Reconstruction of Image using Mean and Median Filter With Histogram Modification

Varsha Joshi[1],   Archana Mewara[2],   Laxmi Narayan Balai[3]

P. G. Scholar, Yagvalkya Institute of Technology, Jaipur, Rajasthan, India
[2]Assistant Professor, Yagvalkya Institute of Technology, Jaipur, Rajasthan, India
[3]H.O.D. (Electronics & Comm.), Yagvalkya Institute of Technology, Jaipur, Rajasthan
Email - [1]varshajoshi04@gmail.com, [2]archana.mewara@gmail.com, [3]lnbalai@yahoo.com,

Abstract: *As the image is captured from the camera, so it might be possible that the image get taint due to nasty or impulse uproar, transmission errors, malfunctioning pixels elements in the camera sensor, faulty memory locations and timing errors. The most important part of any image is de-noising or enhances the image contrast. Histogram modification is a well-known basic technique to increase the image contrast and improve the image quality. As the edges possess the important information of any image so, mean filter is maintaining the smoothness in the original image. Experimental results demonstrates that the proposed scheme yields the better results and the images have good contrast and artifacts-free. The main objective of this paper is to reconstruct the original image with the former results so, that it would not only improve the visual effects but also enhances the image contrast.*

Key Words: *Image, contrast, medical, ultrasound, clustering.*

1. INTRODUCTION:

Image contrast enhancement is a technique in which an image will transform one image into another image with higher quality and suitable for a certain application using expanding the range of gray levels and changing its histogram [1]. This is having wide range of applications in the field of remote sensing, medical images, and many other applications.

A histogram refers to a representation of a frequency distribution by means of rectangles whose widths represent class intervals and whose areas are proportional to the corresponding frequencies. The definition comes from [2].

Filtering technique is used to reduce the error rate with the help of the concoction of mean and median filter. In this technique linear and non – linear filter both are working together to reconstruct the original image with the histogram.

Mean Filter: It is a linear filter which is used to preserve the edges and help out in smoothing the images.

Median Filter: Median Filter is less sensitive than mean filter. It runs through the window of 3x3 matrix and take out the median value out. Filter is to run through the signal entry by entry, replacing each entry with the median of neighbouring entries. The pattern of neighbours is called the "window", which slides, entry by entry, over the entire signal. For 1D signal, the most obvious window is just the first few preceding and following entries, whereas for 2D (or higher-dimensional) signals such as images, more complex window patterns are possible (such as "box" or "cross" patterns). Note that if the window has an odd number of entries, then the median is simple to define: it is just the middle value after all the entries in the window are sorted numerically. For an even number of entries, there is more than one possible median, see median for more details [3].

2. PROBLEM FORMULATION:

As the Mean Filter and Median Filter are good enough to work with the removal of uproar from the image but these filters are having some drawbacks. So, both the filters are working together to provide the original image without losing the information.

3. RELATED WORK:

Nasrul Humaimi Mahmood (2011) [4] to solve the ultrasound images in medical application. Ultrasound is widely used in medical applications. However, the problem in ultrasound image is it contains many speckles, and this make a sonographer hard to interpret the ultrasound image. The idea to solve this problem is by make the pre-processing image before proceed with further image processing techniques. The filter is used to remove the speckles so that the area of the region needed is clearer. After that, the segmentation also can help sonographer to analyze the qualitative and quantitative of ultrasound images. Three types of filter are being use to compare the effect of the filters and choosing the best one to enhance the ultrasound images. Such filters are median filter, wiener filter and unsharp filter. Then, the morphological and segmentation process will enhance the shape of the region of interest. From the final images, the qualitative and quantitative dimensions are measured and presented.

Mitushiko Meguro [5] In his paper one of the Learning type of Mean and Median Hybrid Filter is designed that replaced all the previous technique and design the filter from FIR and OS filter give results on the basis of proiri information using MSE criterion. It can easily and effectively remove from middle to long – tailed disturbances. The results demonstrated the image is superior to Weiner Filter.

Akira Taguchi [6], in this paper a new adaptive filter is designed with the help of mean and median which helps in removing all sort of uproar and preserving the edges. Through this proposed filter there is a quantitative evaluation with the performance of adaptive filter as its result compared with the mean and median filter. Its structure is simple to design and remove both sort of impulse and non impulse noise.

