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Removal of High-Density Salt-and-Pepper Noise in Images Using BFT Algorithm

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Abstract *– Recently, many interesting procedure intelligence based mostly image denoising techniques are reportable for the removal of either salt & pepper or uniform impulse noise. However, to the simplest of our information, the difficult challenge of developing a multi denoising technique that may remove mixed-impulse noise, uniform impulse, salt & pepper, and impulse-burst noise, has not been reportable so far. This work targeted on the review of some existing nonlinear filtering techniques for reduced impulse noise in several digital pictures.*

Keywords*: filter, high-density impulse noise removal, salt & pepper noise, BFT*

I. Introduction

Noise reduction collectively of the primary pre-processing steps in image process has gained huge attention throughout the years and also there exists an over plus of literature introducing novel approaches to affect numerous forms of noises that are commonplace in digital image process and the connected fields. Among differing kinds of noise, Gaussian noise, speckle noise and impulse noise are often mentioned. Gaussian noise, that is independent from pixel intensity, is principally caused by Johnson-Nyquist noise (thermal noise) [1], [2]. Speckle noise, on the opposite hand, is common in pictures acquired by narrow-band detection systems like synthetic Aperture radar (SAR), ultrasound and Optical Coherence tomography (OCT) systems and its distribution are often delineated by a Rayleigh distribution [3]–[5]. On the opposite hand, impulse noise is typically caused throughout the method of acquisition and transmission of digital pictures [6], [7]. There are 2 forms of impulse noise: random-valued (RV) impulse noise and fixed-valued (FV) impulse noise that is additionally referred to as salt and pepper. In the RV, the corrupted pixels are replaced with a random price whereas within the case of FV the corrupted pixels take values up to minimum or most possible intensity levels.

Image noise is that the random variation of brightness or color data in pictures created by the sensor and electronic equipment of a scanner or digital camera. Image noise can even originate in film grain and within the unavoidable shot noise of a perfect photon detector. The Additive White Gaussian noise [6] is independent at every element and signal intensity. a picture containing salt-and-pepper noise can have dark pixels in bright regions and bright pixels in dark regions he blurredness of the image is depend upon the purpose unfold function (psf) .The PSF could circular or linear. The image is blurred because of the camera movement or the thing displacement.

Noise removal could be a common pre-processing step to enhance the property of the recovered signal, during this case the image. Throughout image acquisition or transmission, digital pictures can be degraded by impulse noise. 2 common varieties of impulses are the salt and pepper noise and random-valued noise [1, 2]. Impulsive salt and pepper noise could be a special reasonably noise that takes place for a brief duration with high energy due to camera sensors or transmission in noisy channels. Several algorithms are suggested to remove this kind of noise with prime quality in terms of PSNR and SSIM. There are several algorithms to get rid of these noises whereas protective image details. It's known that if the noise isn't additive, linear filtering fails, therefore most algorithms use non-linear approaches to induce higher results. Median filter (MED) and its changed versions are the most common ways utilized in literature due to their de-noising power and process efficiency [3, 4]. One among the changed versions of med is adaptive Median Filter (AMED) [5], within which the window size changes to find a non-noisy element as median, however this kind of method is long and error propagating. Additionally, it finally ends up losing the real edges for highly corrupted pictures. To overcome these issues, symmetrical and uneven cut median filters, like technique [6] and changed decision based mostly unsymmetrical trimmed median filter (MDBUTMF) [7], are developed.

II. Filters

Removing salt & pepper noises there are several linear and non linear filtering techniques.

II.1. Median filter (MF)

In Median filter (MF) [5] is employed to reducing noise. It's used to remove noise in image for only low noise density. This filter performance is poor. The quality Median Filter (SMF) is employed to remove only low noise densities however high noise densities its performance is poor and image isn't cleared.

II.2. Adaptive Median Filter (AMF)

In adaptive Median Filter (AMF) [6] "Salt & Pepper Impulse Detection and Median based mostly Regularization using adaptive Median Filter". New adaptive 2nd special filter operators for the restoration of salt & pepper impulse noise are corrupted digital pictures. Its performance is best as compare to SMF however high noise densities the window size must be increased, thus pictures are blurring.

II.3. Weighted Median Filter (WMF)

Full- Weighted Median Filter (WMF) [7] is additionally used to removal salt and pepper noise and its performance is good for low density noise however high density noise pictures aren't clear. In Center Weighted Median Filter (CWMF) [8][9] weights are assigned to selected pixels within the filtering window so as to manage the filtering behavior however at high noise density filters fails to reproduce the first image with edge details[10]. Centre weighted median filter and algorithmic Weighted Median Filter (RWMF) are wont to improve the performance of the median filter. It additionally offer additional weight to some designated pixel in window and exhibits blurring of filtered pictures [11] [12] [13]. To overcome this drawback in adaptive Center Weighted Median Filter (ACWMF) however during this filter we want some threshold values [5].

