International Journal of Applied Research 2017; 3(3): 173-175

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2017; 3(3): 173-175
www.allresearchjournal.com
Received: 25-01-2017
Accepted: 26-02-2017

J.MERCY
UG Scholar,
Department of ECE,
SNS College of Technology,
Coimbatore-641035,
Tamil Nadu, India.

R.LAWANYA
UG Scholar,
Department of ECE,
SNS College of Technology,
Coimbatore-641035,
Tamil Nadu, India.

A.MANIKANDAN
UG Scholar,
Department of ECE,
SNS College of Technology,
Coimbatore-641035,
Tamil Nadu, India.

M.SARAVANAN
Assistant Professor,
Department of ECE,
SNS College of Technology,
Coimbatore-641035,
Tamil Nadu, India.

A.SANTHOSH KUMAR
Assistant Professor,
Department of ECE,
SNS College of Technology,
Coimbatore-641035,
Tamil Nadu, India.

Correspondence
S.NAVEEN
UG Scholar,
Department of ECE,
SNS College of Technology,
Coimbatore-641035,
Tamil Nadu, India.

Effective filtering methods to remove different types of noises in brain MRI images

S.Naveen, J.Mercy, R.Lawanya, A.Manikandan, M.Saravanan and A.Santhosh kumar

Abstract
Nowadays in health care, Medical image processing plays an important role for diagnosis and treatment. While capturing the medical images there may be possibility of noises in the images that may degrade the details in the images. So it becomes difficult for the doctors and therapist to diagnosis the diseases properly. Therefore it is mandatory to process and remove the noise from the medical images. MATLAB provides good noise removal techniques and filtering the images that enhances and restores the images. In this paper, different types of noises and various types of filters that are used to remove noise in the images are discussed. The most efficient techniques in removing noises in retinal images and brain MRI images and the comparison of performance of various filters that can efficiently remove or reduces the noise in the images are studied. Among all Wavelet thresholding technique provide a effective removal of noise in brain MRI images

Keywords: Homomorphic filter, maximum-minimum filter, box filter, alpha trimmed mean filter, contra harmonic mean filter, wiener filter, Gabor filter, NAFSM filter, adaptive median filter, average filter, adaptive weighted median filters

Introduction
Generally, in medical image processing while transmitting the scanned images from the transmitter to the receiver in an medical instrument, or during the acquisition of image by the intended receiver, there may be a possibility of noise occurrence. The noise may be defined as the form of an unwanted signal or interruption that makes the image to be blurred and reduces the details of images. So it makes the doctors or physicians difficult to diagonize the diseases accurately and properly. Hence it becomes mandatory to denoise the noise affected images by image denoising and restore the original image. Image restoration helps in the removal of noise affected image and gives a clean image free from noise.
Noise may be of various types such as salt and pepper, Gaussian, poisson, Speckle noise and Brownian noise. Generally there exists two types of noise models such as additive and multiplicative noise models.
Additive noise rule can be given by
$F(m, n) = S(m, n) + N(m, n)$
Multiplicative noise rule can be given by
$F(m, n) = S(m, n) * N(m, n)$
Each noise has its own source of origin, own effects and results on original images. The removal of noise in images is possible by some filtering techniques and the filters are in general can be classified as linear and non-linear filters.
Linear filter may include averaging filter may include removes the Gaussian noise. Non-linear filter may include mean filter, median filter and so on which simply replaces the outer pixel values with the mean or median values of surrounding pixels.
Various other filters are also available such as homomorphic filter, maximum-minimum filter, box filter, alpha trimmed mean filter, contra harmonic mean filter, wiener filter, Gabor filter, NAFSM filter, adaptive median filter, average filter, adaptive weighted median filters.

2. Literature Review
I). In "Noise Adaptive fuzzy switching median filters for removing Gaussian noise and salt & pepper noise in retinal images", images are corrupted with noise during its acquisition, transmission and blurring artifacts restoration attempts to remove such noise while trying to

preserve as much as possible. Filtering techniques are used for noise reduction, interpolation and re sampling of images and the choice of filter depends on nature of the image to be denoised and depends on its applications.
In retinal images, denoising medical images is a challenging task and this paper attempts to denoise the Gaussian and salt & pepper noise with the help of different filters. Among all the filters, NAFSM filter proves to be the best in terms of performance metrices.

II). In "Reduction of FBM noise in brain MRI images using wavelet thresholding techniques", image processing deals with image restoration or denoising which restores the original image while preserving the important features needed for proper diagnosis and to track the progress of the disease.
In brain MRI images FBM noise is caused by the Brownian motion which is a random movement of tiny particles that are suspended in brain fluid and if greatly affects brain MRI images. This study deals with the implementation of three thresholding techniques such as Visu shrink, Bayes shrink, SURE shrink in wavelet domain for denoising the brain MRI images.

