

# An Enhanced Approach for Image Filtration Over Multi-Noise Effects

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**Abstract**— In this paper, we propose a hybrid approach that will remove the noise from the signal. The traditional median filter is combined with the digital filters and this is further updated by using the optimization algorithm like Genetic algorithm, ACO, PSO etc. With the help of optimization technique the optimized results are obtained. In addition to this Gaussian filter is used for removing the channel noise. The proposed algorithm results shown that a noise free image after processing. It turns out that the hybrid approach is better than the traditional Median filter.

**Key words:** Filtration function, Median filter, Digital filter, Gaussian filter, image De-noising.

## I. INTRODUCTION

Digital images plays very significant role in day-to-day activities along with the area of research & technology but the main drawback of digital images is that noise is added [4] due to non-idealities in imaging process during transmission [10]. Noise represents unwanted information which destroys the image quality [19]. In most applications it is very important to remove noise from image and recover a clear image it needs to use denoising filter to process the image data [10].

### A. Image Denoising

Denoising is very leading affair in the field of image processing. It is the process of recuperating the primary image from observation that has been deprived by various noises. The main properties of good denoising model are that it will remove noise while preserving edges. The most common types of noise model is salt-and-pepper noise, Gaussian noise. In salt-and-pepper noise the pixels are corrupted by max & min value. In Gaussian noise each & every pixel gets affected [18].

Types of Noise

#### 1) Gaussian Noise-

This type of noise in digital images arise during acquisition e.g. sensor noise result in high temperature & poor illumination.

#### 2) Salt-and pepper Noise-

Impulsive noise is sometimes also referred to as salt-and-pepper noise or spike noise. An image comprising salt-and-pepper noise will have dark pixels in bright regions and bright pixels in dark regions

#### 3) Quantization noise-

It is caused by quantizing the pixels of a sensed image to a number of discrete levels is referred to as quantization noise

#### 4) Anisotropic Noise-

A significant orientation in images is sometimes shown up by some noise sources. For example image sensors are sometimes subject to row noise or column noise.

Types of filters

#### 1) Median Filter-

A non-linear digital filtering proficiency used to remove noise. Such noise reduction is a standard pre-processing step to improve the results of later processing. Digital image

processing use median filter very extensively because under certain conditions, it conserve edges while removal of noise. To run through the signal entry by entry, replacing each entry with the median of neighbouring entries is the main idea of median filter. "Window" is known as the pattern of neighbours, which slides entry by entry over the entire signal. Median is simple to define if it has odd number of entries: it is just the middle value after all the entries in the window are sorted numerically while For even number of entries there is more than one possible median, then usually defined to be the mean of the two middle values e.g. the median of {3, 5, 7, 9} is (5+7)/2=6.

#### 2) Gaussian Filter

A filter whose impulse response is a Gaussian function is referred to as Gaussian filter. It contains the property of having no overshoot to a step function input while minimizing the rise and fall time. This behaviour is closely connected to the fact that the Gaussian filter has the minimum possible group delay. It is considered the ideal time domain filter, just as the sinc is the ideal frequency domain filter. Areas such as oscilloscopes and digital telecommunication systems are important in these properties.

$$G(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{x^2}{2\sigma^2}}$$

#### 3) Digital Filters-

A system that performs mathematical operations on a sampled, discrete-time signal to reduce or enhance certain aspects of that signal is known as digital filter. This is in contrast to the other major type of electronic filter, the analog filter, which is an electronic circuit operating on continuous-time analog signals. It consists of an analog-to-digital convertor to sample the input signal, followed by a microprocessor and some peripherals components such as memory to store data and filter coefficients etc. Finally a digital-to-analog convertor to complete output stage. Digital filters are more expensive than an equivalent analog filter due to increased complexity, but they make practical many designs that are impractical or impossible as Analog filters.

Parameters

- 1) PSNR- PSNR (Peak Signal -to-Noise Ratio) used for quality measurement between input and Output image. If greater the PSNR value that means improves the quality of output image.
- 2) MSE- MSE (Mean Square Error) describes the Cumulative Squared Error between Input and Output image Whereas PSNR describes a measure of the Peak Error. If lesser the value of MSE that means reduce the error.
- 3) BER- The rate at which errors arises in a transmission System is known as Bit Error Rate. It is simply defined as the number of error bits to the total number of bits sent. The definition of Bit Error Rate can be rewritten into a Simple Equation.

BER = Number of Error Bits/ Total number of bits sent

- 4) SSIM- The structural similarity index is a technique for surveying the similarity b/w two images. It is used for checking or figure out the image quality depends on initial uncompressed or noise free image. It is constructed to upgrade traditional techniques such as PSNR & MSE which have analyzed to be incompatible with human visual perception.
- 5) Correlation- It is a statistical quantity that specifies the scope in which two or more variable function together. When the inconstancy of one variable reliably figure out a similar inconstancy in another variable means that the variation in one causes the variation in another.

## II. BLOCK DIAGRAM & METHODOLOGY

### A. Methodology

- 1) Firstly browse an image after converting Colour image into grey scale image
- 2) Secondly apply Median Filter on the input image to remove the salt-and-pepper Noise from the image.
- 3) Next apply proposed filter on the image received from previous step with the selection of best filtration coefficients to remove the other types of noises from the image.
- 4) Then apply the Gaussian filter on the image received from preceding step to remove the Gaussian noise from the image.
- 5) Final obtain the filtered image.

