IJASRM
International Journal of Advanced Scientific Research and Management, Volume 4 Issue 6, June 2019
www.ijasrm.com
ISSN 2455-6378

MEAN FILTERING TO DE-NOISING IMAGE USING VARIOUS BLOCK SIZE

M. Kasthuri

Assistant Professor, / Department of Computer Applications, / Bishop Heber College, Tiruchirappalli-620017, Tamil Nadu, India

Abstract

Digital image processing is a growing technology which helps to enhance the quality of the image. Mean filtering is a linear method for noise suppression with gray scale images of a fixed pixel block size is a simple and easy to implement. In this paper various forms of noise applied to a image of various pixel block size to enhance the quality of image. The quantitative performance of Peak Signal Noise Ratio (PSNR), Root Mean Square Error (RMSE), Universal Image Quality Index (UIQI), and Enhanced Measure of Enhancement (EME) are used as the evaluation index. The results obtained were evaluated

Keywords: *Mean filter, De-noising, PSNR, RMSE, UIQI and EME*

1. Introduction

Digital image processing is the technology of manipulating these groups of pixels to enhance the quality of image. Noise is always present in digital image during image acquisition, coding, transmission and processing. Images get affected during data transmission and compression. Therefore, de-noising is frequently a vital and before analyzed. Noise removal is considered thus far assumes the image is corrupted by additive noise. Mean filter reduces the amount of intensity variation between pixels and performs average smoothing on an image.

2. Review of Literature

Toh et al proposed Image transmission noise may be caused by various sources, such as car ignition systems, industrial machines in the vicinity of the receiver, switching transients in power lines, lightning in the atmosphere and various unprotected switches [2]. Kong et al proposed Noise removal is one of the major concerns in the field of computer vision and image processing. Images are often contaminated by impulsive noise due to noisy sensors or channel transmission errors or faulty storage hardware. The goal of removing impulsive noise is primarily to suppress the noise as well as to preserve the integrity of edges and detailed information [3, 4]. Tulin Yıldırım et al proposed digital images are often corrupted by different types of noise during its acquisition and transmission phase. Such degradation negatively influences the performance of many image processing techniques and a preprocessing module to filter the images is often required [1]. Thirumurugan1 et al proposed one of the noises commonly corrupting digital images is the impulse noise. Removal of Random valued impulse noise is more complicated due to the random distribution of the noise pixels [8]. Ma et al proposed enhanced anisotropic diffusion models for image de-noising. The proposed model was utilized for classifying the different data of images like smooth regions, edges, corners and gradient variation parameter [10]. Ibrahim et al Furthermore, an edge fusion method was proposed for edge-preserving after de-noising by fusing the several de-noising and edge detection methods. Originally, the de-noised images were acquired by using de-noising methods and then the edge images of de-noised images were captured by edge detection methods. After that selected edge images were fused with more edges for restoring the edges of de-noised images [7]. Javad Hatamzadi1 et al the Noise pollution was slightly reduced to 60 dB on Wednesday and Thursday. The noise pollution was sharply reduced to 55.8 dB on Friday [13]. Simon Carlile et al proposed contention and opinion in these areas that, from a scientific perspective, are not well founded in the data, simply because there are little data available that effectively address these issues [14].

3. Proposed Work

Noise removal is main task of image processing. It can degrade the image at the time of capturing or transmission of the image. In this proposed scheme, different block sizes are extracted from the raw and

IJASRM
International Journal of Advanced Scientific Research and Management, Volume 4 Issue 6, June 2019
www.ijasrm.com
ISSN 2455-6378

processed digital images. This paper discusses various noises like Gaussian, Salt and pepper, Speckle and Poisson noise etc. available for de-noising the image. Enhancement is a more general term deals with various approaches to improve quality of the image so that the subsequent steps in image processing (or) analysis become more effective. Image de-noising is one such approach where the noise is reduced so that the impact of noise on further process will be minimized. The performance metrics such as Peak Signal Noise Ratio (PSNR), Root Mean Square Error (RMSE), Universal Image Quality Index (UIQI) and Enhancement Measure Enhancement (EME) are measured for evaluate the quality of image.

