

**PERFORMANCE COMPARISON ON VARIOUS NOISE HANDLING
MECHANISM**

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ABSTRACT

Image processing is a signal processing technique used in various fields like medical and education. While capturing the image from surveillance cameras the chances of obtaining a perfect picture are scanty i.e. the noise maybe introduced in the image. This noise enters in the image due to medium, environment, interface circuitry etc. Images can also contain a lot of deteriorations viz. uneven illumination, blur, low resolution, perspective distortion, smear etc. To remove the noise various techniques and filters are provided in the field of image processing. Image filtering can also be used to calculate the probability density function. By using this function clarity within the image can be introduced. We have myriad techniques in order to embellish the image but reviews of some specific techniques which are optimal in nature are discussed. In our proposed paper we are reviewing all the techniques which can be used to overcome the noise in the image.

Keywords: *Image processing, noise, filters, embellish, optimal, Probability density function*

I. INTRODUCTION

The image processing is the art which can be used to embellish the image. Before embellishment the present noise within the image can be handled. By using filtering technique noise of the image can be tackled. The objective of this paper is to discard noise from image using filtering mechanism and then applying embellishment mechanism to make the image better for presentation. Denoising is the process which can be used to remove the noise from the image. By using denoising the quality of the image will be restored. Noise removal is the challenging task for the researchers to study. [1]The noise present in the image is described using the following methods



Figure 1: Showing noise within the image

In contemplation of detection and elimination of noise from the image assimilation of noises within the image is compulsory.[2]In the next section we willclassify the noises within the image.Types of Noise

SALT AND PEPPER NOISE: This type of noise when present in image can distort that image. The spikes are introduced as an application of salt and pepper noise. As it diminishes the image clarity, hence salt and pepper noise can be handled using filtering mechanism. [3]



Figure 2: Showing Image with Salt and Pepper Noise

Median filter can be used in order to handle this kind of noises. The reduction of noise from the image can be reduced by using median filter, which calculates the values of neighbouring pixel and then replaces the corrupted pixel with the filtered pixel.[4]

GAUSSIAN NOISE: As a result of difference between the normal distribution and probability density function noise is enticing within the image. If noise is introduced the normal distribution sine is different from the expected value. To handle such a noise Gaussian Filter is utilized. In order to normalize the distribution we use this filter to make values of both the distribution equal to eliminate noise.[5]

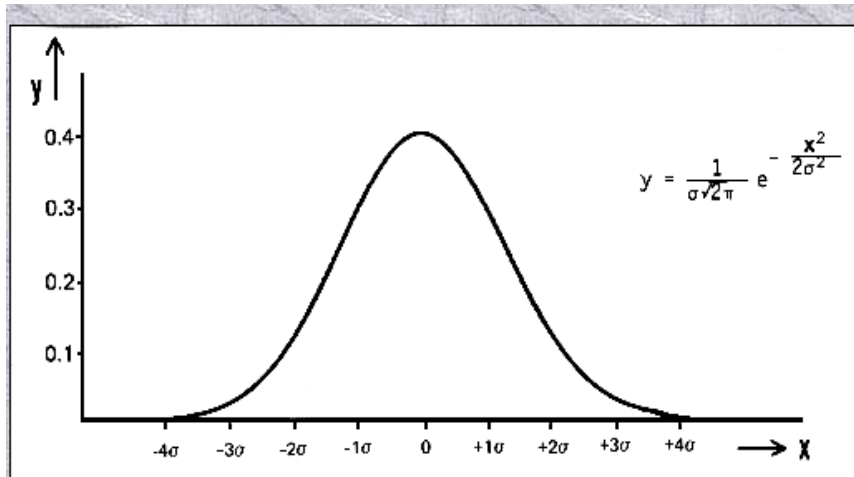


Figure 3: Showing the pulse that occurs when Gaussian noise is introduced

Just because of the Gaussian noise handling is complex since distribution of complex images is also becoming complex.

POISON NOISE: The poison noise can also be referred as shot noise. This noise distorts the image and appears within the image as an emanation of electromagnetic pulses within the image. This noise is similar to Gaussian noise emergence within the image.[6]



Figure 4:: Showing Poison noise within the image

II. METHODS OF HANDLING

Filtering techniques: To de-noise the image enclosed in the image, multifarious tactics can be used. To resolve these issues some of the tactics utilized which are described as follows:

- **MEDIAN FILTER:** In order to tackle salt and pepper noise median filter is used. When the pixel intensity value goes below 0 or above 255 then this type of noise originates. A mechanism can be devised in order to eliminate the pixel whose intensity value reaches beyond the threshold mechanism. In place of corrupted pixel, the median of neighbouring pixels are substituted. [7]

