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Noise Removal from Digital Images for Efficient Processing of Images

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Abstract – Noise can be a major problem and lead to incorrect image recognition in the field of image processing. There are various kinds of noises that can deteriorate the image quality such as Impulse noise, salt and pepper noise, Gaussian noise, Poisson noise, speckle noise etc. Noise can be removed by different kind of filters such as median filter, adaptive median filter, Gaussian filter, mean filter. Each filter plays its role in de-noising images. There can be various parameters to compare different kinds of filters available. Each filter has its own de-noising techniques to restore the original image from the image corrupted by noise.

Index Terms – Impulse noise, median filter, noise detection, noise removal, image recognition.

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1. INTRODUCTION

While the digital images are transmitted through a transmission channel, the images get corrupted by noise. Some pixels get corrupted by noise and there is change in the intensity value of the pixels while other pixels have unaltered pixel intensities and hence they remain noise free. It becomes very important to change the corrupted pixel values with their original pixel intensities. There are various approaches available to remove noise from digital images and hence enhance the quality of digital images. The noise removal approaches can be compared based on their performance. Median filtering approach has been extensively used in the area of image processing to remove impulse noise. Median Filtering approach outperforms linear filtering approach as it is a non-linear filtering technique. The disadvantage associated with median filtering is that it tends to destroy the finer details of the image. The details preservation is done against noise removal by Ko and Lee. In the paper they used the concept of sliding window and applied weight adjustment to the origin pixel. To ensure noise free images and also detail preservation in the images it was very important to identify noisy pixel and change their pixel intensity to the original one, and noise free pixels remain unaltered.

2. APPROACHES TO REMOVE IMPULSE NOISE

In the area of Image Processing Fuzzy Techniques have been applied to perform filtering, interpolation and morphology. A new efficient approach has been proposed in [11]. In this approach a feed forward network has been used to detect the impulse noise in corrupted images. Thereafter a filter known as arithmetic mean filter is proposed to remove the impulse noise. There are various performance evaluation measures used to evaluate the performance of noise detection approach. The measures are False Alarm Ratio (FAR), Missed Noise (MN) pixel and Falsely Detected Noise (FDN) pixels. This approach gives efficient performance at higher noise density. This approach is compared with the other approaches based on the Peak Signal to Noise Ratio (PSNR) value.

3. FILTERING METHOD

The Filtering Methods can be applied to determine the noisy pixels. Decision based filters are considered to be very efficient in reducing impulse noise. The approach given by Tri State Median Filter for image de-noising is proposed to preserve the details of the image and supresses impulse noise. The approach made use of Standard Median Filter and Centre Weighted Median filter to detect noisy pixels. After detecting the noisy pixels the filtering can be applied. The approach used by Tri State Median Filtering approach outperforms other median filters by balancing the trade-offs between noise reduction and detail preservation.

3.1. Tri State Median Filter

Tri State median filter is a novel and effective median filter [3]. Tri State Median filter takes the output from the Standard Median and Centred Weighted Median filters and the value is compared to the centre pixel to make the decision. It is very important to classify pixels as corrupted or uncorrupted pixels based on decision rules. The filtering operation is selectively applied on corrupted pixels. The different types of filters can be compared on the basis of performance .PSNR value is used to compare the performance of various filters. PSNR stands for Peak Signal to Noise Ratio. Higher the PSNR value, better is the image quality. The addition of noise in the digital images causes error in classification of images into appropriate classes. The various filters like Median Filter is the most popular filter which is simple to implement but can cause blurring in the image. Adaptive Median Filter does not change the pixel value. This filtering approach cannot detect noise in the pixel if the noise level is high. Mean filters has very simple structure. Gaussian smoothening filter is known for blurring and suppressing the noise. Adaptive Weiner filter is a statistical approach to filter out noises. Various noises show specific features like Gaussian noise can influence all the values of pixels. Salt & pepper noise can contain black and white spots in an image. Salt & pepper noise is mainly introduced during data transmission.