Different types of noise image (Gaussian, Speckle, Erosion, and Dilation) are removed by mean filter with different block size for restore the image and performance metrics are measured by various parameters like PSNR, RMSE, UIQI, and EME. Image is analyzed using spatial domain as per the proposed system shown in Fig. 1.

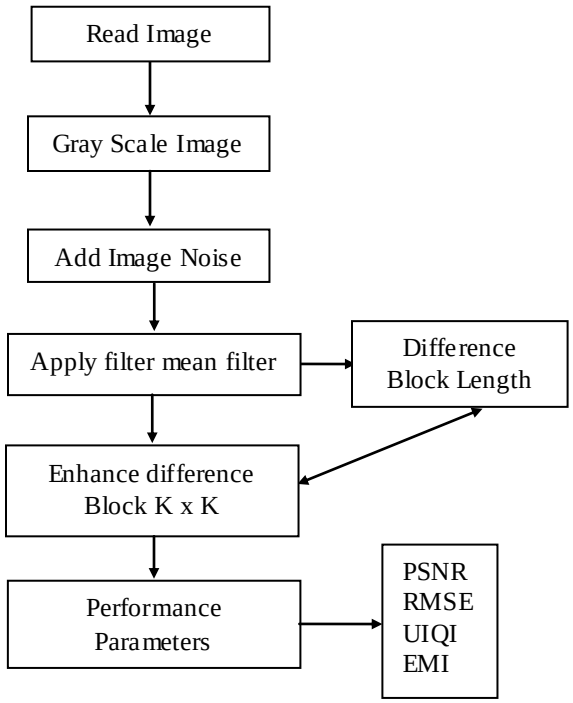

Fig. 1 Different block size with removing noise using mean filter

- Gaussian: Gaussian noise is caused by random fluctuation in the signal, it's modeled by random values add to an image. The magnitude of Gaussian noise depends on the standard deviation (Sigma).Noise magnitude is directly propositional to the sigma value.
- Salt and pepper: Salt and pepper noise contains random occurrence of black and white pixels.
- Local var: Additive Zero-mean Gaussian noise and the local variance of the noise.
- Speckle: Speckle noise can be modeled by random values multiplied by pixel values of an image.
- Poisson: Shot photon noise that can cause, when number of photons sensed by the sensor is not sufficient to provide detectable statistical information. This noise has Root square value proportional to square root intensity of the image. Different pixels are suffered by independent noise value.
- Motion blur: The noise blur image in a particular direction which is then called motion blur. Motion blur is most significant for image quality decrease.
- Dilation: Dilation adds pixels to the boundaries of objects in an image.
- Erosion: Erosion removes pixels on object boundaries of object in an image.

3.1 Spatial Domain Filtering

Spatial domain filtering directly deals with the pixels. Spatial domain filtering is further classified into linear filter and non-linear filter [10].

3.1.1 Linear filter

A mean filter is the optimal linear for Gaussian noise in the sense of mean square error. Linear filter tend to blur sharp edges, destroy lines and other fine details of image. It includes Mean filter and wiener filter [10].

A. Mean filter

The mean filter is nothing but a simple sliding window spatial filter that replaces the center value in the window with the average of all the neighboring pixel values including it. It is implementing with a convolution mask, which provide a result that is weighted sum of values of a pixel and its neighbors. The mask is a square. Mask often a K*K square mask is used. If sum of the mask coefficients up to one then the brightness of the image will be improved. For the mean filtering process, an image with mask is carried out. The filter discussed above is also known as a constant coefficient filter because the weight matrix does not change during the whole process. Mean filter are popular for their simplicity and ease of implementation. Averaging filter is implemented in this work with the help of MatLab. The pixel values of an image "lena.jpg" are read by the function