Jan Eric Kyprianidis (2009) [7] to avoids clustering artifacts by adapting shape, scale and orientation of the filter to the local structure of the input.

Khireddine (2007) [8] he introduces the utility of Wiener Filter and Guassian Filter which are linear in nature and produces the result which is having lower root mean square (rms) value as compare to other non- linear filters. It is the solution to the restoration problem based upon the hypothesized use of linear filter and the minimum mean square error criterion.

Masume Rahimi (2015) [9] He designed a filter which is used to carried out despeckling for SAR image using the different speckle reduction filters. He compares the filtering effect of Thresholding with hard and soft Thresholding, AD and SRAD methods and the filter used the algorithm. All of these filters reduce speckle noise of target SAR images with different standard deviation. Simulations are carried out in MATLAB. The performances of different Despeckling filters in terms of SNR, PSNR and β are compared to get the best result in reducing the noise from the image.

E.Jebamalar Leavline(2013) [10] This paper existing an experimental analysis of median based impulse clatter elimination for grey scale images. Our experimental results show that, among the methods compared, tristate median filter and switching median filter exhibit visually appealing results. The other methods such as standard median filter, adaptive median filter, weighted median filter lack in preserving edges while retaining some clatter components. However, these methods are suitable for impulse noise removal provided the noise density is low. If the noise density is too high, say >90%, then the methods like trimmed median [5] filter may yield better denoising performance.
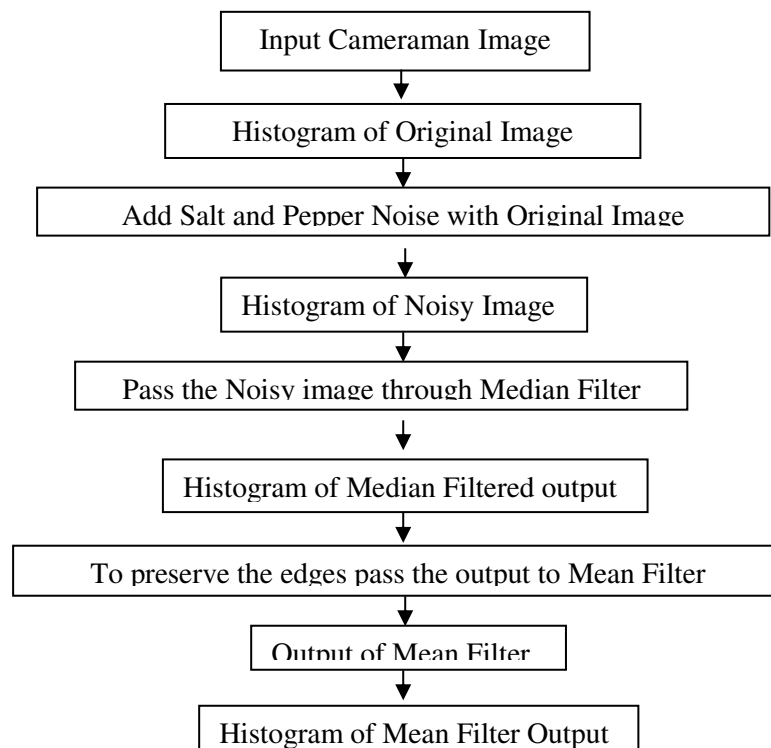
Xu Liu (2017) [11] This paper follows the filter designing method of The hybrid filter bank (HFB) has been considered as a best solution for high-speed, high-resolution analog-to-digital conversion. In this letter, he proposed an adaptable HFB structural design of which the conversion band can be adapted according to the frequency band of interest, e.g., the entire working band of a wideband receiver or a subband with an random spectrum position. Furthermore, he proposed a strategy based on the adaptable HFB for a wideband receiver to efficiently fulfill different tasks. For spectrum sensing, the entire wideband conversion HFB is used. While for subband signal receiving, the subband conversion HFB is utilized.

4. METHEDOLOGY:

Algorithm

The proposed steps in computing the better image contrast and image enhancement with its histogram is as illustrated by the Figure 1.

Mean and Median filter individually plays a central role in reducing various types of uproar such as salt and pepper noise, Gaussian noise from an original image. The main objective of these filters is to reduce the noise and reconstruct the image contrast.

