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Enhancement in Progressive Switching Medium Filter for Denoising Image

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Abstract: *an image is considered as a collection of information and the occurrence of noises in the image causes degradation in the quality of the images. So the information associated with an image tends to loss or damage. It should be important to restore the image from noises for acquiring maximum information from images. In this work we can see how different types of noise will affect the quality of the images and the information in images. As a remedy, the quality and the information from the noised image can be retrieved using different types of filters. There are two types of impulse noise, like Salt and Pepper Noise and random valued noise. Salt and Pepper noise can corrupt the images where the corrupted pixel takes either maximum or minimum gray level. The removal of noise from the image is known as De-noising. In this work, we reduce Salt and Pepper noise using Improved Progressive Switching Medium Filter (IPSMF). This filter will maintain a limit of good pixels and improve only those pixels which are less than that limit. The experimental result will show the comparison and the performance of Existing filter with improved filter to de-noise the noised image.*

Keywords: *Image Denoising; Gaussian noise; Progressive Filter; Salt-and-pepper noise; MSE; PSNR; Thresholding.*

I. INTRODUCTION

Image denoising plays a vital role in digital image processing. There are many schemes for removing noise from images. The good denoising scheme must able to retrieve as much of image details even though the image is highly affected by noise [1]. In common there are two types of image denoising model, linear model and nonlinear model. Generally linear model are being considered for image denoising, the main benefits of using linear noise removing models is the speed and the limitations of the linear models is the models are not able to preserve edges of the images in an efficient manner Non-linear models can preserve edges in a much better way than linear models but very slow.

II. TYPES OF FILTER

1. Mean Filter: There are two types of filtering schemes namely linear filtering and nonlinear filtering. [3] Mean filter comes under linear filtering scheme. Mean filter is also known as averaging filter. The Mean Filter applies mask over each pixel in the signal. Each of the components of the pixels comes under the mask are being averaged together to form a single pixel that's why the filter is otherwise known as average filter. Edge preserving criteria is poor in mean filter. Mean filter is defined by. Where (x1 ….. xN) is image pixel range. Mean filter is useful for removing grain noise from the photography image. As each pixel gets summed the average of the pixels in its neighborhood is found out, local variations caused by grain noise are reduced considerably by replacing it with average value.

2. Median Filter: [3] Median filter is the nonlinear filter. The main idea behind the median filter is to find the median value by across the window, replacing each entry in the window with the median value of the pixel.

Median value calculation 115, 119, 120, 123, 124, 125, 126, 127, 150. Median value = 124 [5]. The pattern of neighbor's pixels is called the "window", when the window contains odd number of values in it than the median is simple: it is just the center value after all the entries in the window are sorted numerically in ascending order. But for an even number of entries, there is more than one center value; in that case the average of the two center pixel values is used. One of the major problems with the median filter is that it is relatively expensive and complex computation. For finding the median it is necessary to sort all the values in the neighborhood into numerical order and this filter relatively slow, even it is performed with fast sorting algorithms like quick sort. However the basic algorithm can be enhanced somewhat for the speed purpose.

3. Wiener Filter: [4] The main aim of the Wiener filter is to filter out the image that has been corrupted by noise. Wiener filter is based on a statistical approach. Desired frequency response can be acquired using this filter. Approaches followed by wiener filtering are of different angle. For performing filtering operation it is must to have knowledge of the spectral properties of the original signal and the noise, in achieving the criteria one can get the LTI filter whose output will be as close as original signal as possible. Wiener filters possess characterized by the following:

- Assumption: signal and (additive) noise are stationary linear random processes with known spectral characteristics.
- Requirement: the filter must be causal where this requirement is failed it resulting in a non-causal

solution Periodic noise can be effectively removed by correcting the amplitude spectrum components altered by the noise, and two frequency filtering methods are currently available, i.e., Wiener filtering and notch filtering. However, a Wiener filter requires an accurate noise model, which may be difficult to obtain in various practical cases. In addition, a Wiener filter is also complicated in computation.

4 Gaussian Filter: [2] The Gaussian filtering scheme is based on the peak detection. The peak detection is based on the fact that peaks are to be impulses. The key point is that this filter corrects not only the spectral coefficient of interest, but all the amplitude spectrum coefficients within the filter window.

Some properties of Gaussian filter are

- The weights give higher significance to pixels near the edge (reduces edge blurring).
- They are linear low pass filters.
- Computationally efficient (large filters are implemented using small 1D filters).
- Rotationally symmetric (perform the same in all directions).
- The degree of smoothing is controlled by σ (larger σ for more intensive smoothing).

III. MEAN FILTERS

Mean filter, or average filter is windowed filter of linear class, that smoothes signal (image). The filter works as low-pass one. The basic idea behind filter is for any element of the signal (image) take an average across its neighborhood. To understand how that is made in practice, let us start with window idea.