IJASRM
International Journal of Advanced Scientific Research and Management, Volume 4 Issue 6, June 2019
www.ijasrm.com
ISSN 2455-6378

imread().The image size is of 256*256. Different type noise is added to this image by Using the function imnoise(). The pixel values of this corrupted image are copied into a 2Dimensional array of size 256*256. Different block size is initialized. Selecting window over the 256*256 pixels matrix, the weighted some of selected window is computed. Image is the corrupted by different types of noise with various 0.05(sigma). Mean filtering reduce the amount of the intensity variation between one pixel and the next. It is often used to reduce noise in images. For next iteration image Enhancement is improve the interpretability perception of information in image for human viewer. It is to improve the image quality so that the resultant image is better than the original image for a specific application. The performance metric are compared with individually.

B. Wiener Filter

Wiener filter is generated inverse filter and it is used to remove noise. The image variance is large, wiener filter performs little smoothing. Where the variance is small, it performs more smoothing.

3.2 Measurement parameters

- PSNR: Typical values for the Peak Signal noise ratio is lossy image and video compression are between 30 and 50dB, provided the bit depth is8 bits, where higher is better. For 16 bit data typical value for the PSNR are between 60 and 80 dB. Acceptable values for wireless transmission quality loss are considered to be about 20dB to 25dB. A 20 dB or higher PSNR indicates that the image is of good quality.
- RMSE: Root Mean Square Error can range from 0 to infinitive are in different to the direction of errors. They are negatively-oriented scores, which mean lower values are better.
- UIQI: Universal Image Quality Index -The comparison between original and distorted image into three comparison luminance, contact and structural comparison.
- EME: The processed image can be an enhanced over the original image in which allow the observer to understand the desirable information in the image. Measure the value at given pixel for enhanced image should depend on the pixels.

4. Experimental Results and Discussion

Noise image was measured by types and its better conclude the result. The performance also can be visually verified. Automatic process and choose the different size of parameter for improvement the quality of the image.

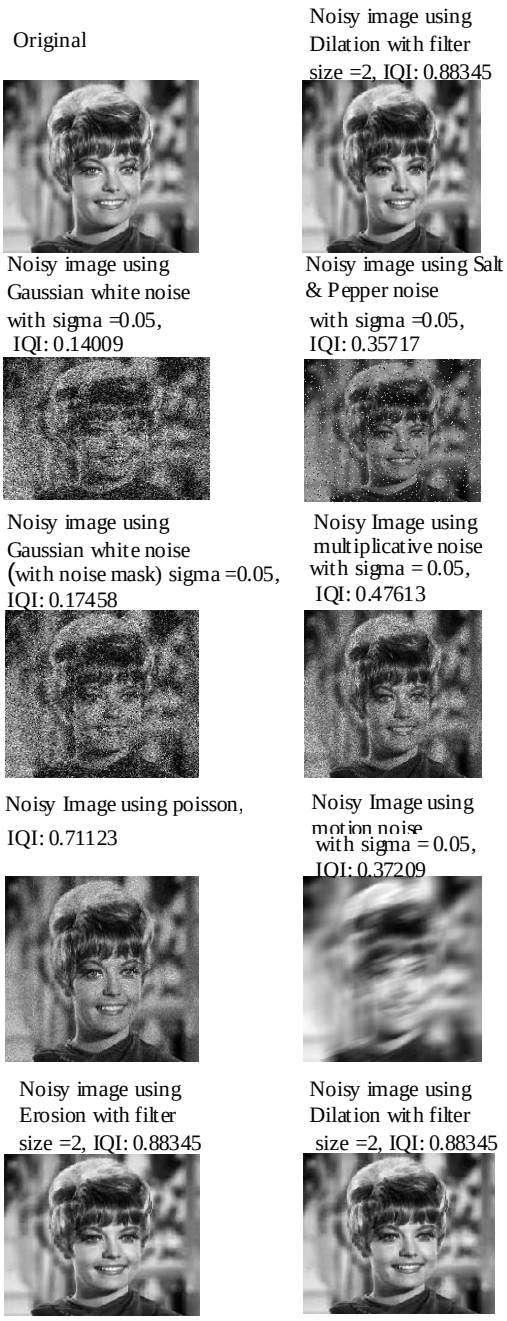

Fig. 2 Performance of De-noising to Lena Image

IJASRM
International Journal of Advanced Scientific Research and Management, Volume 4 Issue 6, June 2019
www.ijasrm.com
ISSN 2455-6378