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┌──────────────────────────────┐
│   Input Cameraman Image      │
└──────────────────────────────┘
              ↓
┌──────────────────────────────┐
│  Histogram of Original Image │
└──────────────────────────────┘
              ↓
┌────────────────────────────────────────┐
│  Add Salt and Pepper Noise with Original Image │
└────────────────────────────────────────┘
              ↓
┌──────────────────────────────┐
│   Histogram of Noisy Image   │
└──────────────────────────────┘
              ↓
┌────────────────────────────────────────┐
│  Pass the Noisy image through Median Filter │
└────────────────────────────────────────┘
              ↓
┌──────────────────────────────┐
│ Histogram of Median Filtered output │
└──────────────────────────────┘
              ↓
┌────────────────────────────────────────┐
│ To preserve the edges pass the output to Mean Filter │
└────────────────────────────────────────┘
              ↓
┌──────────────────────────────┐
│     Output of Mean Filter    │
└──────────────────────────────┘
              ↓
┌──────────────────────────────┐
│ Histogram of Mean Filter Output │
└──────────────────────────────┘
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Figure 1. Step for reconstructing original image with the help Mean and Median Filter

The input image is displayed with its histogram then the Salt and Pepper noise is added to the original image. After displaying the noisy image with its histogram and comparing the difference between both. To remove the salt and pepper noise from the noisy image it is passed through the median filter and displaying the image but the drawback of median filter is that the information at the edges is lost. To preserve the edges and smoothening of images, Mean Filter is applied to the output image with the histogram and the comparison of original image with final image histogram is same.

5. RESULT:

In 256x256 matrix of image, it is difficult to reconstruct the original image without losing any information from any of the filter. When image is passing through the median filter so, edges of the image suffer a lot the loss of information. Both the Mean and Median filters are required to work simultaneously to reconstruct the original image properly.
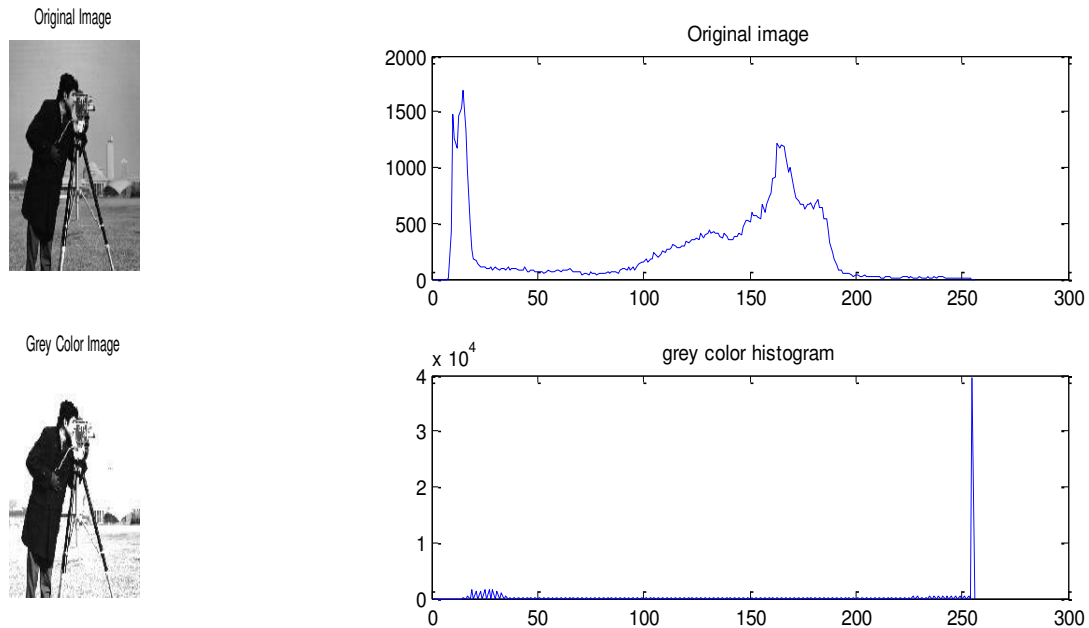