We have provided an overview of the adaptive alpha trimmed mean filters and examined their performance when the underlying noise deviates from Gaussian noise model. It is shown that the adaptive filter suggested by Restrepo and Bovik is very sensitive to deviations from the symmetric uni-modal noise assumption. Although this filter is fast and easy to implement and produces very good results for uni-modal symmetric noise distribution, it does not perform well for certain cases. The adaptive filter suggested by Taguchi, in general, shows a very good performance. However, this filter requires the variance of the noise distribution as an input. This can be estimated but the estimator should be very robust against outliers (impulses and edges). The MAD estimator we suggested is very robust but it makes this filter computationally very complex. Taguchi's filter is to be preferred over the other filters when the noise variance is known.

Mean filter or average filter is windowed filter of linear class, that smoothest signal (image). The filter works as low-pass one. The basic idea behind filter is for any element of the signal (image) take an average across its neighborhood. To understand how that is made in practice, let us start with window idea.

IV. PROBLEM DEFINITION

Noise in digital images is used to refer to random fluctuations in brightness, colour and intensity that usually make it more difficult to process the image properly. It basically adds irrelevant and unwanted information to the image, and so we should reduce that before proceeding onwards. There are techniques that can handle the reduction of noise in images, and that is what we shall discuss here. There is always a fair amount of approximation involved in noise reduction, but it is worth the potential loss of some needed information, to be able to get rid of a lot of unnecessary information. These technique work well as it can but some technique is better, some is not so by survey on these techniques, we will find out a comparison analysis and determine which one perform better.

V. OBJECTIVES

Our objectives includes the following

Step 1: Select an image on which we want to work for noise filtering.

Step 2: Image represent by pixels, so some pixels are good or some are bad due to some problem during capturing. Mean filter based on Linear De-noising never check about quality of pixels. It works only in step that is Filtering. So filter based on Median is used in our research work that detects corrupted pixels and then filter.

Step 3: Progressive Switching Median Filter based on Non-linear de-noising is implement on that noisy image and get result.

Step 4: This Filter has a disadvantage that it removes both the noise and the fine detail pixel since it cannot tell the difference between the two. It can tell only median level pixel.

Step 5: The pixel in fine quality is useful for us, so to overcome this problem we propose a new filter.

Step 6: The proposed filter sets a limit of pixel quality and the pixels higher that limit never change but noisy pixels improved by number of iterations.

Step 7: Result of improved filter compared with existing pixels and analysis of comparison provide us a conclusion of our research work

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VI. SIGNIFICANCE OF WORK

Progressive Switching Median Filter is a median-based filter, which works in two stages. In the first stage an impulse detection algorithm is used to generate a sequence of binary flag images. This binary flag image predicts the location of noise in the observed image. In the second stage noise filtering is applied progressively through several iterations. This filter is a very good filter for fixed valued impulse noise but for random values the performance is abysmal. The advantage of using Progressive Switching Median Filter preserves the positions of boundaries in an image, making this method useful for visual examination and measurement. But the disadvantage is to removes both the noise and the fine detail since it cannot tell the difference between the two. To overcome the above drawback Decision Based Algorithm is proposed.

The progressive switching median (PSM) filter implements a noise detection algorithm before filtering. Both noise detection and filtering procedures are progressively repeated for a number of iterations. As an attempt to improve the PSM filter, an improved progressive switching median filter (IPSM) is proposed to enhance progressive median filter in term of its noise filtering ability. The proposed algorithm sets a limit on the number of good pixels used in determine median and mean values, and substitute impulse pixel with half of the value of the summation of median and mean value. Experimental results show that the proposed algorithm performs a better noise filtering ability as the images are highly corrupted.

VII. RESULTS

We have to implement the designed algorithm on an image. We took any one image and convert it into binary form which is suitable for applying our selected classifier. It's not easy to apply classifier directly so first of our entire main objective is that making it accessible form for classifier.

