Impulse and Gaussian Noise Removal Using Adapted Decision Based Unsymmetrical Trimmed Mean Filter cascaded with New Gaussian Filter

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Abstract- An adjusted choice based unsymmetrical trimmed mean channel fell with Gaussian filter (ADBUTMF) calculation for the recovery of light black scaled picture which is instigated by a high thickness Salt and Pepper (drive) clamor is proposed and tried in this paper. The proposed calculation replaces the loud pixel by trimmed mean quality when other pixel values, 0's and 255's are introduce in the chose window and when all the pixel qualities are 0's and 255's then the commotion pixel is supplanted by mean estimation of every last one of components present in the chose window. This proposed calculation shows preferred results over the Standard Median Filter (MF), Decision Based Algorithm (DBA), Modified Decision Based Algorithm (MDBA), Progressive Switched Median Filter (PSMF) and Modified Decision Based Unsymmetrical Trimmed Median Filter (MDBUTMF). The proposed calculation is tried against distinctive grayscale and color pictures and it gives better Peak Signal-to-Noise Ratio (PSNR).

Index Terms- Mean Filter, Salt & Pepper Noise, Unsymmetrical Trimmed Mean Filter, Cascaded Filter

I. INTRODUCTION

Data sources are legitimated by digital signal and pictures to fluctuated in fields of building and science. They are in the process by taking actual values in arbitrary position called motivation evacuation calculations are important for sign rebuilding to solve computerized signs/ pictures by means of changed picture transforming applications. The innovator drives sifting calculations focused around straight operations like the Mean channel smoothened picture subtle elements while evacuating clamor thus non-direct administrators rose effective to arrangement the non-straight qualities of motivation commotion. Impulse noise is attributable to mistakes in transmission through the sign getting stage. salt and pepper noise and irregular esteemed noise are two mixtures of impulse noise. Salt and pepper noise destroy the photos wherever the debased picture can least or most light black level. salt and pepper clamor can help in rebuilding of pictures by using various non linier channels. By using these kind of dependable technique to discard the salt and pepper clamor In any case, the Main drawback of using Median Filter (MF) is that the channel is executable exclusively when density is poor. [1] In case of high density Sting subtle elements of picture can't be saved by such average channel. On the other hand versatile median filter perform well at lower densities of window size. [2]The picture can blurring while change in median filter the choice is predefined threshold values .The downside of this methodology is that process is complex. In case of amplitude is high the edge and details of filters will not be recovered satisfactory.

To overcome the downside of this method, Decision Based Algorithmic (DBA) is proposed [3].

In this technique, first image is denoised by applying 3x3 matrix. If the value is 0 or 255, No change will take place under this method. Noise is high when density norm are 0 or 255. This regular replacement of neighboring elements can produces Blotch image[6]. So to overcome of this technique , Decision Based Unsymmetrical Trimmed Median Filter (DBUTMF) is planned [7]. In case of higher noise density, if the chosen window have all 0's or 255's or each then, trimmed median value can't be obtained. At awfully high noise density that's at (i.e.80% to 90%). This algorithm cannot prove higher result. The Modified Decision Based Unsymmetrical Trimmed Median Filter (MDBUTMF) algorithmic program remove this downside at high noise density and offers best results in contrary the higher Peak signal to noise ratio (PSNR) values than the present algorithmic program. Now to improve the image quality i.e. and develop the algorithm of PSNR Process of MDBUTMF method passed through a Gaussian filter and outcome of the proposed algorithm is tremendous. The rest of the paper is structured as follows. A quick overview of unsymmetrical trimmed median filter is given in Section II. Section III describes concerning the planned algorithmic program and completely different cases of planned algorithmic program. The careful description of the planned algorithmic program with an example is given in Section IV. Simulation results with the different pictures are given in Section V. Finally conclusions are illustrated in Section VI.

II. UNSYMMETRIC TRIMMED MEDIAN FILTER

To reject the noisy pixel from the chosen 3X3 window is thought behind a trimmed filter. When the Trimming is symmetric at one or both end using symmetric channel is called Symmetrical Trimmed Mean Filtering. The uncorrupted pixels are additionally cut in this strategy.

Loss of picture point of view, edges and obscuring of the picture are only because of this prompt. So an Unsymmetrical Trimmed Median Filter is proposed to check this downside.

At that point the pixel values 0's and 255's in the picture are expelled from the picture and the average estimation of the

remaining pixels is taken. To supplant the uproarious pixel, This average quality is utilized. So Actually This channel is called trimmed average channel that the pixel values 0's and 255's are expelled from the chose window. This system uproots clamor in preferred path over the ATMF.

