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Methodical Technique for Denoise Salt & Pepper and Gaussian Noise in Gray Scale Image

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Abstract--- In this paper, a adaptive technique for reduction of an salt & pepper noise and Gaussian noise using a filters. Noise can degrade the image at the time of capturing or transmission of the image. Before applying image processing tool to an image, noise removal from the image is done at highest priority. Median filters are preferred for removing salt & pepper noise because of their simplicity and less computational complexity and also Wiener filter was preferred for removing an Gaussian noise. Extensive Simulation have been carried out on gray scale images with median filter and Wiener filter. This paper presents the result of applying different noise type and various noise reduction techniques.

I. INTRODUCTION

Noise is the result of errors in the image acquisition process that result in pixel values that do not reflect the true intensities of the real scene. A gray scale image is simple one in which the only colors are shades of gray. The reason for differentiating such images from any other sort of color image is that less information needs to be provided for each pixel. In fact a `gray' color is one in which the red, green and blue components all have equal intensity in RGB space, and so it is necessary to specify a single intensity value for each pixel, as to opposed the three intensities needed to specify each pixel in a full color image. Often, the grayscale intensity is stored as an 8-bit integer giving 256 possible different shades of gray from **Blackto White**. If the levels are evenly spaced then the difference between successive gray levels is significantly better than the gray level resolving power of the human eye[3]. Grayscale images are very common, because, image capture hardware can only support 8-bit images. In addition, grayscale images are entirely sufficient for many tasks and so there is no need to use more complicated and harder-to-process color images. A pixel is also known as PEL [5]. In the fig 2 and fig 3, there may be thousands of pixels together make up this image. We will zoom that image to the extent so that we can able to see some pixels division.

(a)

(b)

Fig -1: (a) Original Image (b) Gray scale Image

Each pixel can have only one value and each value denotes the intensity of light at that point of the image.

Fig -2: RGB Pixel values

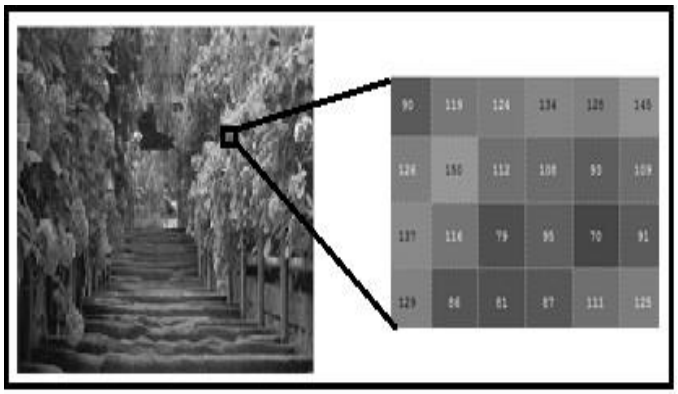

Fig -3: Gray Scale Pixel values

Each pixel is a sample of an original image; more samples typically provide more accurate representations of the original. The intensity of each pixel is variable. In color image systems, a color is typically represented by three or four component intensities such as red, green, and blue, or cyan, magenta, yellow, and black.

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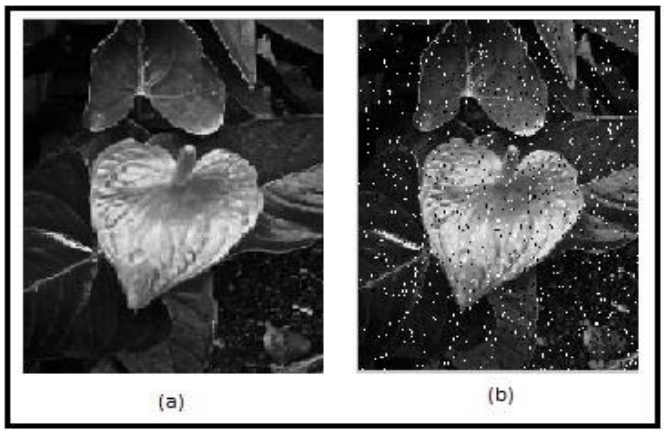
II. DIFFERENT NOISE IN AN IMAGE

Due to the random variation of brightness or color information in images causes the noisy environment in an image, and is usually an aspect of electronic noise. It can be produced by the sensor and circuitry of a scanner or digital camera. Image noise can also originate in film grain and in the unavoidable shot noise of an ideal photon detector. Image noise is an undesirable by-product of image capture that adds spurious and extraneous information.