Figure 2.1. a) Original image b) Gray Color image c) Original Image d) Gray Color Image Histogram
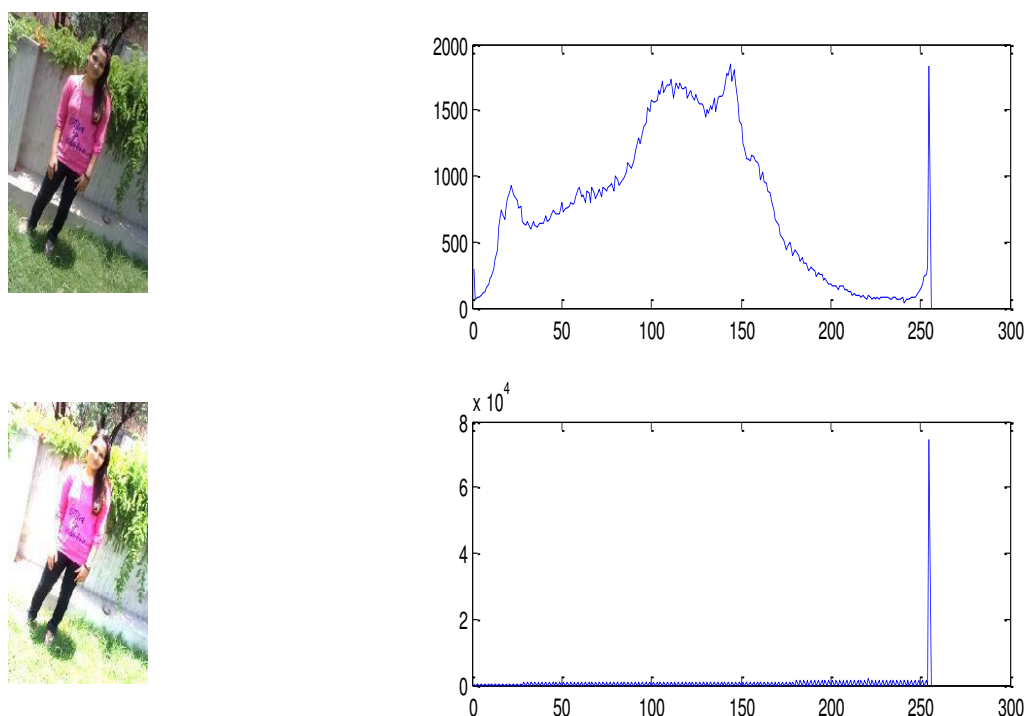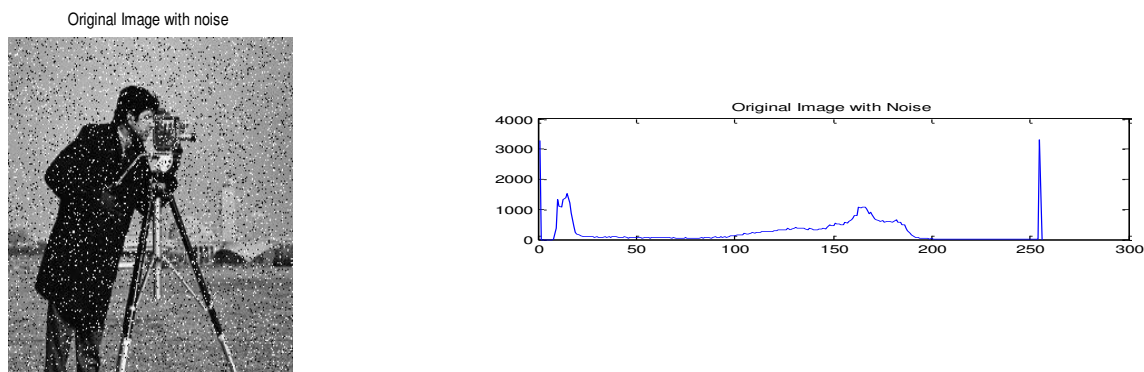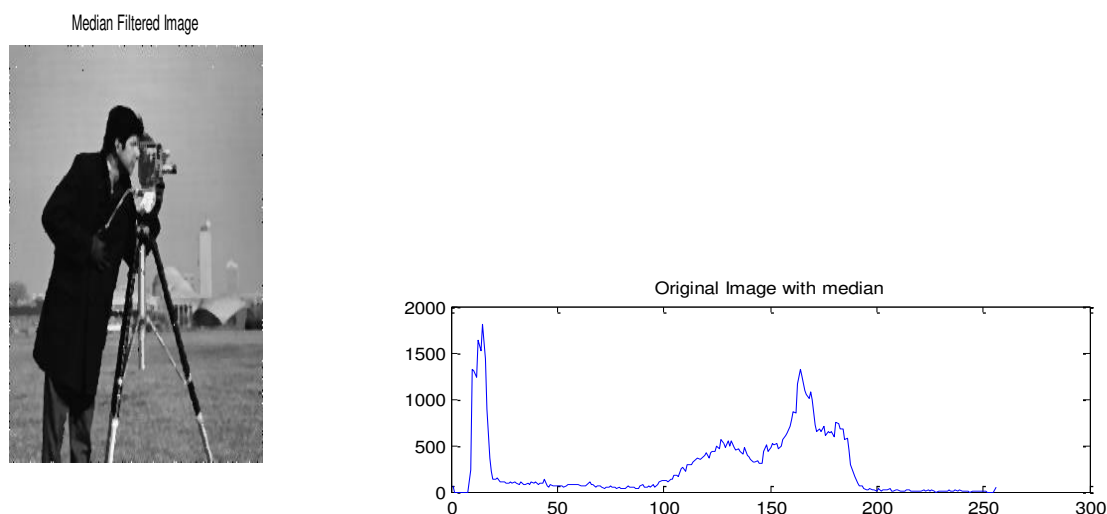

