COMPARISON ON AVERAGE, MEDIAN AND WIENER FILTER USING LUNG IMAGES

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Abstract -

Image is a prone which have a variety of noise is Digital images. i.e. Poisson noise , Gaussian noise. To get a significant results, Filters like Median filters , Averaging filters, Weiner filter have been proposed to remove noise from Lung Images .This Paper deals with comparison of various filters for noise removing by accounting Peak Signal to Noise Ratio, Mean Square Error and Root Mean Square Error as performance parameters. This Paper proves that wiener filter is best filter for removing noise from the lung images. Results of this paper have been simulated on MATLAB.

Key Words: Image Denoising, MSE , PSNR , RMSE, Lung Image.

1.INTRODUCTION

Image denoising is an important & significant image processing task for both as a process itself and as a component in other processes. The main properties of a good image denoising model is that it will remove noise while preserving edges.[4]. A very many ways to denoise an image or a set of data exists.Traditionally, linear models have been used. One common approach s to equivalently solving the heat-equation with the noisy image or use a Gaussian filter as input-data, i.e. a linear, 2nd order PDE-model. One big advantage of linear noise removal models is the speed.For some purposes this kind of denoising is adequate. But a backdraw of the linear models is that they are not able to preserve edges in a good manner. Denoising of image is an essential part of reconstruction an image process. Noise gets introduced during transmission, acquisition & reception and storage & retrieval processes. Noise may be classified as substitutive noise (impulsive noise like pepper and salt noise etc), additive noise like Gaussian noise and multiplicative noise like speckle noise[1]. The property of an denoising model of image , it should absolutely eliminate noise with preserving edges. Basically the image quality is measured by the peak signal to noise ratio (PSNR) and root mean square error (RMSE).In this paper use the real data form the hospital. all lung images are taken by the hospital.

2. IMAGE DENOISING

The principle approach of denoising of image is filtering. To remove noise used filters are-
 2.1 Median filters
 2.2 Average filters

 2.3 Wiener filters.

2.1. Median filters

The median filter is non-linear filter. It remove noise effectively as well as preserving sharp edges.[3] A convolution filter is less effective than median filtyer. When the goal is to simultaneously reduce noise and preserve noise. It simply replaces each pixel value by the median of the intensity level in the neighborhood of the pixel. It proves to be best in removing salt and pepper noise . Instead of taking the mean ,rank of pixel values in the window use order statistics filter, take the nth order value

2.2. Average Filter

Average filter or mean filter is simple and easy to understand.it perform images smoothing (i.e sinking variation of intensity between one pixel and next)[3]. Average filter replaces each pixel by the average of pixel in a square window surrounding these pixels. ,larger window can noise removimg more effectively, but also blur image

2.3. Wiener Filter

Wiener filter is a linear filter. It provides linear estimation of a desired signal sequence from another related sequence[3] . Wiener filter provide solution in finding signal estimation troubles for stationary signals. It provides successful results in removing noise from images .Wiener filter is based on statistical approach

3. PERFORMANCE PARAMETER

The performance parameters are most important criteria to justify the simulation results. Peak signal to noise ratio (PSNR) and mean square error (MSE) are considered parameters[6].
Where MSE is the mean square error between original and denoised image with M*N size and R is maximum value of pixel present in an image.

$$MSE = \frac{1}{NxM} \sum_{i=0}^{N-1} \sum_{j=0}^{M-1} [X(i,j) - Y(i,j)]^2$$

The quality of denoised image is measured by

$$ \text{PSNR} = 10 \log_{10} \left(\frac{I^2_{\max}}{\text{MSE}} \right) $$

Where , x(i , j) is original image and y(i , j) is denoised image .

RMSE is defined as :

RMSE =sqrt(MSE)

4. RESULTS

TABLE 1- The following table shows the value of PSNR,RMSE,MSE Of Lung Images Using AVERAGE Filter.

IMAGE NAME	PSNR	RMSE	MSE
IMAGE 1	37.42	3.45	11.87
IMAGE 2	37.59	3.38	11.42
IMAGE 3	36.96	3.63	13.20
IMAGE 4	36.45	3.85	14.86
IMAGE 5	36.32	3.91	15.28
IMAGE 6	34.60	4.77	22.72

TABLE 2- The following table shows the value of PSNR,RMSE,MSE Of Lung Images Using Median Filter.

IMAGE NAME	PSNR	RMSE	MSE
IMAGE 1	42.31	1.96	3.85
IMAGE 2	40.75	2.35	5.51
IMAGE 3	41.39	2.18	4.76
IMAGE 4	39.12	2.83	8.03
IMAGE 5	40.55	2.40	5.77
IMAGE 6	37.40	3.45	11.92

TABLE 3 The following table shows the value of PSNR,RMSE,MSE Of Lung Images Using Wiener Filter.

IMAGE NAME	PSNR	RMSE	MSE
IMAGE 1	42.97	1.82	3.31
IMAGE 2	41.68	2.11	4.45
IMAGE 3	42.47	1.93	3.71

IMAGE 4	40.73	2.35	5.53
IMAGE 5	41.65	2.12	4.48
IMAGE 6	38.32	3.11	9.65

The following lung images are using in this paper-

Fig 1: Image

Fig 2: Image

Fig 3. Image

Fig 4: Image

Fig 5: Image

Fig 6:Image

3. CONCLUSION

In this paper, Above the results are show the best performance of the wiener filter. Wiener filter are the best filter to use the removing noise in comparison to Average and median filter. Wiener filter performs better in removing noise than other filters. Median filter also provide better results for removing noise. PSNR MSE, and RMSE has been used as comparison parameters. Results have been simulated on MATLAB .

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