Block diagram

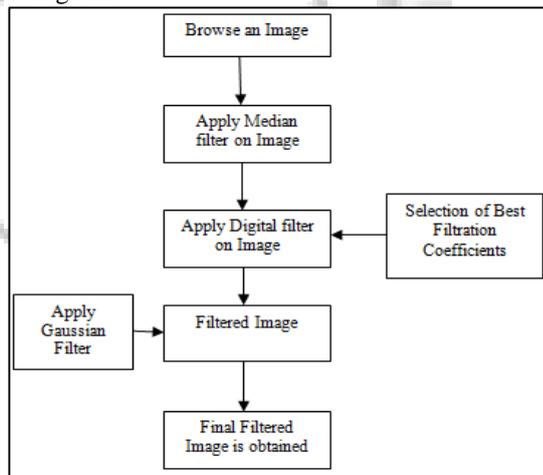


Fig. 1:

## III. PROBLEM FORMULATION

In image processing the improving the quality of the image is one of the major issues. Image is affected by the noise. Noise in an image is undesirable because it degrades image quality. So to remove the noise from the image in order to improve the quality various filtering methods are applied. Traditionally for removing the salt and pepper noise median filter were used. But median filters were not suitable for removal of any other noise from the signal. So presence of any other noise could effects the quality of the signal. So there is a need to find some other method for removing noise from the image along with the median filter. The method that is to be proposed should be able to increase the quality of the image.

Objective

The main objective of the proposed work is to

- 1) To update the traditional filtration method for removing salt & pepper noise from the signal.
- 2) To propose a hybrid approach for filtration of the noise from the signal that decreases the quality of the signal.
- 3) To improve the quality of the image

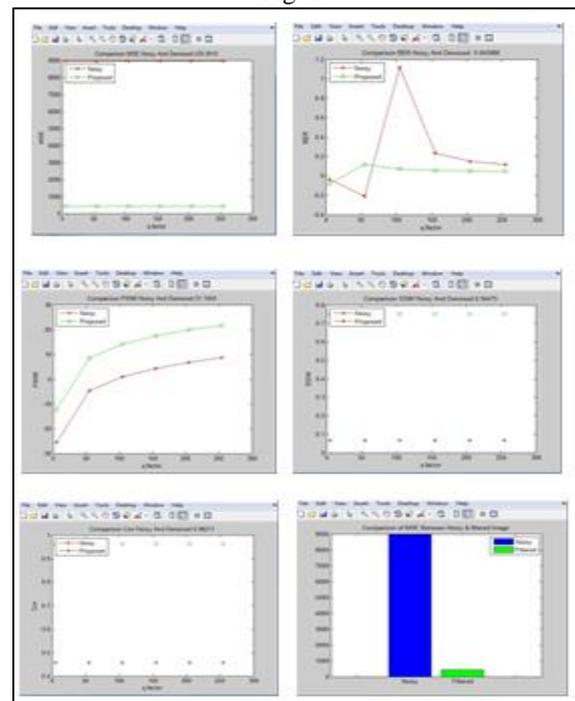
## IV. PROPOSED WORK

In the proposed work a hybrid approach is proposed that will remove the noise from the signal. The traditional median filter is combined with the digital filters and this is further updated by using the optimization algorithm like Genetic algorithm, ACO, PSO etc. with help of the optimization technique the optimized results are obtained. In addition to this the Gaussian filter are used. The Gaussian filter is used for removing the channel noise. This proposed algorithm will result in removing the noise from the image and the noise free image is obtained. So this method is considered to be better than the traditional methods for noise removal from the image.

## V. RESULTS



Fig. 2:



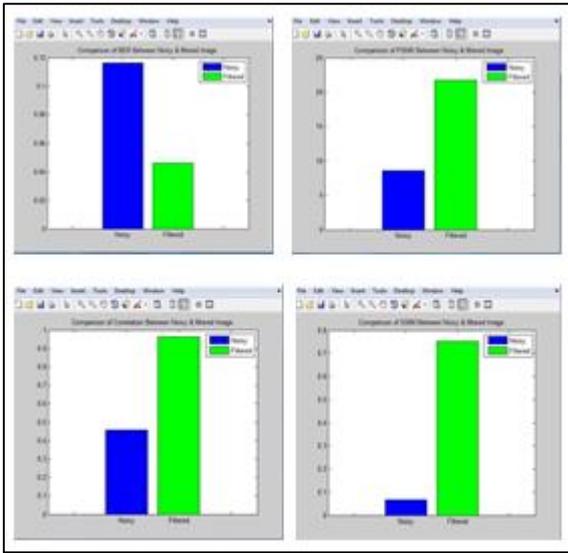


Fig. 3: Graphical Representation of MSE, BER, PSNR, SSIM & Correlation

Parameter Metrics	MSE	BER	PSNR	SSIM	Correlation
Image 1	1928.61 23	.06545 2	15.278 4	.9047 8	0.91703
Image 2	1418.13 37	.06019 2	16.613 6	.9201 9	0.92678
Image 3	1675.91 44	.06293 9	15.888 3	.9073 4	0.89235
Image 4	2049.80 09	.06660 6	15.013 7	.9851 3	0.94916

Table. 1: Comparison Using Parameters MSE, BER, PSNR, SSIM & Correlation.

## VI. CONCLUSION

Image attribute evaluation plays a crucial role in several image processing applications. In this paper the digital filter has been proposed for eliminating noise from noisy images as advancement on the median & Gaussian filter. The image is operated using proposed, it is hard to catch noise specks and has good effect on saving the details as well. The paper takes numerous performance parameters such as MSE, PSNR, BER, SSIM and Correlation to analyse the efficiency of proposed filter. The experiment shows that the achievement of proposed filter is superior as compared to traditional filter

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