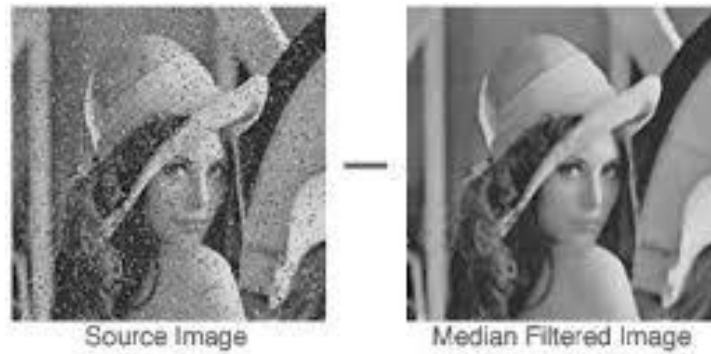


Figure 5: Application of median filter on salt and pepper noise

- MEAN FILTER:** In this filter the average of all the values of pixels in the window are recouped with the centre value. It is a simple sliding window spatial filter. The kernel or window is mostly square shaped but it can be in any shape.[8][9]–[11]

$5 + 3 + 6 + 2 + 1 + 9 + 8 + 4 + 7 = 45$ $45/9 = 5$

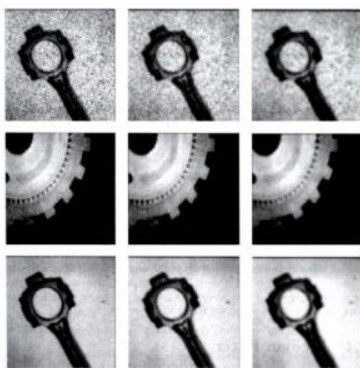


Figure 6: Application of Mean filter

Figure 7: Mean Filter utilization

- GAUSSIAN FILTER:** In Gaussian filtering technique M X M mask is used. By using the Gaussian function, we compute the weights. By using Gaussian filtering technique we remove the Gaussian noise from the image. The weights that we are going to compute will give the higher significance to the pixels near to edge.[8]

Gaussian function which is given below:

$$g(i,J)=c.e^{-i^2+j^2/2a^2}$$

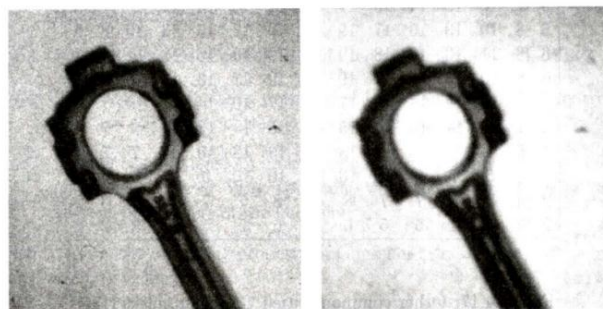


Figure 8: Showing Gaussian Filter utilization

III. COMPARISON OF VARIOUS FILTERS USED FOR IMAGE PROCESSING

Table 1: Showing the performance comparison on Lena Image using various Filtering

Type of Noise	Denoised Image PSNR					
	Linear Filters		Non Linear Filters			Adaptive Filters
	Gaussian Filter	Average Filter	Median Filter	Min Filter	Max Filter	Adaptive Median Filter
Gaussian noise	23.7253	25.8026	25.4979	14.7697	14.6815	22.7467
Salt & Pepper noise	22.1794	24.9387	30.5088	12.1861	11.7244	37.4839
Speckle noise	22.5712	25.1905	23.3750	14.7026	14.2945	20.7189
Poisson noise	30.0853	27.5862	29.2124	18.8530	18.4931	28.7065
Uniform noise	23.7290	25.4830	30.6693	20.8097	10.9641	34.6640
Rayleigh noise	17.9421	20.7429	27.2467	20.9664	7.0116	29.3020
Erlang noise	25.6125	26.3890	30.9288	20.7841	12.3587	34.9521

Table 2: Showing the performance comparison on boat image using various filtering techniques.

Type of Noise	Denoised Image PSNR					
	Linear Filters		Non Linear Filters			Adaptive Filters
	Gaussian Filter	Average Filter	Median Filter	Min Filter	Max Filter	Adaptive Median Filter
Gaussian noise	23.7516	26.0948	25.7364	14.8648	14.6925	22.6735
Salt & Pepper noise	25.0062	25.0062	30.9745	11.7478	11.9887	35.7980
Speckle noise	22.0179	25.1206	22.9734	14.3615	13.8254	20.1106
Poisson noise	30.0707	27.9380	29.3486	18.9826	18.7393	28.5874
Uniform noise	24.3334	26.0411	31.2354	21.2726	11.4607	36.0756
Rayleigh noise	18.4553	21.2884	28.1451	21.4167	7.4662	30.6818
Erlang noise	25.8548	26.7381	31.3529	21.2579	12.6767	36.2143

IV. CONCLUSION

Due to weird performance comparison and description of the various images indicates there is a need for designing a filter that can be used to handle multiple noises which comes simultaneously. The hybrid filter will be used in order to accomplish this combination of filtering mechanisms. The performance comparison indicates that Gaussian filter is optimal filter which we can use to de-noise the image efficiently.

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