A . Salt and Pepper Noise

An image containing salt-and-pepper noise will have dark pixels in bright regions and bright pixels in dark regions. This type of noise can be caused by analog-to-digital converter errors and bit errors in transmission ,etc. Salt and pepper noise is sometimes called impulse noise or spike noise or random noise or independent noise. In salt and pepper noise pixels in the image are very different in color or intensity unlike their surrounding pixels.



Fig– 4: (a) Original Image (b) Salt & Pepper Noise Image

Salt and pepper degradation can be caused by sharp and sudden disturbance in the image signal. Generally this type of noise will only affect a small number of image pixels. When viewed, the image contains dark and white dots, hence the term salt and pepper noise [2].

B. Gaussian Noise

Principal sources of Gaussian noise in digital images arise during acquisition example, sensor noise caused by poor illumination and/or high temperature.

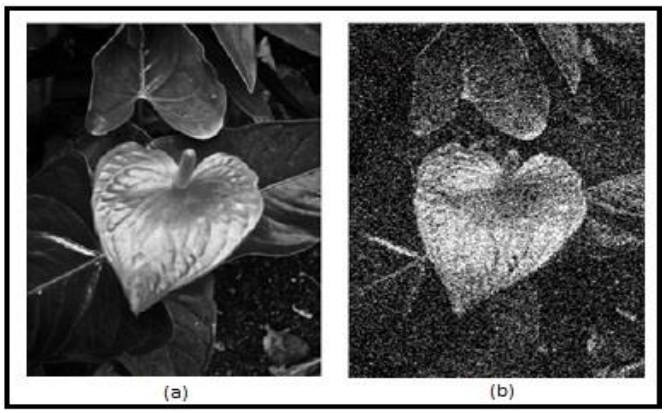


Fig -5: (a) Original Image (b) Gaussian Noise Image

Gaussian noise is statistical noise having a probability density function (PDF) equal to that of the normal distribution, which is also known as the Gaussian distribution This noise model is additive in nature and follow Gaussian distribution. Meaning that each pixel in the noisy image is the sum of the true pixel value and a random, Gaussian distributed noise value.

III. DENOISE THE IMAGE BY FILTERING

A Median Filter

The median filter is a nonlinear digital filtering technique, often used to remove noise[1]. Such noise reduction is a typical pre-processing step to improve the results of later processing (for example, edge detection on an image). Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise.

To run a median filter considers each pixel in the image, Sort the neighboring pixels into order based upon their intensities. Replace the original value of the pixel with the median value from the list. Median are good at removing salt and pepper noise from an image and also cause relatively little blurring of edges and hence are often used in computer vision application. 3x3 Median Filter is well suited for removing the salt & pepper noise. Median filtering is similar to using an averaging filter, in that each output pixel is set to an average of pixel values in the neighborhood of the corresponding input pixel.

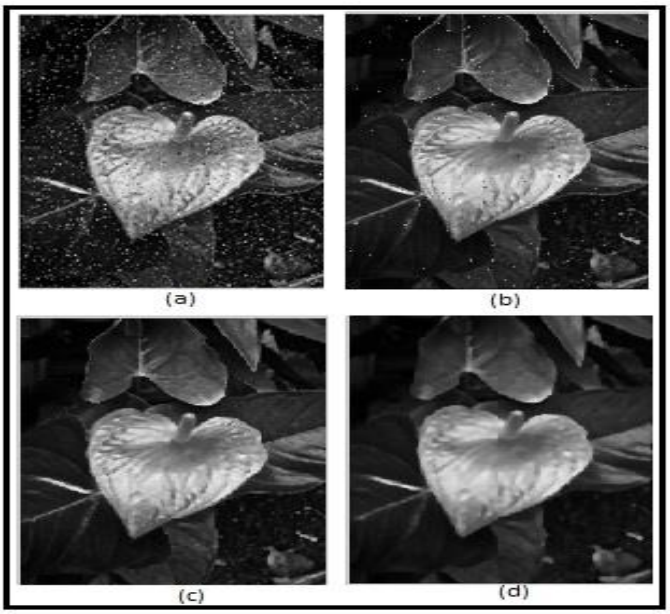


Fig -8: (a) Salt & Pepper Noise (b) 2x2 Median Filter (c) 3x3 Median Filter (d) 5x5 Median Filter

