International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 02 Issue: 08 | Nov-2015 www.irjet.net p-ISSN: 2395-0072

REVIEW PAPER: TO STUDY THE IMAGE DENOISING TECHNIQUES

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Abstract - *In most of the fields and application use of the image is becoming popular like in education, medical etc. But problem arises during the transmission, because during transmission the noise will be introduced. So the original image get distorted during the transmission. One more problem arises during the transmission that is the edge destruction. In this paper we compare the techniques that are used for denoising the image and used for edge preservation of the digital image. This paper gives the brief introduction of noise, types of noise, image denoising and about the techniques used for noise removal. In this paper we studied the performance parameters such as peak signal to noise ratio (PSNR), mean absolute error (MAE), mean square error(MSE).All the techniques used in this paper for image denoising were implemented in MATLAB. The main focus of this paper is to provide some useful knowledge of denoising technique so as to provide an ease.*

Key Words: *MAE, PSNR,MSE,Salt and Pepper noise.*

1. INTRODUCTION

Digital image plays an important role in our daily life and in the area of research and technology.When the digital image is transmitted from one place to another place,during the transmission noise is added into the image.Any form of signal processing having image as an input and output is called image processing. Due to the imperfection of the instruments used in the image processing , noise can be generated .The interference during the transmission degrade the data.Noise can also be generated by the transmission error and compression.Different types of noises are introduced by different noise sources like dark current noise is due to the thermally generated electrons at sensor sites. . Noise degrades the image quality that's why there is a need to denoise the image to restore the quality of image.There are various methods that are help to remove the noise from the digital image.But selecting the appropriate method is plays major role in getting the desired image.The methods used to denoise the satellite image and medical image are different,Therefore the image denoising method used for satellite image is not suitable for denoising the medical image.

1.1 Types Of Noise

Noise is the unwanted signal that affect the performance of the output signal**.** Noise produces undesirable effects such as unseen lines, corners, blurred objects and disturbs background scenes etc.Typical images are corrupted with additive noises modelled with either a Gaussian, uniform, or salt and pepper distribution.

- **Salt and Pepper Noise:**Salt and pepper noise is also called as impulsive noise.Imulsive noise generate during data transmission. The image is not fully corrupted by impulsive noise,some pixel values are changed in an image. Image pixel values are replaced by corrupted pixel values either maximum 'or' minimum pixel value.The maximum or minimum values are dependent upon the number of bits used. In salt-and-pepper noise corresponding value for black pixels is 0 and for white pixels the corresponding value is 1. Impulsive noise can be caused by analog-to-digital converter errors, bit errors in transmission, etc. The salt and pepper noise is generally caused by faulty of pixel elements in the camera sensors, faulty memory locations, or timing errors in the digitization process. Elimination of impulsive noise can be done by using dark frame subtraction and interpolating around dark/brightpixels.

- ***Gaussian noise:*** Gaussian noise is also called as electronic noise because it arises in amplifiers or detectors. Gaussian noise is the statistical noise having probability density function (PDF) sequal to that of the normal distribution.This normal distribution is also known as the Gaussian distribution. This noise is additive in nature.Gaussian noise is independent at each pixel and signal intensity.It is caused by thermal noise.The mean of each pixel of an image that is affected by Gaussian noise is zero.It means that Gaussian noise qually affects each and every pixel of an image. The probability distribution function of Gaussian noise is bell shaped.

- **Poisson Noise:** Poisson noise is also called as quantum (photon) noise or shot noise. The poisson noise is appeared due to the statistical nature of electromagnetic waves such as x-rays, visible lights and gamma rays. The x-ray and gamma ray sources emitted number of photons per unit time. These rays are injected in patient's body from its source, in medical x rays and gamma rays imaging systems. These sources are having random fluctuation of photons.

2. Techniques compared used for denoising image

It is big challenge for the researchers to denoising image, because noise removal introduces artifacts and causes blurring of the images. But denoising is necessary and the first step to be taken before the images data is analyzed. It is necessary to apply an efficient denoising technique to compensate for such data corruption.We used many techniques to remove the noise from the digital image.