3.2. Impulse noise detection using fuzzy approach

To detect noise corrupted pixels in an input image, fuzzy based approach can be effectively used. In an input image I of size M*N. A noise free image is very smooth and has well separated edges. The noise removal algorithm works in stages. The first stage is to detect the noise. The next stage is to remove the noise. In other words to change the pixels corrupted by noise into original pixel values. It is very crucial to preserve details of image corrupted by impulse noise. A novel filtering operator which is based on fuzzy techniques has been proposed. The performance of filtering operator is compared with other noise removal operator and it is also tested for images corrupted by noise of various densities. In this paper it has been clearly depicted that the filter is very efficient in suppressing the noise in the image and also it can preserve the useful information in the image. A new filter for impulse noise removal is proposed**.** In this paper a simple new fuzzy soft switching hybrid filter for removing impulse noise from digital image is proposed. The proposed filter comprised of many different filters such as Standard Median filter, fuzzy filter, and identity filter. This filter outperforms other conventional filters used for removing impule noise. A filter to remove noise from digital images is proposed. The proposed filter has been tested to suppress noise on Tiger & Peppers test images. The images were corrupted by different density of noise. The density of noise can vary from 20% to 80%. The filter was compared with five different filters and the performance of proposed filter was found to be more efficient. The proposed filter was tested on images which were highly distorted and the noise suppression and detail preservation of the images was done very efficiently.

4. CONCLUSION

Noise removal is a very important step in the pre-processing of images. For the efficient face recognition the digital images should be noise free. There are various filters available to detect noise and for the removal of noise from the digital images. The performance of various filters is compared based on the parameter like PSNR value.

REFERENCES

[1] D. Florencio and R.W. Schafer, “Decision-based median filter using local signal statistics," Proc. SPIE, vol. 2308, pp. 268-275, Sept. 1994.
[2] F. Russo and G. Ramponi, “A fuzzy filter for images corrupted by impulse noise," IEEE Signal Process. Lett., vol. 3, no. 6, pp. 168-170, 1996.
[3] T. Chen and K. Ma and L. Chen, “Tri-state median filter for image denoising," IEEE Trans. Image Process., vol. 8, no. 12, pp. 1834-1838,1999.
[4] E. Abreu and M. Lightstone and S. K. Mitra and K. Arakawa, “A new efficient approach for the removal of impulse noise from highly corrupted images," IEEE Trans. Image Process., vol. 5, no. 6, pp. 1012-1025, 1996.
[5] R.C. Hardie and K.E. Barner, “Rank conditioned rank selection filters for signal restoration," IEEE Trans. Image Process., vol. 3, no. 2, pp.192-206, 1994.
[6] G. R. Arce and M. P. McLoughlin, “Theoretical analysis of the MAX/Median filter,” IEEE Trans. Acoust., Speech, Signal Processing, vol. ASSP-35, pp. 60–69, Jan. 1987.
[7] M. Gabbouj, E. J. Coyle, J. Neal, and C. Gallagher, “An overview of median and stack filtering,” Circuits Syst. Signal Process., vol. 11, pp.7–45, 1992.
[8] Y. H. Lee and S. Tantaratana, “Decision-based order statistics filters,”IEEE Trans. Acoust., Speech, Signal Processing, vol. 38, pp. 406–420,Mar. 1990.
[9] Azadeh Noori Hoshyar and Adel Al-Jumaily and Afsaneh Noori Hoshyar, “Comparing the Performance of Various Filters on Skin Cancer Images,” Procedia Computer Science 42 (2014) 32 – 37
[10] Gajanand G, “Algorithm for Image Processing Using Improved Median Filter and Comparison of Mean, Median and Improved Median Filter”,International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-1, Issue-5, November 2011.
[11] G. Kaliraj and S.Baskar ,”An efficient approach for the removal of impulse noise from the corrupted image using neural network based impulse detector”, Volume 28, Issue 3, March 2010, Pages 458–466.