IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 4, April 2016

A Brief Study in Noise and Filtering for Dermoscopic Images

D. Saranya[1], Dr. V. Radha[2]

M. Phil[1]

Professor, Department of Computer Science, Avinashilingam University, Coimbatore[2]

Abstract: Noise is one of the main problems of digital image processing. The noise in an image is a disturbance while performing operations in the image processing. Medical images plays vital role in digital image processing. In dermoscopic images, the unwanted hairs on skin lesion, air bublles etc., are considered as noise. Noise can be removed in the preprocessing stage through filtering. Filtering is the technique used in preprocessing to make the image a clear and eligible manner so that other process can be further continued without any disturbances. This paper mainly focuses on the noise in an image and filtering used to remove the noise.

Keywords: Noise, Filtering, Images, Pixels, Preprocessing.

I. INTRODUCTION

Digital images play a vital role in all the fields and application such as medical, remote sensing, etc... Preprocessing is the first and fundamental arena in image processing. Noise is arbitrary changes that occur during image acquisition, transmission and compression. Noise results error in the image. Noise is the undesired data that contains in the image. Noise may be generated due to the defective instruments used in image processing during image acquisition process and also due to the variation in signal. Noise corrupts the quality of an image. Noise occurs in the image through sensor, light and by CCD camera. Noise in medical images is too hard and difficult when compared to other images. Medical images are generally degraded due to the light effects captured from the digital camera. The noise can be removed by using filtering. Filtering reconstructs the pixel values. Filtering removes the speckles in the image and brings the brightness for an image.The various noises present in image are Gaussian, impulse and Speckle noise. Section 2 covers the basic concepts of various noises. Section 3 brief about various filters. Section 4 discusses the experimental results and Section 5 concludes about the work.

II. TYPES OF NOISE

Image Noise is indiscriminate in brightness or color information. The noises are charted in following Figure.1.

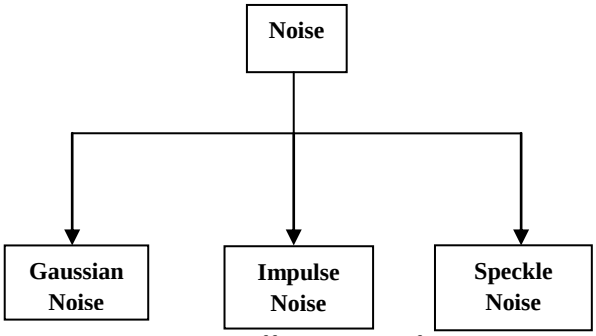


Figure1. Different types of noise

A) Gaussian Noise

Gaussian Noise arises in the digital image through image acquisition. Gaussian noise also known as White or additive noise. An image with higher resolution also being vault with some kind of noise, which affects the images when it is tend for further processing.

Gaussian noise can be removed by spatial filtering were the edges get blurred. The wiener filter is being used to get effective result. In Gaussian noise each and every pixel value of an image is changed from its original value [9].

B) Impulse Noise

Impulse Noise occurs due to the transmission of an image or during image acquisition. Noise occurs due to the faulty changes in camera pixels etc. Impulse noise is of two types, salt and pepper noise and random valued noise. Impulse noise, considerably decline the quality of an image. The pixels in the image are diverse in intensity from the neighboring pixels.

This type of noise affects only minute changes in pixels. The noisy image contains dark and white dots. Removing the impulse noise is one of the important tasks in research [1].The Presence of impulse noise in a medicalimage will be comparatively low or high, and this will corrupt the image quality and there will be loss of information. Impulse noise inmedical images can be categorized by noisy pixels or by taking minimum or maximum value and also as random noise.

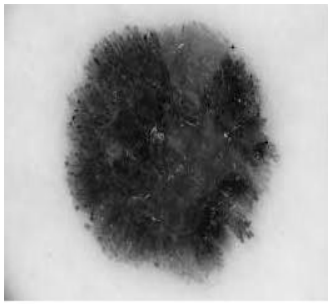
C)Speckle Noise

Speckle Noise is one of the common problems in image processing. Speckle noise makes the image in a renovate manner. Speckle Noise is also known as multiplicative noise. Speckle Noise makes negative bang on the image quality. Radical reduction makes the image resolution pitiable [2]. God men's have developed an implementation of reconstruction of intensity distribution in CCD cameras. Speckle noise arises only mostly arises only in the ultrasound images.

