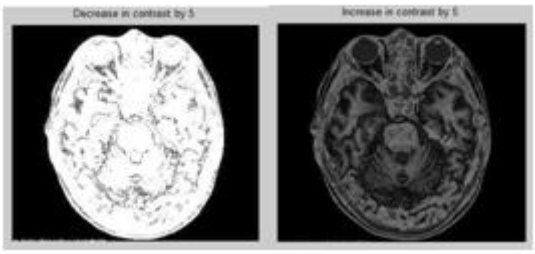


Fig. 4 Contrast increased and decreased by 5

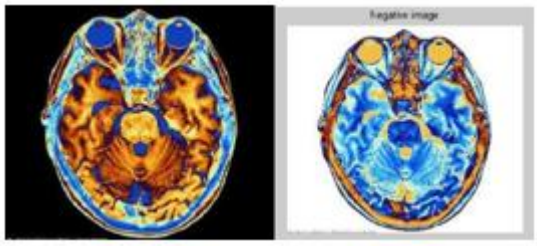
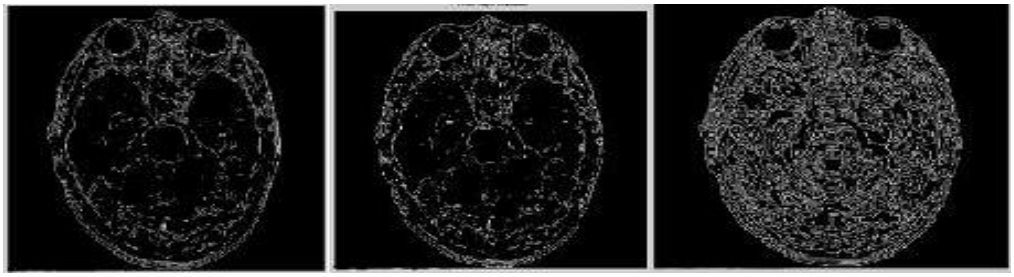
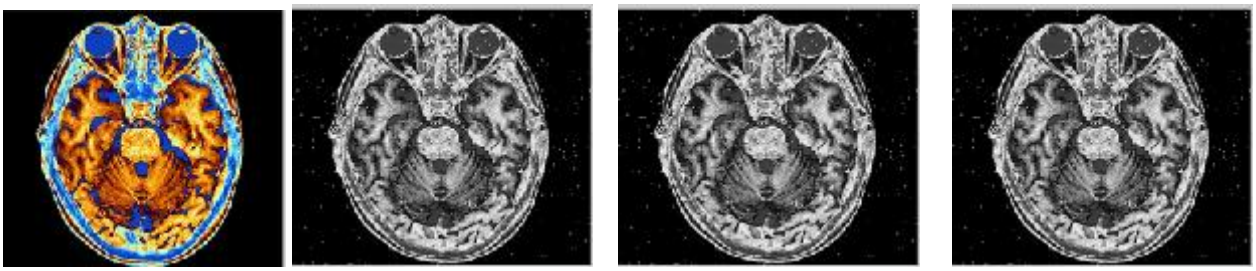


Fig. 5 Original Image and Negative Image



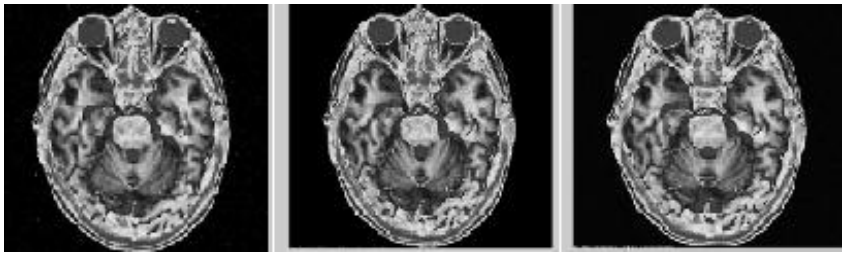
(a) (b) (c)

Fig. 6 (a) (b) (c).Results of Sobel ,Petrwitt,Canny edge detector



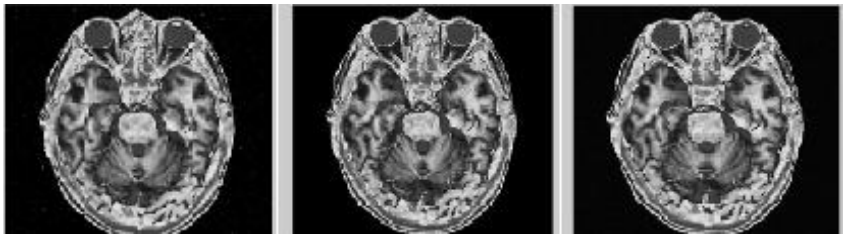
(a) (b) (c) (d)