III. PROPOSED ALGORITHM

The formation of the tainted pictures by first disappearing the Salt and Pepper contamination when Gaussian (ADBUTMF) method cascaded with the adapted decision based unsymmetrical trimmed mean filter. The handling pixel is checked whether it is uproarious or boisterous free. That is, if the transforming pixel lies in the middle of maximum and minimum gray level values then it is noise free pixel, it is left unaltered or intact. In the event that the handling pixel takes the most extreme or least gray level then it is boisterous pixel which is prepared by . The steps of the proposed algorithm are clarified as takes after.

ALGORITHM

Step 1: A 3*3 two dimensional window is selected as processing window and consider the pixel being modified is Xij

Step 2: If then is an uncorrupted pixel and its value is left unchanged. This is discussed in Case III) of Section IV.

Step 3: If more than one pixel is a corrupted pixel in the selected window then two cases are possible as given in Case i) and ii).

Case i): If the selected window carry, all the pixel values as 0's and 255's. than increase the window size 4X4 and find non zeros and 255 value. and save this value to replace Xij of the element of window.

Case ii): If the selected window contains not all elements as 0's and 255's. Then eliminate 255's and 0's and find the mean value of the remaining elements. Replace Xij with the mean value.

Step 4: Repeat steps 1 to 3 until all the pixels in the entire image are processed. The pictorial representation of each case of the proposed algorithm is shown in Fig. 1. The detailed description of each case of the flow chart shown in Fig. 1 is illustrated through an example in Section IV.

IV. ILLUSTRATION OF THE PROPOSED ALGORITHM

Each and every pixel element of the image under observation is performed replacement with, if necessary each and every pixel image is interchange with salt and pepper noise. Required cases are shown in this Section. If the processing pixel is noisy and all other pixel elements are 0's or 255's is shown in Case I). If the noisy pixel is processing than all the other pixel elements are O's or 255's as Explained in Case ii) If noisy pixel is not processing pixel than its value lies between O' to 255 as explained in Case iii).

Case i): Processing & neighboring pixel selected by the window contains salt & pepper noise as contains all pixel values that add salt & pepper noise to the image so the windows size is increased and search out if any non 0's or 255 is present to interchange the processing pixel.

$$\begin{bmatrix} 0 & 255 & 0 \\ 0 & \langle 255 \rangle & 255 \\ 255 & 0 & 255 \end{bmatrix}$$

where"255" is processing pixel, i.e (2,2).

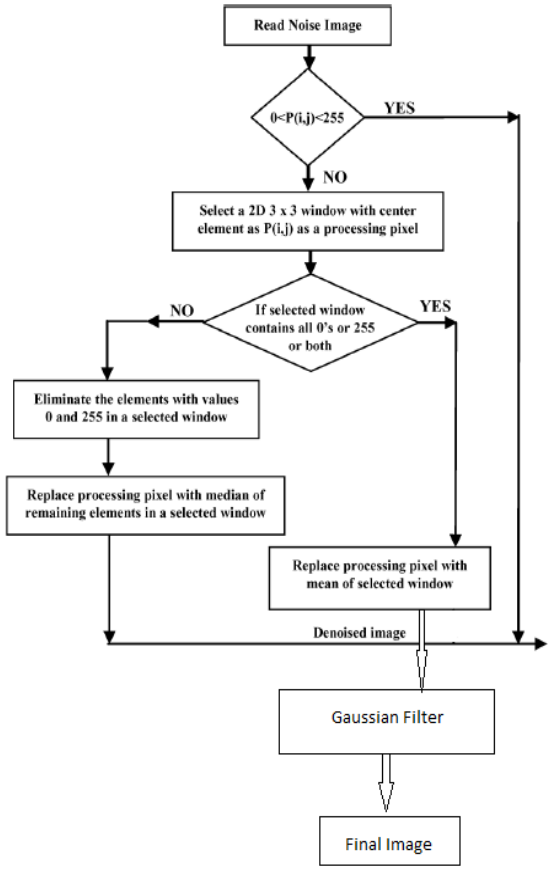

Figure 1: Flow Chart of Proposed Methodology

In the surrounding window all the elements are O's and 255's. The mean value is again noisy if it will be either 0 or 255. So the size of window is increased to solve this problem i.e. 4 x 4 then interchange the processing pixel with that value which is non zero and 205 to check it or the mean of the selected 3 x 3 window is calculated if the expanded window is noisy and the mean value replace the processing pixel.

