ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 12, December 2013

An Independent Edge Preserving Algorithm for Multiple Noise

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ABSTRACT: In this paper a new technique is used to removing mixed multichannel noise from multichannel image. The mixed noise in the multichannel image is detected by using multiscale detection. The HSDLF (Half space deepest location filter) is used to find the noise present in the half space deepest location. By developing the DEEPLOC algorithm in spatial domain the accuracy and effectiveness is increased in HSDL and also time complexity is reduced.

Keywords: Multichannel image, Mixed noise, Multi scale detection, HSDLF, DEEPLOC algorithm.

I. INTRODUCTION

Removal of mixed noise in multichannel image is most important problem in digital image processing and one denoising algorithm cannot be used for removal of mixed noise. The main aim of denoising algorithm is used to remove the noise and preserve the image details.

The digital images consist of salt & pepper noise, additive noise and multiplicative noise. The unwanted random image that is added with the original image is the additive noise. Resistive circuits and opamps are the orgin of additive noise. The salt and pepper noise have dark pixels in bright regions and bright pixels in dark regions. The orgin of this noise is sensor cells; memory cells failure and synchronization errors in image digitizing. The unwanted random image that is multiplied with the relevant image is the multiplicative noise and it can be caused during capture or transmission of images.

This paper contains the section I as the introduction, effect of noise and denoising in section II ,the spatial domain denoising in section III, multi scale detection, DEEPLOC algorithm in section III, Experimental images in section IV, and conclusion in section V.

II. LITERATURE SURVEY

The noise in the digital image is replaced in the spatial domain or transform domain [1]. The transform domain is used to remove low noise densities and it has the disadvantages as Oscillation, aliasing and absence of phase information. The spatial domain is used for high noise densities and it is most efficient than the transform domain[2].The BDND uses noise detection and filtering to remove the noise. Detection is based on clustering.

The filtering replaces the noisy pixel by its estimate of original value. It degrades the system performance [3].The fuzzy method uses the FMLAWK filters to reduce noise. It preserves the edges but it increase the computation time [4]. The cloud filter restores an image with good preservation. Noise increases the run time also increases. The AM-EPR cannot preserve the details for high level noise[5].The fuzzy rules based on spatial ,temporal and color information and it needs two filtering steps[6].The PDE method depends on the conductance coefficient and it provide good tradeoff[7]. The fourth order PDE is uses the median filter to remove multiplicative noise .It avoids the blocky effects[8].The modified K-SVD algorithm is used .It demonstrate better performance but it take more computation time[9].Iterative impulse noise detector is used to detect the noisy pixels .The adaptive median filter is used to restore them[10]. Noisy pixels are replaced by average value and the nonlinear filtering is used. These methods are take more computation time. The main goal is to reduce the computation time and preserve the edge details. Spatial domain denoising

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III. SPATIAL DOMAIN FILTERING

The spatial domain filtering affects all the pixels in an image. It affects pixels which corrupted by noise and uncorrupted noisy pixels. Due to this the output images are blurred and edges are undetectable. The nonlinear filters are used to overcome this problem. The speckle, salt & pepper cannot be separated from an image using a linear filter .So the nonlinear filter should be used in the spatial domain. Except some nonlinear transforms all the other nonlinear filter can be implemented only in the spatial domain. The nonlinear vector filters produce excellent result in multichannel denoising. Processing of a local neighborhood should be reduced in the spatial domain filtering.

The nonlinear vectors are currently used to remove impulse noise but this filtering method is fundamentally different approach. The multichannel image preserves the Spectral correlation between the channels. The deepest locations are founded simultaneously and find the most central point in the multichannel image. The spatial domain needs memory requirement because it identifies the noise and finds the location by using the noise map. To reduce the memory requirement go for the multiscale detection.