B. Weiner Filter

Wiener filter can be used in image processing to remove noise from a picture. Wiener filter is used to compute a statistical estimate of an unknown signal using a related signal as an input and filtering that known signal to produce the estimate as an output. The Wiener filter minimizes the mean square error between the estimated random process and the desired process.

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The most important technique for removal of blur in images due to linear motion or unfocussed optics is the Wiener filter. 5x5 Weiner Filter is well suited for removing the Gaussian noise.

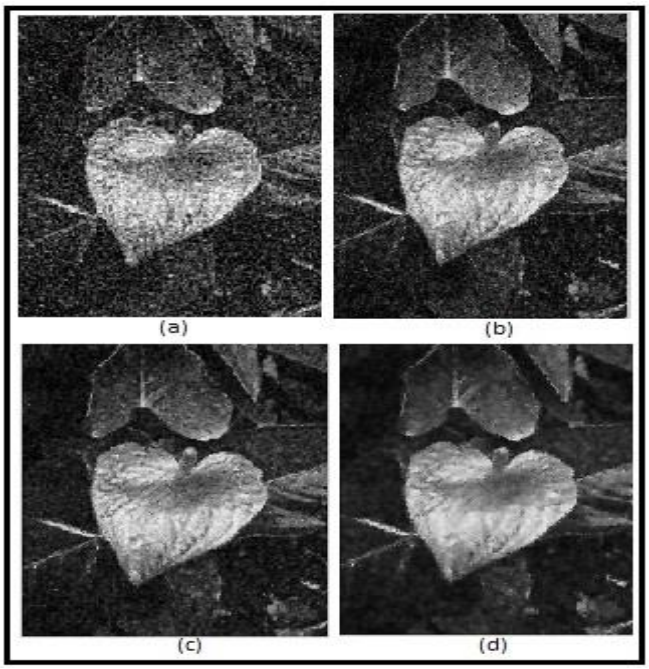

Fig- 9: (a) Gaussian Noise (b) 2x2 Weiner Filter (c) 3x3 Weiner Filter (d) 5x5 Weiner Filter

From a signal processing standpoint, blurring due to linear motion in a photograph is the result of poor sampling. Each pixel in a digital representation of the photograph should represent the intensity of a single stationary point[4].

IV. SIMULINK RESULT

The reduction of salt & pepper was performed in Matlab Simulink using median filter was shown in fig 10.At first image from the file(salt & pepper.jpg) is selected and apply a image to a median filter and the output of the median filter is viewed with help of Video Viewer.

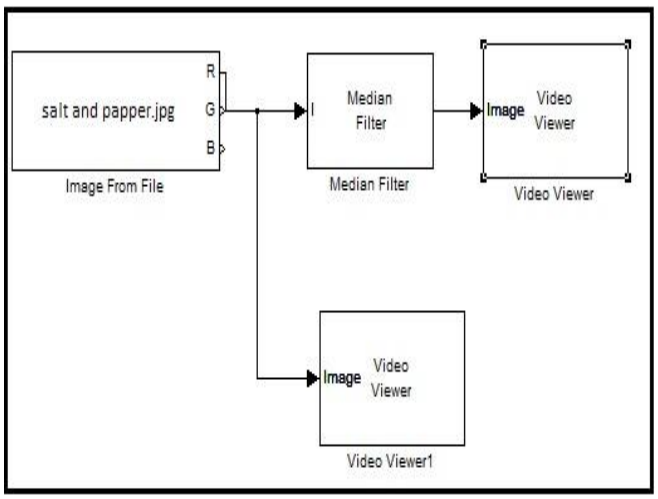

Fig -10: Simulink to Denoise the salt & pepper noise

The arrangements of median filter and Video Viewer's was shown in Fig 10, in that we can able to perform 3x3 median filter to perfectly reduces the noise in an image.