Figure 2.2. a) Original image b) Gray Color image c) Original Image Histogram d) Gray Color Image Histogram

Fig. 2.3 a) Original Image with Salt and Pepper Noise with 0.10 b) Original Image with Salt and Pepper Noise Histogram

Figure 2.4. a) Median Filtered output b) Median Filter Image Histogram

The output of the Median filter is somewhat noisy and the noise is not removed from the edges further it is passed through the mean filter to smooth the image and preserve the edges.

At the end, we retrieve the output of the original signal with the help of mean filter along with its histogram.
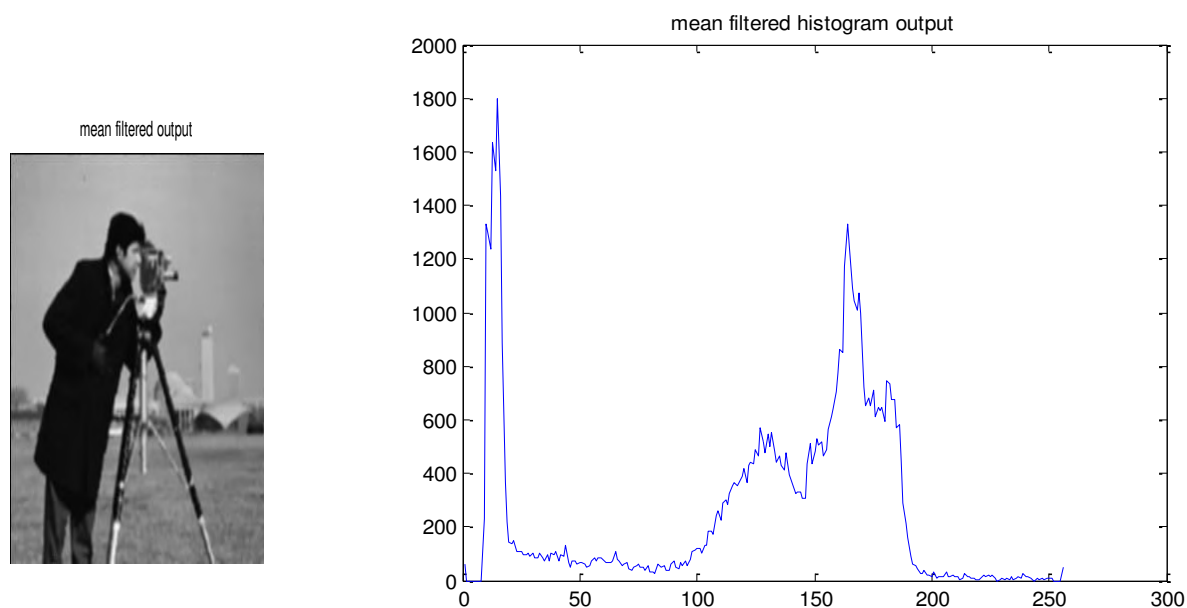
Figure 2.5. a) Mean Filter Output b) Mean Filter Output histogram

6. CONCLUSION:

The designing of this algorithm is used to reconstruct the original image and improving the image contrast. This Hybrid filter to reduce the uproar and preserving the edges. In this paper the algorithm is used to reconstruct the original image back with the comparision of histogram.

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