III). In "Implementation and comparison of various filters for the removal of fractional Brownian motion noise in brain MRI images", image processing deals with the processing of raw images into the suitable form, that can be categorized into image segmentation, image enhancement, image compression and image restoration.
The performance of various filters such as mean filter, alpha trimmed mean filter, contra harmonic mean filter, wiener filter and hamomorphic filters are compared using evaluation metrices such as PSNR (Peak Signal to Noise Ratio), MSE (Mean Square Error), NAE (Normalized Absolute Error) and time elapsed to filter the noisy image. When comparing all the filters, hamomorphic filter proves to the best whereas other filters removes noise at the compensation of over smoothing the noisy image and hence the performance of the remaining filters is not worthwhile in removing fractional Brownian motion noise in Brain MRI images. Hers the simulations is done through MATLAB R2013a. The simulation results for the implemented filters are compared and the best performing filter is identified.

IV). In "Comparative results performance analysis of various filters used to remove noises in retinal images", such as mean, average, median, adaptive median, adaptive weighted median filters are used to remove the salt and pepper noise and Gaussian noise in retinal images. The performance of all the filters are compared using metrices such as PSNR (peak signal to noise ratio), MSE (Mean square error), NAE (Normalized absolute error), NK (Normalized cross correlation), AD (Average difference), MD (Maximum difference), SC (Structural content) and Time elapsed to produce the denoised image.
While restoring the original image from the noisy image or to denoise a image, it is important to note that there should be a balance between removing noise and preserving signal features. On comparing the performance metrices of all the above mentioned filters, adaptive weighted median filter attempts to remove the noise better than other filters and also provide the balance between removing noise and preserving signal features.

V). In "Performance comparison of various filters for removing salt and pepper noise ", to denoise the image affected by salt and pepper noise various filters such as median, average, adaptive weighted median and their performance are compared by evaluating their metrices such as PSNR, MSE, NAE, SC.
The main reason for the occurance of the salt and pepper noise is by malfunctioning of pixel elements in the sensors of cameras, faulty memory locations or timing errors of the digitization process, also due to error in ADC and bit error in transmission. Salt and pepper noise is impulse type noise and an Image affected by salt and pepper noise has dark pixels in bright region and bright pixels in dark region. Salt and pepper noise is also called as flat-tail distributed or intensity spike noise. Filtering techniques are linear technique and non-linear technique where average and Gaussian filters are linear technique filters and mean, median and wiener filters or non linear technique filters. Adaptive weighted median filter gives optimum values for all the filters.

VI). In "A Novel Approach for Enhancing Foggy Images", the images are degraded by the fog because the images taken in foggy weather conditions are not clear and cannot be used for wide variety of applications. Fog tends to scatter the pixels of the digital image by reducing the ability of image vision and also it changes the corresponding RGB components of the image. In the proposed work, the contrast enhancement algorithm was used to change the intensity component among the converted HIS components from the RGB components of the original foggy image.
The foggy image appears more clearly than the original image in terms of Peak Signal to Noise Ratio (PSNR) and Mean Square Error (MSE) by converting back to RGB components. The contrast enhancement technique is based on intensity adjustment where PSNR and MSE has increased to a significant value that enhances the details of the image degraded by the fog.

VII). In "FPGA based Denoising Method with T-Model mask architecture design for removal of noises in images", during the conversion of images into different form and transmission of images for various applications the originality of capture images are affected by different noises in the process of image acquisition. There exist various techniques for removing noises in digital images but the main problem in these techniques is degrading the image information. Therefore an efficient VLSI (Very Large Scale Integrated Circuits) implementation of Trimmed median filter algorithm with T-Model mask technique is used for removal of impulse noise is proposed.
The VLSI implementation consumes less area and the architecture is simple and it provides the capability of implementing the reconfigurable fabric in a pipelined fashion to improve the speed when compared to DTBDM (Decision-Tree-Based-Denoising Method). The VLSI architecture implemented on FPGA (Field Programmable Gate Array) by pipelining with parallel processing will improve the performance of filtering process and reduces the delay. On comparing with different denoising methods the performance of proposed algorithm provides better results.

VIII). In "Retinal image analysis for evaluating image suitability for medical diagnosis", to enhance the quality of retinal image, the algorithm based on image quality indicators are used. For diagnosis purpose, features such as color and focuses are used as quality indicators to evaluate image suitability. This algorithm deals with Pre-processing where the retinal image includes cropping, masking and removal of noise from the original image. In pre-processing steps noises are identified and various types of filters such as linear smoothing filter, wiener filter, non-linear filter, fuzzy filters are used to remove such noise. In this paper, focus assessment and color assessment algorithm are performed separately which enhances the image quality. The fuzzy filters are used which provides promising results in image processing tasks than the other classical filters.