Table 1: Performance Evaluation of Mean Filtering based on Noise Type

Noise Type	Performance of Metrics	Block Size							
		1	2	3	4	5	8	16	32
Gaussian	PSNR dB	13.75	13.76	13.78	13.74	13.79	13.77	13.79	13.80
	RMSE	10.32	10.38	10.35	10.37	10.39	10.37	10.37	10.37
	UIQI	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
	EME(original)	0.00	3.15	6.16	8.27	10.56	15.82	25.86	39.12
	EME(noise)	0.00	18.13	19.92	18.68	16.46	8.96	2.12	0.00
Salt & Pepper	PSNR dB	18.53	18.22	18.40	18.34	18.18	18.36	18.28	18.34
	RMSE	6.30	6.35	6.49	6.28	6.41	6.36	6.20	6.03
	UIQI	0.37	0.35	0.36	0.36	0.35	0.36	0.35	0.36
	EME(original)	0.00	3.15	6.16	8.27	10.56	15.82	25.86	39.12
	EME(noise)	0.00	4.85	8.14	9.99	10.56	5.30	0.00	0.00
Local Var	PSNR dB	14.91	14.89	14.93	14.91	14.90	14.91	14.89	14.94
	RMSE	9.88	9.86	9.88	9.82	9.87	9.90	9.86	9.84
	UIQI	0.17	0.17	0.18	0.17	0.17	0.17	0.17	0.17
	EME(original)	0.00	3.15	6.16	8.27	10.56	15.82	15.82	25.86
	EME(noise)	0.00	17.08	19.58	18.52	16.54	10.16	9.61	1.74
Speckle	PSNR dB	21.22	21.22	21.22	21.22	21.22	21.22	21.22	21.22
	RMSE	8.89	8.87	8.86	8.83	8.90	8.89	8.82	8.86
	UIQI	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
	EME(original)	0.00	3.15	6.16	8.27	10.56	15.82	25.86	39.12
	EME(noise)	0.00	10.57	15.52	18.45	20.96	26.78	36.77	48.52
Poisson	PSNR dB	21.18	21.18	21.20	21.17	21.22	21.22	21.19	21.22
	RMSE	8.85	8.85	8.85	8.85	8.85	8.85	8.85	8.85
	UIQI	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
	EME(original)	0.00	3.15	6.16	8.27	10.56	15.82	25.86	39.12
	EME(noise)	0.00	10.65	15.54	18.47	20.98	26.68	36.59	49.82
Motion Blur	PSNR dB	21.58	21.55	21.52	21.58	21.58	21.57	21.57	21.62
	RMSE	5.98	6.00	6.03	6.01	6.03	5.98	6.01	5.99
	UIQI	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
	EME(original)	0.00	3.15	6.16	8.27	10.56	15.82	25.86	39.12
	EME(noise)	0.00	6.37	10.27	13.09	15.64	21.64	33.06	44.75
Erosion	PSNR dB	27.67	27.67	27.67	27.67	27.67	27.67	27.67	27.67
	RMSE	10.58	10.58	10.58	10.58	10.58	10.58	10.58	10.58
	UIQI	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
	EME(original)	0.00	3.15	6.16	8.27	10.56	15.82	25.86	39.12
	EME(noise)	0.00	2.99	5.71	8.07	10.11	15.82	25.31	37.19
Dilation	PSNR dB	27.67	27.67	27.67	27.67	27.67	27.67	27.67	27.67
	RMSE	10.58	10.58	10.58	10.58	10.58	10.58	10.58	10.58
	UIQI	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
	EME(original)	0.00	3.15	6.16	8.27	10.56	15.82	25.86	39.12
	EME(noise)	0.00	2.99	5.71	8.07	10.11	15.82	25.31	37.19