II.4. Tri-State Median Filter (TSMF)

To remove the threshold drawback in Tri-State Median Filter (TSMF)[14][15].In this filter pictures noise detection by an impulse detector, this takes the outputs from the SMF and CWMF and compare with the centre pixel value and origin value so as to form a tri-state call. The switching logic is controlled by a threshold T and also the output of TSM filter.

II.5 Directional Weighted Median Filter (DWMF)

Directional Weighted Median Filter (DWMF), are used to remove impulse noise and this filter is additionally used to determine noisy pixel using all four directional data of the chosen pixel to calculate the median. During this methodology, 2 major steps: observe noisy pixel using new impulse detector and Utilize weighted directional calculate the median for removing impulse noise and preserve details.

III. Proposed Methodology

The proposed technique makes the use of cascading of two individual filters, median & weiner filters. Basically they are used to eliminate salt paper noise individually, but in this technique as both filters are used simultaneously, impulse noise and Gaussian noise are eliminated at a time. This technique is a bidirectional process. It is generally desirable for image brightness (or film density) to be uniform except where it changes to form an image. There are factors, however, that tend to produce variation in the brightness of a displayed image even when no image detail is present. This variation is usually random and has no particular pattern. In many cases, it reduces image quality and is especially significant when the objects being imaged are small and have relatively low contrast. This random variation in image brightness is designated noise.

The proposed flow diagram shown in fig.4.1.In this flow diagram firstly takes an input image and then add salt paper noise. After the process applying savitzky-golay filter to a set of digital image points for the purpose of smoothing the data, that is, to increase the signal-to-noise ratio without greatly distorting the signal. Then applying median filter on noisy image to perform some kind of salt paper noise reduction on an image or signal and used to remove salt paper noise. After the process of applying DWT and then applying Brute Force Threshold Algorithm to Finding an optimized value (λ) for threshold is a major problem. A small change in optimum threshold value destroys some important image details that may cause blur and artifacts. So, optimum threshold value should be found out, which is adaptive to different sub band characteristics. Here we proposed a Brute Force Thresholding technique which gives an efficient threshold value for noise to get high value of PSNR. Threshold follows the same concept as in basic electronics, Brute force Threshold is given 5 times the maximum pixel intensity, which will be 127 in most of the images. Brute force thresholding always outclass other existing thresholding techniques in terms of better results. Further process is checking the result. After the process of decomposition, in this we are first level decomposition of image. Then we are replace the low pixel of image and then apply direction dependent and smoothing filter to smooth the image. Further process is applying IDWT on the noise remove image. After applying IDWT then we get output results.

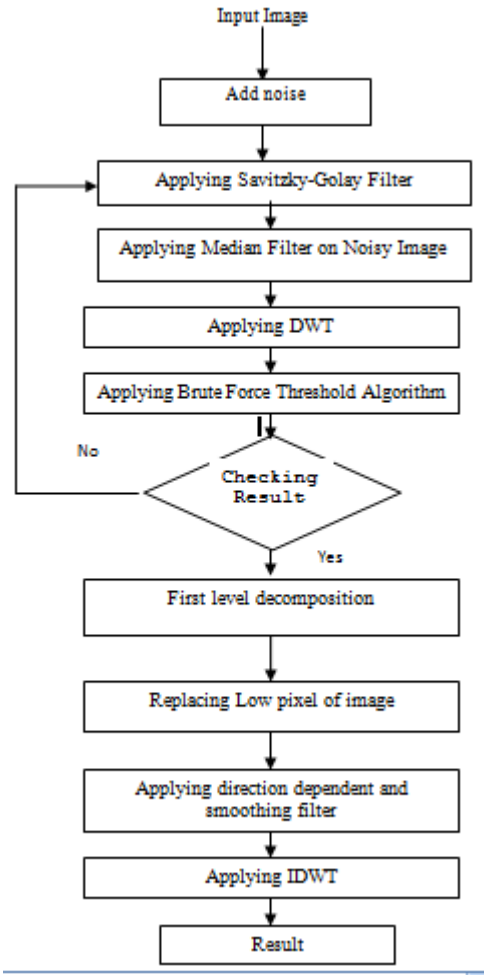

Fig.1 Flow diagram of proposed methodology

IV. Simulation Result

In this research work image denoising method based on the wavelet transform median filter and decomposition has been performed. In this meadian filter, savitzky golay filter and Brute Force Threshold Algorithm are used in the proposed system then we get the better results that is denoising image are as shown in below:

Fig.2 Original image

This fig.2 shows the original image. In this proposed method we take the input image for proposed work.

Fig.3 salt paper noise image

This fig. 3 shows the salt paper noise image. This input image adds the noise that is known as salt paper noise image.

Fig.4 Savitzky-Golay Filtered image

This fig.4 shows the Savitzky-Golay Filtered image. The salt paper noise image is filtered by the use of Savitzky-Golay Filter.