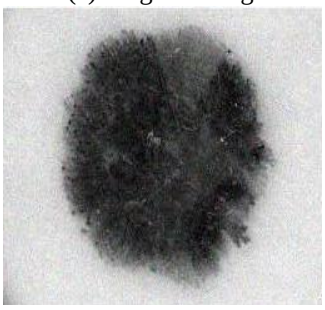
IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

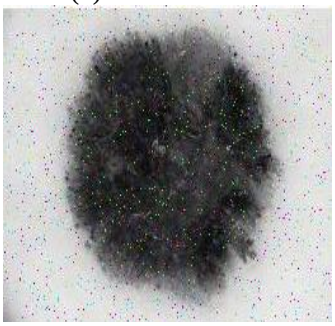
International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 4, April 2016



2(a) Original Image



2(b) Gaussian Noise



2(c) Impulse Noise

Figure.2 (a) to 2(c) Difference between Original Image and Noisy Images

III. FILTER

De-noising is one of the standard processes in image processing. The main goal of image processing is to get clear information from the degraded images. Adjusting the pixels in an image, based on some neighborhood pixels is filtering. Filtering is used to make the image an eminence one. Filters are used for removing noise, enhancing the image and also to identify the known pattern. Filtering has been classified into various types. They are shown in the figure2.

a) Median Filter

Median filter is one of the efficient methods, which is used to remove salt and pepper and impulse noise from images. It is one of the non-linear methods [10]. Filtering is done by replacing the image pixels from the neighborhoods pixels of median value. In Median filteringthe pixels values in a window form are ordered based on intensity values [3]. Median filtering is widely used in image processing, since it preserves or protects the edges while removing noise [4]. Median Filtering has a tremendous noise effect and less blurring ability when compared to other filters [5].

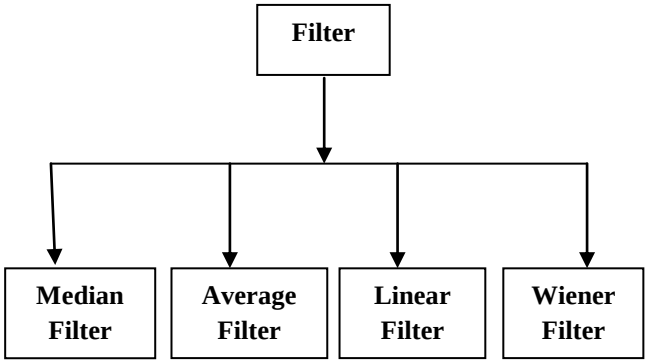


Figure 3.Classification of Filter

b)Average Filter

It is one of the filtering used to reduce the noise in an image. Average filtering is a technique, were the images are smoothened and highlights the edges and degrades the information about the image. Average filtering is also known as mean filter[8]. It works by substituting each pixel by average of pixels in a square form and by reducing the intensity of an image between the pixels. The images get blurred in average filtering, when compared to other filters used.

c)Linear Filter

Linear Filtering works by restoring pixels of neighborhood in a liner combination manner. It enhances the image by sharpening the edges and correcting the illumination which make the image a standard one [6]. Convolution is one of the important factors in linear filtering, which is used for smoothing an image.

d) Wiener Filter

Wiener filtering is used to reduce the noise that has degraded in an image and results same as the original image. The goal is to have least amount of mean square error. Wiener filtering investigates the prior knowledge about the noise in an image [7]. It has the wide-ranging of restoration for finding the noisy image.

IV. RESULTS

Generally image contains various types of noises such as gaussian, impulse, speckle etc... In dermoscopic images, impulse and gaussian noise mostly occurs due to its lesion pigment, air bubbles etc. To remove the noise from the images various types of filter are considered such as Median, Wiener, Average and Linear Filters. The Metrics used in experiment are Peak Signal Noise Ratio (PSNR) and Mean Square Error (MSE). PSNR is being used to evaluate the difference between the quality of filtered image from the noisy image. MSE is used to find the error rate of an image. The formula for PSNR and MSE is given below:

$$\mathbf{PSNR} = \frac{10 * \log10\ (255\text{^}2)}{\text{mse}}$$

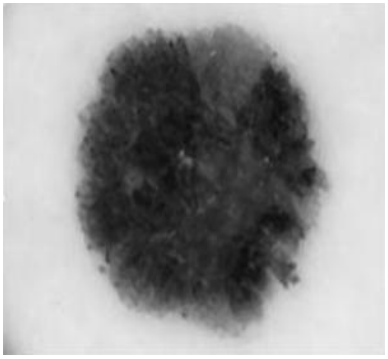
$$\mathbf{MSE} = \frac{(\text{mseR} + \text{mseG} + \text{mseB})}{3}$$

DOI 10.17148/IJARCCE.2016.5479

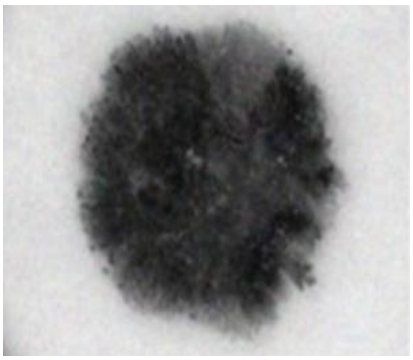
IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