5. Conclusion

Mean filter perform well on digital images but they have some constraints regarding resolution degradation. This filter operate by smoothing over a fixed window and it produces artifacts around the object sometimes causes over smoothing them causing blurring of image. Image enhancement removes the noise with the perception of information in image. Further improve the quality performance. The analysis will brings out a new trend in the quality metrics of the images and prove to be efficient than the conventional metrics. Performance of de-noising is measured using Quantitative performance such as PSNR, RMSE, UIQI and EME as well as in terms of visual quality of the image. The system works only for block sizes 1 to 32 which can be extended to work with the block sizes above 32 for future work.

References

[1] Tulin Yıldırım M, Alper Bas¸turk and Emin Yuksel M, Impulse Noise Removal From Digital Images by a Detail-Preserving Filter Based on Type-2 Fuzzy Logic, IEEE transactions on fuzzy systems, pp.920-928, (2008).

[2] Toh K. K. V, Ibrahim H, and Mahyuddin M. N, Salt-and-pepper noise detection and reduction using fuzzy switching median filter, IEEE Transactions on Consumer Electronics, Vol 4 (54): 1956-1961, (2008).

[3] Ibrahim H, Kong N. S. P, and Ng T. F, Simple adaptive median filter for the removal of impulse noise from highly corrupted images, IEEE Transactions on Consumer Electronics, Vol 54 (4): 1920- 1927, (2008).

[4] Kong N. S. P and Ibrahim H, The effect of shape and weight towards the performance of simple adaptive median filter in reducing impulse noise level from digital images, in Proc. 2nd International Conference on Education Technology and Computer (ICETC), Vol 5: 118-121, (2010).

[5] Tom Mélange, Mike Nachtegael, and Etienne Kerre E, Fuzzy Random Impulse Noise Removal from Color Image Sequences, IEEE transactions on image processing, pp.959-970, (2011).

[6] Ibrahim H, Ng T. F, and Teoh S. H, An efficient implementation of switching median filter with boundary discriminative noise detection for image corrupted by impulse noise, Scientific Research and Essays (SRE), Vol 6 (26): 5523-5533, (2011).

[7] Ibrahim H, Adaptive switching median filter utilizing quantized window size to remove impulse noise from digital images, Asian Transactions on Fundamentals of Electronics, Communication & Multimedia, Vol 2 (1): 1-6, (2012).

[8] Thirumurugan1 P* and Sasi Kumar2 S, Performance analysis of Impulse Noise Reduction Algorithms: Survey, International Journal Current Research and Academic Review, Vol 2: 114-123, (2014).

[9] Mahmoud F, Sharkawy El, Ali S, and Alsubaie R, Study of Environmental Noise Pollution in the University of Dammam Campus, Saudi Journal of Medicine & Medical Sciences, Vol 2 (3): 178-184 (2014).

[10] Ma H, and Nie Y, An side fusion scheme for photograph de-noising primarily based on anistropic diffusion fashions, Journal of Visual Communication and Image Representation, Vol 40:406-417, (2016).

[11] Majidi F, and Khosravi Y, Noise Pollution Evaluation of City Center of Zanjan by Geographic Information System (GIS). Iranian Journal of Health and Environment; Vol 9(1): 91-102, (2016).

[12] Zannin P.H.T, and Ferraz F, Assessment of Indoor and Outdoor Noise Pollution at a University Hospital Based on Acoustic Measurements and Noise Mapping, Open Journal of Acoustics, Vol 6: 71-85, (2016).

[13] Javad Hatamzadi1, Amirreza Talaiekhozani1 2, and Gholam Reza Ziaee3, Evaluation of noise pollution in ilam city in 2018, Journal of Air Pollution and Health, Vol 3(2): 73-80, (2018).

[14] Simon Carlile, John Davy L, David Hillman, and Kym Burgemeister, A Review of the Possible Perceptual and Physiological Effects of Wind Turbine Noise, Trends Hear, Published online, Vol 22, (2018).