- ***Removing Noise by Median Filter:***

In signal processing its desirable to perform noise reduction on an image.Median filter is a non-linear filtering technique used to remove noise.After denoising the edges has to be preserved of the digital image.Median filter remove the noise from the image as well as preserve the edges of image,so median filter is widely used in image processing.The main idea of the median filter is to run through the signal entry by entry, replacing each entry with the median of neighboring entries. The pattern of neighbors is called the "window", which slides, entry by entry, over the entire signal. The median is much less sensitive than the mean to external values.Therefore it is better to remove the external values without reducing the image sharpness.It is one kind of smoothing technique.Its performance is not much better than Gaussian blur for high levels of noise, whereas, for speckle noise and impulsive noise it is effective. Because of this, median filtering is very widely used in digital image processing.

- ***Removing Noise by Wiener Filter:***

Wiener filter is a linear filter.It is an adaptive low pass filter, it uses pixel wise adaption.Therefore this technique is also called as adaptive filtering technique.The method used in this filter is based on the ststistics estimated from a local neighbourhood of each pixel.It preserve the edges and other frequency parts of an image.However it require more computational time as compared to the linear filtering. For colour image it can be implemented on red,green and blue colour planes separately.

- **Removing noise by Mean Filter:**

*Mean filter is also called as linear filter.*This filter acts on an image by smoothing it. It reduces the intensity variations between the adjacent pixels.It replaces the centre value of the window with the average values of its all neighboring pixels values including itself. It is implemented with the convolution mask, which provides the results that is weighted sum of values of a pixel and its neighbors. The mask is square. The 3×3 mask is used. If the coefficient of the mask sum is up to one, then the average brightness of the image is not changed. If the coefficient sum to zero, average brightness is lost, and it returns a dark image.

- **Removing noise by the fuzzy vector median filter:**

This filtering technique is based on the surface smoothing.It collect the information regarding the spread of samples in image pixels.In this technique membership function is used ti calculate the degree of pixel.This method provide the more accurate results as compared to the other technique,but this is not suitable for high density Gaussian noise in image.

- **Removing noise by Unsymmetrical trimmed variants filters:**

This filter is used for removal of high density salt and pepper noise in an images or vediso. The corrupted or noisy pixel is replaced based on the number of non-noisy pixel in the current processing window. This technique is applied on various grayscale, and videos that gave excellent peak signal-to-noise ratio, high image enhancement factor, low mean square error, and very good SSIM with excellent edge preservation even at high noise densities.This filter is able to recover an image as well as preserve the edges.

- **Removing Noise By Peer Group Averaging Filter (PGF):**

It is nonlinear filter for image smoothing and impulse noise removal in color images. In this filter each image pixel is replaces with the weighted average of its peer group members, which are classified based on the color similarity of the neighboring pixels. The noise is effectively removes and smooth color an image is obtained without blurring edges.PGF is used as a preprocessing step for color quantization.

3. CONCLUSIONS

Image noise is usually unwanted, variation in brightness or color information is considered as a noise. The noise that is present in the image can degrade its quality. So in this thesis a new technique is proposed for the removal of the noise .the optimization technique is used for the filtration of the image so that the noise us removed. The genetic algorithm is used for the optimizing the properties of the filter. It is concluded that the new methods is better than the traditional methods as the noise is removed from the image to the great extent. The quality of image is improved after applying this method.

In addition to this analysis of various parameters was done, like BER, PSNR and it were observed that these parameters were improved. So this method is considered to be better and more efficient for removing the noise from the image than the previously used methods.

FUTURE SCOPE

In this work new method is proposed for the removal of noise by using the optimizing algorithm, when the properties of the filter are optimized using the Genetic algorithms. In the future this method can be made more efficient , as genetic algorithm is used for optimizing the filter properties , the genetic algorithm generate the fitness function , so in future by enhancing the fitness function of the genetic algorithm we can make the proposed method more efficient .

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