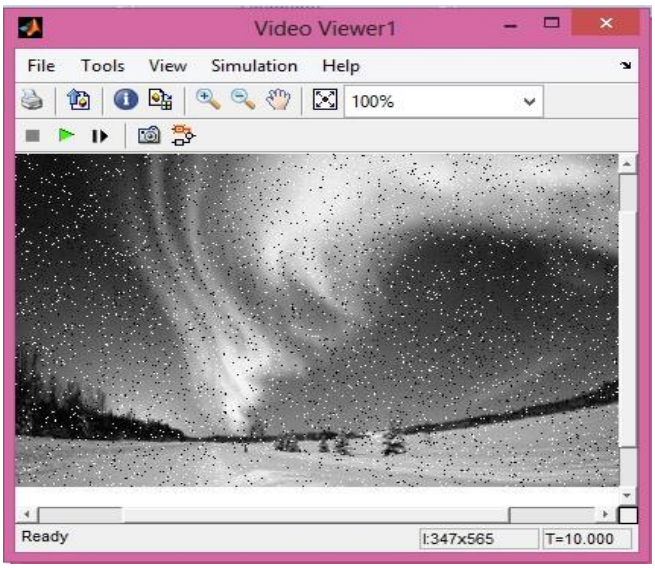

Fig 11. Video Viewer 1 output (Noisy Image)

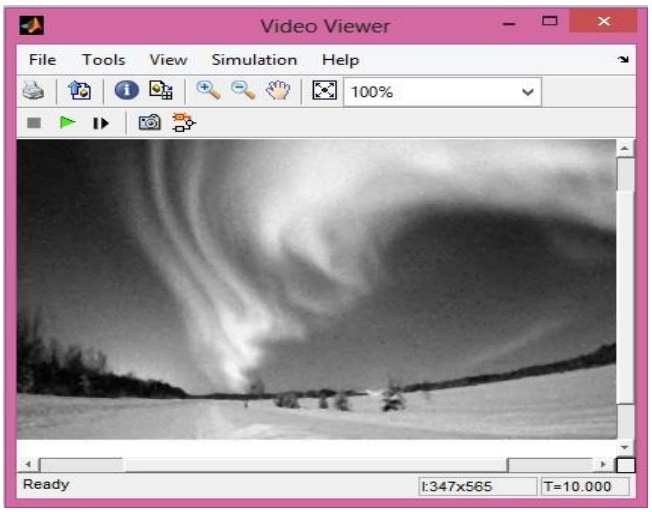

Fig 12. Video Viewer output (Filtered Image)

Video Viewer 1 is used to view the salt and pepper noise shown in Fig 11 and the video viewer is used to view the filtered (removal of salt and pepper noise) noise shown in Fig 12.

V. CONCLUSION

In this paper, we have discussed the salt & pepper and Gaussian noise in an image and also presented the pixel values for gray scale image and removing the noise present in the image using the Median and Wiener filter. We analyzed and finally comes up with the solution of Median Filter is suited for Salt & Pepper noise and Wiener Filter is suitable for Gaussian noise and BM3D may also well suited for removing of Salt & Pepper noise.

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REFERENCES

1. Dr.V.Kavitha, Mythili, "Efficient Technique for Color Image Noise Reduction" The Research Bulletin of Jordan ACM, ISSN: 2078-7960Vol.II (III).
2. Rafael.C.Gonzalez, Richard E.Woods.2008. Digital Image Processing, 3rd edition, Pearson education.
3. http://homepages.inf.ed.ac.uk/rbf/HIPR2/gryimage.html.
4. https://www.clear.rice.edu/elec431/projects95/lords/wiener.html.
5. https://en.wikipedia.org/wiki/Pixel.
6. Rohit Verma, Jahid Ali" A Comparative Study of Various Types of Image Noise and Efficient Noise Removal Techniques.

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