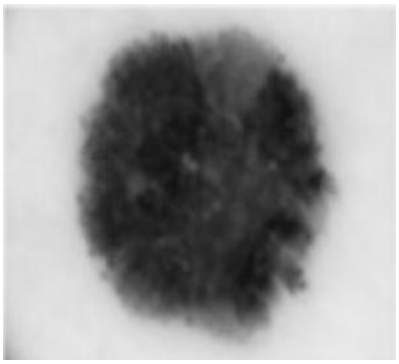
International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 4, April 2016



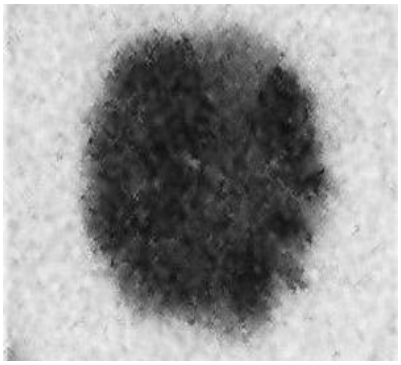
4(a) Median Filter



4(b) Average Filter



4(c) Linear Filter



4(d) Wiener Filter

Figure 4(a) to 4(d) Filtered Images

The experimental results shows that median filtering works better compared to other filters for dermoscopic images. Linear is also one of the best filter, but it gets blurred, whereas according to average and wiener filter the image are not clear that leads to difficult for further processing. The Table (1) thus shows the results of metrics were in median filtering the error rate is being reduced and in PSNR value the noise ratio is highly identified.

Table 1: PSNR and MSE Value

Filter	MSE(Mean Square Error)	PSNR(Peak Signal Noise Ratio)
Median Filter	0.10023	6.4098
Average Filter	0.15764	6.2373
Linear Filter	0.18415	6.1916
Wiener Filter	0.70603	6.1494

V. CONCLUSION

Noise normally occurs in every digital image. Various filters are used to detect noise in an image, were median filtering works better in dermoscopic images when compared to other filters used above. This paper focus on identifying the noise in a dermoscopic image and removing the noise through filters. Better results have been achieved in median filtering for impulse noise, were PSNR is in high ratio and MSE results low.

REFERENCES

[1] Amir Reza Sadri Maryam Zekri, Saeid Sadri1 and Niloofar Gheissari (2012), "Impulse Noise Cancellation Of Medical IMages Using Wavelet Networks and Median Filters" Journal of Mediacl Signals &Sensors,Vol-2,Issue-1.

[2] Ms. Alka Vishwa and Ms. Shilpa Sharma (February 2012), "Speckle Noise Reduction in Ultrasound Images by Wavelet Thresholding" International Journal of Advanced Research in Computer Science and Software Engineering, Vol.2, Issue 2, ISSN: 2277 128X.

[3] Matthias Kirchner and Jessica Fridrich "On Detection of Median Filtering in Digital Images".

[4] Anisha Bhatia(Aug-2013), "Salt-and-Pepper Noise Elimination in Medical Image based on Median Filter method", International Journal of Electrical, Electronics and Data Communication, Vol.1, Issue-6, ISSN: 2320-2084.

[5] U.Sahin, S.Ughz and F.Sahin (2014), "Salt and pepper noise filtering with fuzzy-cellular automata"Elsevier,Vol.40, Issue.1, pp.59–69.

[6] Hari OM and MantoshBiswas (April 2014), "MMSE based map estimation for image denoising"Elsevier,Vol.57, pp.252–264.

[7] Pawan Patidar, Sumit Srivastava,Manoj Gupta and Ashok Kumar Nagwat (Nov-2010), "Image De-noising by Various Filters for Different Noise"International Journal of Computer Applications ISBN:0975-8887, Vol.9-No.4.

[8] Sonali R. Mahakle & NileshSingh V. Thakur (2012) "A Comparative study of image filtering on various noisy pixels", International Journal of Image Processing and Vision Sciences,Vol.1, Issue-2, ISSN (Print):2278 – 1110.

[9] M.HariKrishnan and R.Viswanathan"A New Concept Of reduction Of Gaussian Noise In Images Based on Fuzzy Logic "Applied Mathematical Sciences,Vol.7,No.12, pp.595-602.

[10] Raymond H. Chan Chung-Wa Ho and Mila Nikolova(2005), "Salt-and-pepper Noise Removal by Median-TypeNoise Detectors and Detail-Preserving Regularization", IEEE TRANSACTIONS ON IMAGE PROCESSING, Vol.14, No.10.

DOI 10.17148/IJARCCE.2016.5479