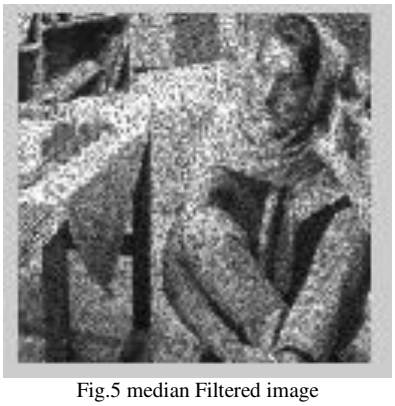

Fig.5 median Filtered image

This fig.5 shows the median filtered image. The Savitzky golay filtered image is also filtered by the median filter. Then we get this image.

Fig.6 Denoised image

This fig.6 shows the de-noised image. The input image filtered by the use of different filters then filtering the noise that is remove the salt paper noise after get the de-specked image that is output image.

Table 1 Result Analysis

Image	Noise level	PSNR(dB) (Base paper)	PSNR (dB) (Proposed)
Barbara	0.2	31.95	61.5937
	0.4	26.74	59.1369
	0.8	22.78	57.5364

Our proposed method is compared with several existing methods, and various images with fixed- or random-valued salt pepper noises are used for testing. The proposed approach has been tested on a variety of standard test images corrupted with salt pepper noise of different types. The results reveal that the proposed approach has effectively reduced different types of salt pepper noise. The improved quantitative results of our approach in terms of PSNR measures are reported. In this table 1 shows the comparison of base paper method and proposed method. In this the Barbara image. We take the noise level is 0.2, 0.4 and 0.8 for both the base paper method and proposed method. After calculating the PSNR the base paper PSNR is low and proposed method PSNR is high. That is Base paper PSNR is lower than proposed PSNR. So, base paper denoised image quality is poor than proposed method image.

V. Conclusion

In this research work image denoising using combination of techniques has been discussed. In the thesis we introduced brute force threshold algorithm and savitz golay filter for image denoising. In this work, used the image format and adding noises (salt and pepper) and apply the noisy image to the advanced filter. The final images nearly same as the original image. The filtered image is depending upon the blurring angle and the blurring length and the percentage of the impulse noise. When these variables are lesser in amount the filtered image is nearly equal to the original image. There are a couple of areas which we would like to improve on. One area is in improving the de-noising along the edges as the method we used did not perform so well along the edges .Instead of using the median filter we can use the adaptive median filter. There are several methods for image denoising in spatial and transform domain. The current trends of the image denoising research are the evolution of mixed domain methods based on the result..

References

[1] Akash Kethwas, Bhavana Jharia "Image de-noising using Fuzzy and Wiener filter in Wavelet domain", 2015 IEEE

[2] Nevine Jacob and Aline Martin "Image Denoising In The Wavelet Domain Using Wiener Filtering", 2004

[3] Stefan Schulte, Valérie De Witte, and Etienne E. Kerre. "A Fuzzy Noise Reduction Method for Color Images", IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 16, NO. 5, MAY 2007 1425.

[4] S.ARUNKUMAR, RAVI TEJ AKULA, RISHABH GUPTA "Fuzzy Filters to the Reduction of Impulse and Gaussian Noise in Gray and Color Images", International Journal of Recent Trends in Engineering, Vol. 1, No. 1, May 2009.

[5] Chang, S. Grace, Bin Yu, and Martin Vetterli. "Adaptive wavelet thresholding for image denoising and compression." IEEE Transactions on image processing 9.9 2000.

[6] Gupta, Kanika, and S. K. Gupta. "Image Denoising techniques-a review paper." IJITEE 2 (2013): 6-9.

[7] Malothu Nagu, N.Vijay Shanker "Image De-Noising By Using Median Filter and Weiner Filter", International Journal of Innovative Research in Computer and Communication Engineering Vol. 2, Issue 9, September 2014.

[8] Nevine Jacob and Aline Martin "Image Denoising In The Wavelet Domain Using Wiener Filtering", Unpublished course project, University of Wisconsin, Madison, Wisconsin, USA (2004).

[9] Mehra, Mayank, Devendra Moraniya, and Dhiiraj Nitnawwre. "Performance Analysis of Image de-noising using Fuzzy and Wiener Filter in Wavelet Domain." International Journal of Computer Applications 101.3 (2014).

[10] Dwivedi, Mr Ashutosh, Mr Pratik Soni, and Mr Virendra k Verma. "Comparative Analysis of Image De-noising with Different Filters in Wavelet Domain." , International Journal of Engineering Trends and Technology (IJETT) – Volume 24 Number 2- June 2015.

[11] Israr Hussain and Huj un Yin "A Novel Wavelet thresholding method for adaptive image denoising", IEEE 2008.

[12] R C Gonzalez and R .E.Wood Digital image processing Prentice hall, upper saddle river, N J.,2nd edition, 2002.

[13] W. K. Pratt, Digital Image Processing, 2nd ed. New York: Wiley, 1991.

[14] J. S. Lim, Two-Dimensional Signal and Image Processing. Englewood Cliffs, NJ: Prentice-Hall, 1990.

[15] H. C. Andrews and B. R. Hunts, Digital Image Restoration, Englewood Cliffs, NJ: Prentice-Hall, 1977.