Case ii): If processing pixel and neighboring pixel selected by the salt or pepper noise as contains some pixels values. Here processing pixel is 'O' i.e. from the selected window, the salt and pepper noise is removed.

$$\begin{bmatrix} 78 & 90 & 0 \\ 120 & \langle 0 \rangle & 255 \\ 97 & 255 & 73 \end{bmatrix}$$

Where "0" is processing pixel, i.e. So it is elimination of O's and 255' s. (78, 90, 0 120 0 255 97 255 73) is the I D array of the above matrix. The pixel value of selected window will be (78, 90, 120, 97 73) if O's and 255' s is removed. So 91 is mean value, Although the processing pixel is replaced by 91.

Case iii): Further processing does not required by selected window as it contains a noise free pixel as a processing pixel.

For example: It is noise free pixel as the processing pixel is 90. The processing pixel is 90. It does not need further processing because 90 is a noise free pixel.

$$\begin{bmatrix} 43 & 67 & 70 \\ 55 & \langle 90 \rangle & 79 \\ 85 & 81 & 66 \end{bmatrix}$$

Where "90" is processing pixel. Since "90" is a noise free pixel it does not require further Processing.

V. SIMULATED RESULTS

When applying algorithm is tested and compared with the previous results and parameters corresponding values then the final image received. Noise is differ from 10% to 90%. The PSNR measures Pinioning performances quantitatively as defined in (1).

$$PSNR\ in\ dB = 10 \log_{10} \left(\frac{255^2}{MSE} \right) \quad (1)$$

$$MSE = \frac{\sum_i \sum_j \left(Y(i,j) - \hat{Y}(i,j) \right)^2}{M \times N} \quad (2)$$

where MSE stands for mean square error, MXN is size of the image, Y represents the original image, bar y(i,j) denotes the denoised image. $\hat{Y}$

Table: PSNR of proposed and existing algorithm at 10% to 90% noise density.

Noise in %	PSNR in DB						
	MF	AMF	PSMF	DBA	MDBA	MDBUTMF	CASCADED
10	26.34	28.43	30.22	36.4	36.94	37.91	37.03
20	25.66	27.40	28.39	32.9	32.69	34.78	34.23
30	21.86	26.11	25.52	30.15	30.41	32.29	33.05
40	18.21	24.40	22.49	28.49	28.49	30.32	31.91
50	15.04	23.36	19.13	26.41	26.52	28.18	30.93
60	11.08	20.60	12.10	24.83	24.41	26.43	29.77
70	9.93	15.25	9.84	22.64	22.47	24.30	28.89
80	8.68	10.31	8.02	20.32	20.44	21.70	28.19
90	6.65	7.93	6.57	17.14	17.56	18.40	28.13

The PSNR values of the proposed algorithm are compared against the existing algorithms by varying the noise density from 10% to 90% and are shown in the table above, the existing algorithms are compared opposite the PSNR values of the proposed algorithm. From the above table it is proved that cascaded Gaussian's performance is better than the existing algorithms at both low high noise densities

The qualitative analysis of the proposed algorithm against the existing algorithms at different noise densities for Baboon image is shown in Fig. below. In this figure, the first column represents the processed image using MF at 80% and 90% noise densities. Subsequent columns represent.The processed images for AMF, PSMF, DBA, MDBA, MDBUT MF and cascaded Gaussian are represented by the subsequent columns.The proposed algorithm is tested against images namely Baboon and Lena..images 10% salt pepper noise corrupts these images. In the figure below. The PSNR values of these images using different algorithms are given in Figure below. From the figure, it can be made out that the Cascaded Gaussian provides better PSNR values irrespective of the nature of the input image.

To Process the color images which are spoiled by salt and pepper noise is also used in the cascaded Gaussian. The color image of Baboon is taken into account.. In Fig. below, the first column represents The processed image is represented by the first column using MF at 80% and 90% noise densities. Subsequent columns represent The processed images are represented by subsequent columns for PSMF, DBA, MDBA and MDBUTMF.

From the figure, it is possible to observe that the quality of the restored image using proposed algorithm is better than the quality of the restored image using existing algorithms.