Fig. 7 (a) (b) (c) (d) Original Image,Results of Noisy image(Salt and pepper,Gaussian,Speckel Noise)



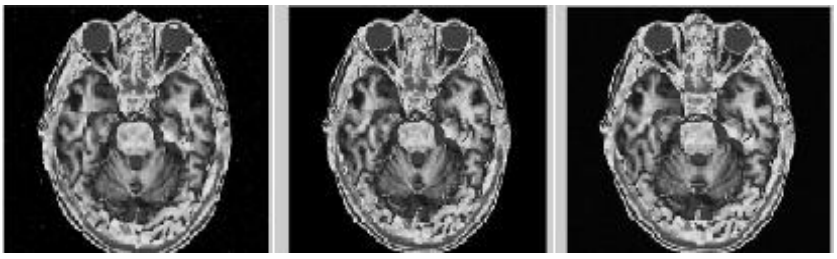
(a) (b) (c)

Fig. 8 (a) (b) (c) Results of denoised image by Mean Filter



(a) (b) (c)

Fig. 9 (a) (b) (c) Results of denoised image by Median Filter



(a) (b) (c)

Fig. 10 (a) (b) (c) Results of denoised image by Weiner Filter

The performance of the inage enchancement methods are analysed using the performance metrices as Peak signal to noise ratio for the various level of noise. Table 1 shows the resultant of the filter for 0.5% of speckle noise.For example Image 4 the mean filter shoes the PSNR value as 30.99 where as median filter and weiner filter vaue as 29.63 and 9.06 repectively so its very clear the for speckel noise the mean filter sound good than the other proposed filter.

Table 2 shows the resultant of the filter for 4% of salt and pepper noise.For example Image 1 the mean filter shows the PSNR value as 31.95 where as median filter and weiner filter vaue as 26.41 and 30.03 repectively so its very clear the for salt and pepper noise the mean filter sound good.Table 3 shows the resultant of the filter for 1% of Gaussiane noise.For example Image 1 the median filter shoes the PSNR value as 46.58 where as mean filter and weiner filter vaue as 31.36 and 33.03 repectively so its very clear the for the median filter sound good than the other propoed filter.

Table. 1 PSNR Value (DB) For 0.5% of Speckle Noise

IMAGE NO	MEAN FILTER	MEDIAN FILTER	WEINER FILTER
1	33.33	32.80	33.03
2	31.72	30.11	16.33
3	30.93	30.20	8.90
4	30.99	29.63	9.06
5	35.90	33.57	16.89
6	31.75	30.26	13.45
7	31.90	30.86	12.77
8	35.96	34.24	14.14
9	34.15	33.98	13.99
10	31.78	30.44	8.97

Table. 2 PSNR Value (DB) For 4% of Salt and Pepper Noise

IMAGE NO	MEAN FILTER	MEDIAN FILTER	WEINER FILTER
1	31.95	26.41	30.03
2	30.72	26.26	16.33
3	31.98	24.26	8.90
4	31.04	24.58	9.06
5	33.98	36.93	16.89
6	30.83	25.86	13.45
7	30.75	25.83	12.77
8	30.04	25.26	14.14
9	33.04	32.81	13.99
10	27.14	28.83	8.97

Table. 3 PSNR Value (DB) For 1% of Gaussian Noise

IMAGE NO	MEAN FILTER	MEDIAN FILTER	WEINER FILTER
1	31.36	46.58	33.03
2	30.55	46.73	16.33
3	30.41	49.45	8.90
4	29.68	47.41	9.06
5	33.62	48.64	16.89
6	30.29	42.31	13.45
7	29.97	44.51	12.77
8	33.56	48.35	14.14
9	32.25	48.64	13.99
10	30.38	51.72	8.97

IV. CONCLUSION

In this proposed system different image enhancement techniques has been discussed. In image enhancement field various techniques have proposed to enhance the quality of image such as Brightness Adjustment, Contrast Stretching, Negative image, histogram equalization. Noise is an important part of image processing which degrade the original image quality. Noise appears automatically in an image during image acquisition and transmission. So before going to the field of digital image processing it is very much essential to know the various types of noise and its impact in an image. Various types of noises are applied to the image and its impact in the digital image during image acquisition and transmission. Here light is also through on the cause of noise and there measure source.The best filters for the noise removal were identified by analyzing the results.

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