Conclusion

Thus, this study deals with the implementation of various filters in denoising the medical images such as retinal images and brain MRI images. This paper also deals with the performance comaprision of various filters for removing salt and pepper noises and other noises such as fractional brownian motion noise in brain MRI images, Gaussian noise in retinal images. A comparitive study of various filters and their performance such as peak signal to noise ratio, mean square error and other parameters is also provided in one of the survey literature [4-5]. A novel approach for enhancing foggy images also studied that provides an effective way to enhance the images that are affected by fogs [6]. The future enhancement of this study paper includes implementing various types of filters with efficient performance to remove noises in medical images particularly in retinal and brain MRI images and also to enhance the quality of foggy images. Many more applications of image processing have been discussed in [1] to [17].

References

1. Pradeepa Natarajan, Gokilavani Chinnasamy, Gokul R. A Comparative Survey on Image Segmentation Algorithms, IJARET (International Journal for Advance Research in Engineering and Technology). ISSN: 2320-6802.
2. Gokilavani Chinnasamy, Gowtham M. A Novel Approach for Enhancing Foggy images, IJETAE (International Journal of Emerging Technology and Advanced Engineering) ISSN: 2250-2459. 2014; 4(10)88-91.
3. Gokilavani Chinnasamy, Gowtham M. A Comparative study on Speckle Reduction Techniques in Medical Ultrasound Images. IJSER (International Journal of Scientific and Engineering Research). ISSN: 2229-5518. 2014; 5(10):1046-1048.
4. Gowtham M, Arul Karthick VJ, Gokilavani Chinnasamy. A Novel Finger Print Image Compression Technique Using Run-Length and Entropy coding, IJAR (International Journal of Applied Research). ISSN: 2394-5869. 2015; 1(7):33-39.
5. Gokilavani Chinnasamy, Vanitha S. Fractional Brownian motion and Fractal Analysis of Brain MRI Images: A Review. IJAR (International Journal of Applied Research). ISSN: 2394-5869. 2015; 1(3):21-24.
6. Gokilavani Chinnasamy, Vanitha S. Implementation and Comparison of Various Filters for the Removal of Fractional Brownian Motion noise in Brain MRI Images. IJTET (International Journal for trends in Engineering & Technology). ISSN: 2349-9303, 2015; 3(3):29-33.
7. Gokilavani Chinnasamy, Gowtham M. Performance Comparison of Various Filters for Removing Salt & Pepper Noise. IJMRD (International Journal of Multidisciplinary Research and Development), ISSN: 2349-4182. 2015; 2(1):148-151.
8. Vinitha R, Gokilavani Chinnasamy, Jayageetha J. Retinal Image Analysis for Evaluating Image Suitability for Medical Diagnosis. IJATES (International Journal of advanced Technology in Engineering and Science), ISSN: 2348-7550. 2015; 3(2):355-363.
9. Gokilavani Chinnasamy, Gowtham M. Segmentation of Pedestrian Video Using Thresholding Algorithm and its Parameter Analysis. IJAR (International Journal of Applied Research), ISSN: 2394-5869. 2015; 1(4):43-46.
10. Gokilavani Chinnasamy, Vanitha S, Mohan KS, Dr. Karthik S. Comparison of Various Filters for the Removal of Fractional Brownian Motion noise in Brain MRI Images, ISSN: 0973-4562, 2015; 10(41):30501-30507.
11. Gayathri M, Hari Priya M, Gokilavani Chinnasamy. A Survey on Factors Causing Power Consumption and their Reduction Techniques in Embedded Processors. IJAR (International Journal of Applied Research), ISSN: 2394-5869. 2016; 2(2):766-769.
12. Gokilavani C, Rajeswaran N, Karpagaabirami S, Sathishkumar R. Noise Adaptive Fuzzy Switching Median Filter for Removing Gaussian Noise and Salt & Pepper Noise in Retinal Images, Middle-East Journal of Scientific Research. 2016; 24(2):475-478.
13. Rajeswaran N, Karpagaabirami S, Gokilavani C, Rajendran R. FPGA based Denoising Method with T-Model mask Architecture Design for Removal of Noises in Images, Elsevier Procedia Computer Science, 2016, 519-526.
14. Gokilavani C, Rajeswaran N, Arul Karthick VJ, Sathish Kumar R, Thangadurai N. Comparative results performance analysis of various filters used to remove noises in retinal images.
15. Rajeswaran N, Gokilavani C. Reduction of Fbm Noise in Brain MRI Images Using Wavelet Thresholding Techniques. Asian Journal of Information Technology, Medwell Journals. 2016; 15(5):855-861.
16. Illakiya SN, Ilakiya M, Jayadharani J, Jeniba RL, Gokilavani C. A Survey on Recent Trends and Applications in Embedded Systems. IJAR (International Journal of Applied Research), ISSN: 2394-5869, 2016; 2(8):672-674.
17. Gokilavani C, Saravanan M, Kiruthika Preetha R, Mercy J, Lawanya R, Nashreenbanu M. Analysis of Gabor Filter and Homomorphic Filter for Removing Noises in Ultrasound Kidney images, International Journal of Electrical and Electronics Engineers, 2016; 8(2):513-254.