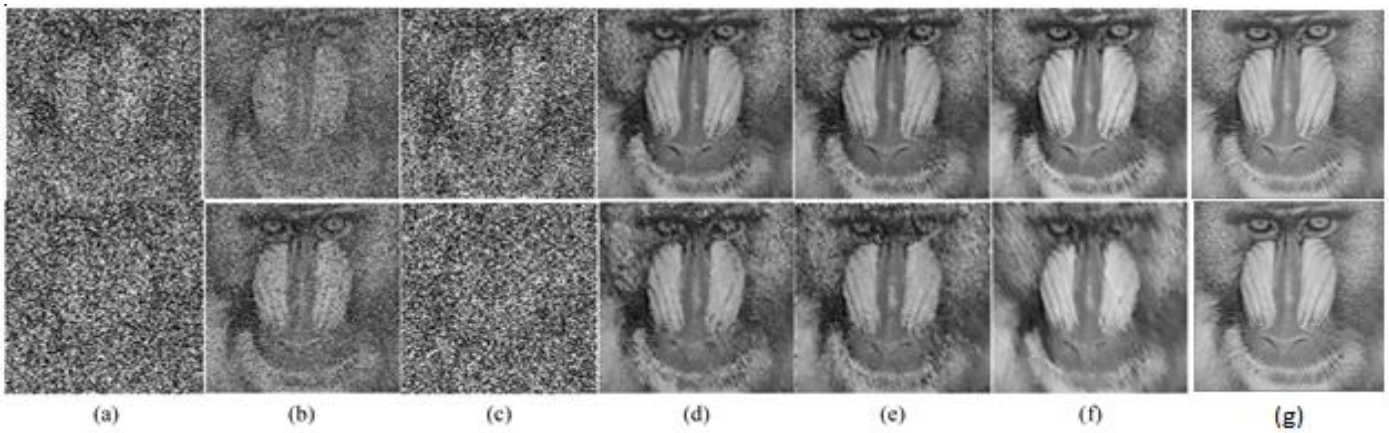

Figure 2:Results of different algorithms for Baboon image. (a) O/p of Median Filter. (b) O/p of Adaptive MF. (c) O/p of Progressive Switching MF. (d) O/p of Decision Based Algo. (e) Output of Modified DBA. (f) Output of MDBA-UTMF (g) Output of Cascaded Gaussian. Row 1 and Row 2 show processed results of various algorithms for image corrupted by 80% and 90% noise densities, respectively.

Fig. Original Image

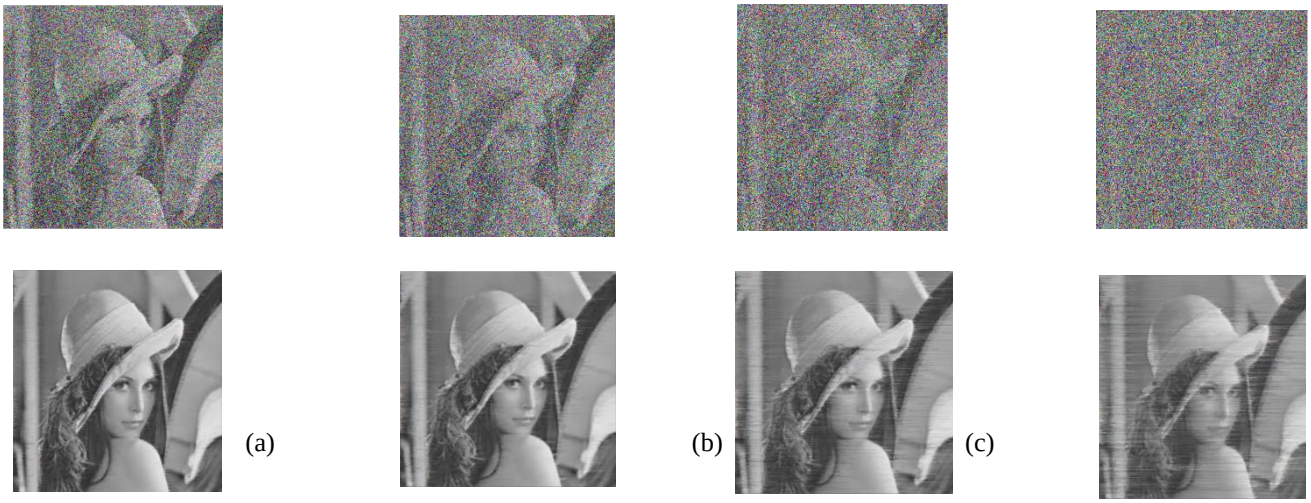

Figure 3: Result of the Algorithm on Lena Image with different Noise inputs (a) 60% (b) 70% (c) 80% (d) 90%

VI. CONCLUSION

The image retrieval from an image induced with high density salt and pepper noise propose a better algorithm approach. The Pproposed Cascaded Gaussian algorithm approach has proved efficient and useful for this task. The existing method like MDBUTMF,MF,AMF and others were compared by this algorithm and so it proved better in performance in all the available approach currently extant. We get efficient and promising results at the high noise levels of 80%-90% in this method and then it can be void that for high density salt and pepper noise removal, it is an efficient method. As colored or R.G.B. image with the same algorithm or better approach can be done by future experiments.

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