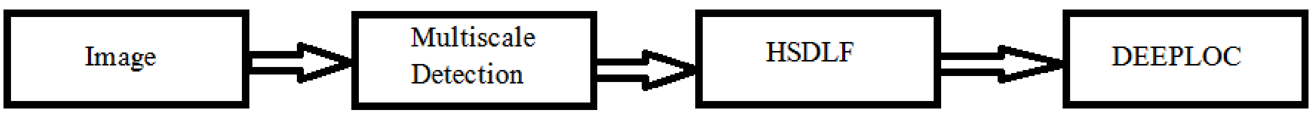

Fig.1. Block diagram of proposed algorithm

The input image used here is ultrasonic image .the noise signal are added to the input image .the noise present in the image is detected by using the multiscale detection. The half space deepest location is founded by using the HSDLF .Noise is removed by using the DEEPLOC algorithm. The wavelet filter is used to filter the noise in the DEEPLOC algorithm.

IV. METHODS USED

A. Multiscale detection:

The noise detection plays important role in the denoising algorithm. The multiscale detection is applied on the noisy image to detect the noisy pixels in an image. The reason for choosing multi scale detection is it exploits the edges and details in different scales and average value always greater because of the noise levels. The images are first smoothened and noise at different level are combined and normalized. Then the normalized value is compared to the set of predetermined threshold. The resultant value is greater than the predetermined threshold then the pixel consist of noise.0 represents the noise free pixel and 1 represents the corrupted pixel. The noise in the image is detected by using the following steps.

The convolution of noisy image Y(i,j) and the Gaussian kernel function G(t,i,j) is given by,

$$I_t(i,j) = Y(i,j) * G(i,j,t)$$

Where,* represents convolution operation t represents resolution of the image and take finite set of elements.

$$I_t(i,j)$$

represents the smoothened image

1. Take different values for ‘t’ and find the difference between the noisy image Y(i,j) and smoothened image is denoted by
   ‘M’ and it is given by,

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$$M = \frac{1}{K}\sum_{t=0}^{\infty} I_t(i,j) - Y(i,j)$$

Where, k is the normalizing constant.

2. Consider different threshold values for different noise level or particular noise level. Pixel detected by noise level or density is given by, M (i,j)>T, then Y (i,j) is noisy pixel. From this method different threshold values are obtained. For different noise level or image should be considered.

B. DEEPLOC algorithm:

1. FIND HSDLF:

In this algorithm use 24 bit (each color consist of 8 bit) multichannel image and the coordinates are the R, G, B. The half space deepest location filter increases the number of directions from class. It preserves the image detail and edges.it consist of less number of artefacts than the other denoising methods. It does not depend on the densities or variables of noise. It can be computed by the following steps Fill the text from your manuscript in different sections.

1. Find the Tukey's median in every dimension d and it is given by,

$$\boldsymbol{M}_1 = \left(\mathrm{Med}\left(x_{i1}; i = 1, \ldots, n\right), \ldots, \mathrm{Med}\left(x_{id}; i = 1, \ldots, n\right)\right)$$

2. After computing the median value, the directions are found by,

$$\boldsymbol{u} \in \mathbb{R}^d, \|\boldsymbol{u}\| = 1$$

3. The average direction U $_{move}$ is given by,

$$\boldsymbol{u}_{\mathrm{move}} = \frac{1}{|U_{\mathrm{move}}|}\sum_{\boldsymbol{u}\in U_{\mathrm{move}}} \boldsymbol{u}$$

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C. Flowchart:

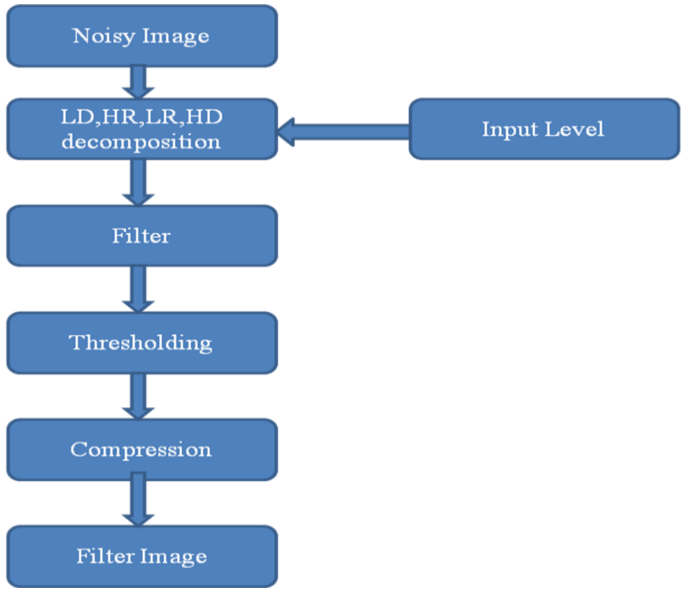

Fig. 2 Flow chart of the noise removal process

The noisy image is taken and the deepest locations are founded. Then the HSDLF is applied for find the noise in the half space deepest location. The threshold control parameter 'p' is used to control the direction of threshold value in all direction. After performing the threshing the image is compressed. The compressed image is taken for filtering .The wavelet filtering is used to filter the noise. This method improves the PSNR values and the computation time is reduced.

D. EXPERIMENTAL RESULTS:

Fig 3.a. Original image

Fig 3.b. Noisy image

Fig 3.c. DEEPLOC

The experimental results shows the high density noise is removed from the image and the edge should be preserved. It should consume less computation time. Better resolution should be achieved.

TABLE I
PSNR VALUES FOR HSDL

Overall average PSNR gain (dB)	**Maximal average PSNR gain (dB)**	**Minimal average PSNR gain (dB)**	**Maximal PSNR gain (dB)**	**Minimal PSNR gain (dB)**
7.33	9.15	5.5	9.65	3.26

V. CONCLUSION

In this paper proposed spatial domain for removal of mixed multichannel noise based on location depth. The HSDLF successfully preserves the edges and image details from original images. The filter takes spectral correlation between channels in the multichannel images. Also, it does not depend on the nature or distribution of noise or any specific digital image format, which means that it is implemented on the lossy compressed image and other types of multichannel noise. HSDL can improve the accuracy , effectiveness and the computation is reduced compared to previous method.

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BIOGRAPHY

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Vol. 2, Issue 12, December 2013

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Dr. R.S. Sabeenian is currently working as a Professor in ECE Department in Sona College of Technology, Salem, Tamil Nadu, and India. He received his Bachelors in Engineering from Madras University and his Masters in Engineering in Communication Systems from Madurai Kamaraj University. He received his Ph.D. Degree from Anna University, Chennai in the year 2009 in the area of Digital Image processing. He is currently heading the research group named **Sona SIPRO** (SONA Signal and Image PROcessing Research Centre) centre located at the Advanced Research Centre in Sona College of Technology, Salem. He has published more than **65** research papers in various International, National Journals and Conferences. He has also published around seven books. He is a reviewer for the journals of IET, UK and ACTA Press Singapore. He received the **"Best Faculty Award"** among Tamil Nadu, Karnataka and Kerala states for the year 2009 given by the Nehru Group of Institutions, Coimbatore and the "**Best Innovative Project Award**" from the Indian National Academy of Engineering, New Delhi for the year 2009 and "**ISTE Rajarambapu Patil National Award"** for Promising Engineering Teacher for Creative Work done in Technical Education for the year 2010 from ISTE.

He received two "**Best Research Paper Awards" from Springer** International Conference and **IEEE** International Conference in the year 2010.He was also awarded the **IETE Biman Behari Sen Memorial National Award** for outstanding contributions in the emerging areas of Electronics and Telecommunication with emphasis on R&D for the year **2011**.The Award was given by Institution of Electronics and Telecommunication Engineers **(IETE), New Delhi**. He is the Editor of 6 International Research Journals Research Journal of Information Technology, Asian Journal of Scientific Research, Journal of Artificial Intelligence, Singapore Journal of Scientific Research, International Journal of Manufacturing Systems and ICTACT Journal of Image Processing. He is also associated with the Image Processing Payload of the **PESIT Pico Satellite Project** which is to be launched by the end of Feb, 2013.He is the External Expert Member for Board of Studies of Adhiyaman College of Engineering, Hosur and M.Kumarasamy College of Engineering, and Karur. He is the Honorary Treasurer of IETE Salem Sub Centre from 2010 onwards. He is the Co-ordinator for AICTE-INAE DVP Scheme. His areas of interest include texture analysis, texture classification and pattern recognition. He delivered more than 50 guest lectures and chaired more than 25 national and international conferences.