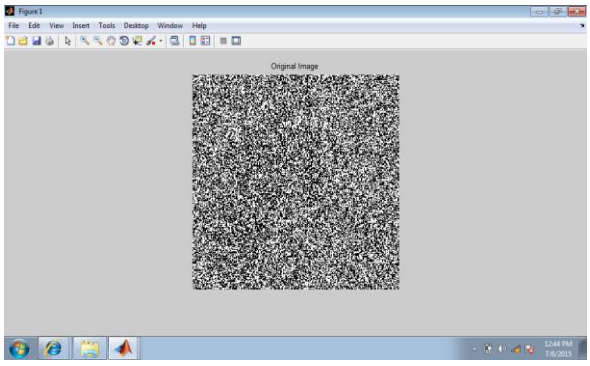

Fig 1: Image From Which We Want To Remove Noise

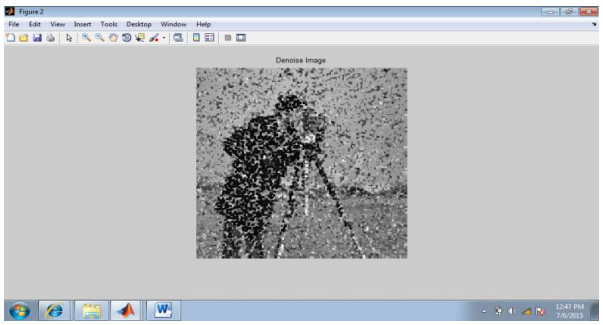

Fig 2: Image After Removing Some Noise

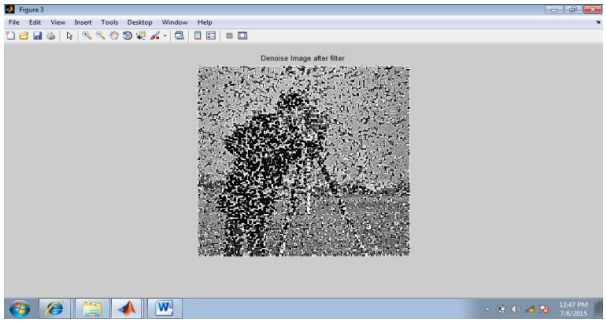

Fig 3: Image After Removing Some Noise Using Filtering Process

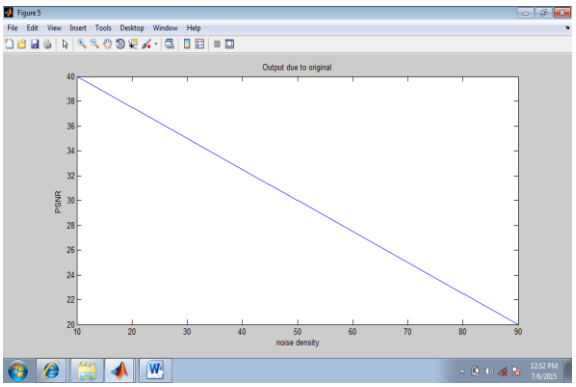

Fig 4: Value of PSNR Vs Noise Denisty of Original Image

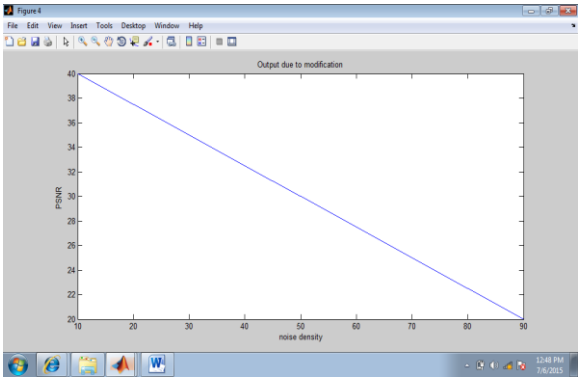

Fig 5: Value of PSNR Vs Noise Denisty Due to Some Modification

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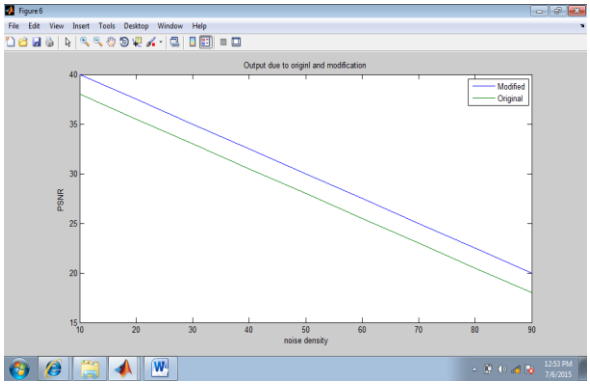

Fig 6: Value Of PSNR Vs Noise Denisty Of Modified And Original Image

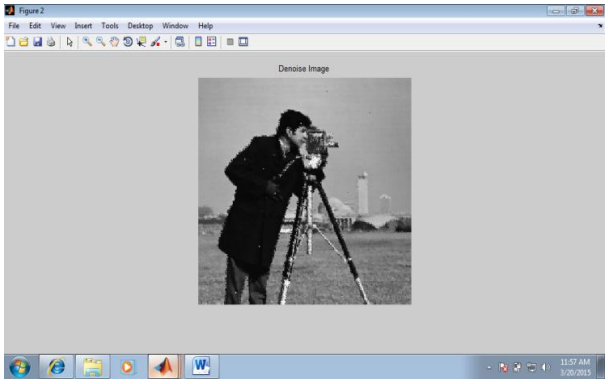

Fig 7: Image After De-Noising Using Progressive Switching Median Filter

VIII. CONCLUSION

It is conclude that noise from an image can be removed using some denoising filters. Median filters are used for this noise reduction. Progressive Switching Median Filter is one of them which have a drawback that it uses number of iterations many times for each type pixel like good or bad. So it is improved in term of filtering ability. So in this research work we fix a limit of pixel quality. Filtering detect pixels that has lower quality than that fixed value. So numbers of iterations are less as compared to existing progressive switching filtering. In short time we get better results with the proposed algorithm.

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