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Hybrid Model Approach for Impulsive Noise Removal Image Enhancement Techniques

Pratima Verma[1*], Jitendra Kurmi[2]

[1]Dept. of Computer Science and Engineering, Babasaheb Bhimrao Ambedkar University , Lucknow, India
[2]Dept. of Computer Science and Engineering, Babasaheb Bhimrao Ambedkar University , Lucknow, India

[*]*Corresponding Author: prtdreams@gmail.com, Pho: +91-9889881232*

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***Abstract*—** In the world of digital image processing, image enhancements is a biggest challenge without losing any information of image, better visualization, edge prevention and provide better quality of the image etc. At the time of image processing, images are corrupted by different types of noises. Using noise removal techniques we have remove noises from the digital image. In this paper we discussed about the impulsive noise and techniques for removal of impulsive noise from digital image by proposed algorithm. The proposed algorithm "An Approach for Hybrid Impulsive Noise Image Enhancement Techniques" is a combination of two algorithms Modified Decision Based Unsymmertic Trimmed Median filter (MDBUTMF) and Fast Switching Based Median Filter for high Density Salt and Pepper noise (FSBMMF). It gives better Peak-Signal-to-Noise Ratio (PSNR) and Image Enhancement Factor (IEF).

***Keywords*—** Digital image processing, Image enhancements, Impulsive noise, MDBUTMF, FSBMMF, PSNR, IEF)

I. INTRODUCTION

Now a day, multimedia data such as audio, videos, images and texts are shared over the internet connectivity. However, very challenging task to shared data without any type of noise and transforming error over the network [1]. In, digital image field when images were transformed then many types of noises comes at that time like Impulsive noise (Salt & Pepper noise and Random value impulse noise), Poisson noise, speckle noise, Gaussian noise etc[2]. And these types of noises remove using a variety of filtering techniques like Median filter (MF), Adaptive median filter (AMF) [3], Switching median filter (SMF), Modified Decision based Unsymmertic Trimmed Median filter (MDBUTMF), Fast Switching Based Median Filter for high Density Salt and Pepper noise (FSBMMF) etc. Median filter is a non-linear filtering technique to remove the salt and pepper noise without loss details of edge. But major drawback of MF is that technique is effective only at low noise density [4]. When noise level increase more than 50% then has not working in efficient manner and this is a reason to loss the details of edge. An Adaptive Median filter (AMF) perform efficient manner at low noise density but at higher noise level gives blur image [5] because at this level window size has to be increased. Switching Median Filter (SMF) [6] [7] is also a non-linear filtering technique to remove high density of impulse noise and preserve edge details of the image. In this technique complexity has to be increased. Corrupted value replaced by the average value of the already processed neighbouring pixels inside the filtering window and uncorrupted pixels remain unchanged. It is perform better in assessment of MF and AMF. Modified Decision Based Unsymmertic Trimmed Median filter (MDBUTMF) is a non linear filtering technique to remove the impulsive noise in the corrupted image. It is a decision based algorithm for finding the corrupted and uncorrupted pixels in the image. MDBUTMF is an algorithm for the gray scale and color images that are highly corrupted by salt and pepper noise. It gives better Peak-Signal-to-Noise Ratio (PSNR) and Image Enhancement Factor (IEF) [8]. Fast Switching Based Median Filter for high Density Salt and Pepper noise (FSBMMF) is consist two stages for removing the noisy pixels first one is detection stage and other is filtering stage. In this, detection stage using 3x3 detection mask is applied to current processing pixel [9] for finding the pixels are corrupted or not. If pixels are corrupted then apply the mean filter or median filter for removing these pixels, uncorrupted pixels remains unchanged. Its' apply the double padding for preventing the edge information and providing sharpness of image. FSBMMF converted window size in at processing time.

Now in this paper, we have proposed hybrid model that means combination of MDBUTMF and FSBMMF. Both are performed together over disadvantages of each other and finally give better quality of image in terms of PSNR and IEF and better perform in comparison of other impulsive noise removal techniques.

The remaining part of this paper is organized as follows. The next section II contains the proposed algorithm and flowchart also, section III contains processing steps of the algorithm and section IV contains the conclusion and future scope of this concept.

II. AN APPROACH FOR HYBRID IMPULSIVE NOISE IMAGE ENHANCEMENT TECHNIQUES

A lot of work has been done in the field of fixed value impulse noise. Impulsive noise removals is an image enhancement technique for removing high density salt and pepper noise from the digital image and provide better quality of image [10]. Impulsive noise consist salt & pepper noise and random valued impulse noise. Salt and pepper noise also known as fixed value impulse noise (0'ss and 255's). This noise is remove by using various filtering algorithm like MF, AMF, SMF, CWMF (center weighted median filter) etc. These filtering techniques discussed previous in section I. Hybrid approach is a combination of two noise removal impulsive algorithms DBUTMF and FSBMMF. Both algorithms work for the removal high density salt & pepper noise from digital image using mean median concept. In mean median concept, find mean or median value of pixels in selected window size and replace corrupted pixels by this value. But in DBUTMF not perform in efficient manner in the case of selected window considers all pixels 0's and 255's means that all pixels are corrupted. So when find the mean or median of these pixels, again find the corrupted value, in this situation DBUTMF not properly work. But in case of other this algorithm work very effective manner and gives fast result in terms of PSNR and IEF factor and in case of FSBMMF vice-versa of DBUTMF. In this case, proposed hybrid model combining both the algorithm. Hybrid model removes salt and pepper noise from the image with prevention of edge details, high visualization and gives high quality result of the digital image. We can exceed window size according to need like 5X5, 7X7, 9X9 etc., algorithm worked without creating any complexity and not blur the image. Concept of double padding in hybrid model is use for the edge prevention and no loss of any type of information.

III. PROCESSING STEPS OF HYBRID MODEL ALGOTITHM

1. Select $2D\ 3x3$ window size. Let processing pixel is $P\ (i,j)$.
2. Read pixels in window, if window considered $0 < P\ (i,j) < 255$ then pixels are uncorrupted and left unchanged its value.
3. If $Pij = 0$ and $Pij = 255$ then Pij is corrupted then,

a. If selected window not contain all 0's and 255's then find median value of remaining pixels and replace corrupted pixel with median value.

b. If selected window contains all 0's and 255's then find corrupted set $P\ (i,j) = 1$ then processed the following steps:-

i. If Xij is the very first pixels of image $(i = j = 1\ \&\ i = j = N)$, replace it with the median of uncorrupted pixels in the 5x5 window centred about it.

ii. Else if Xij is the first or last row of the image $(i = 1\ or\ i = N)$, replace it with the processed pixel to its immediate left $(Xi, j-1)$.

iii. Else if Xij is the first or last column of the image (j = 1 or j = N), replace it with the processed pixel to its immediate left $(Xi-1, j)$.

iv. Else replace Xij with the mean of four previously processed pixels in Pij.

4. The restored image obtained after processed above steps.

The flowchart of this algorithm is shown in fig. 1.

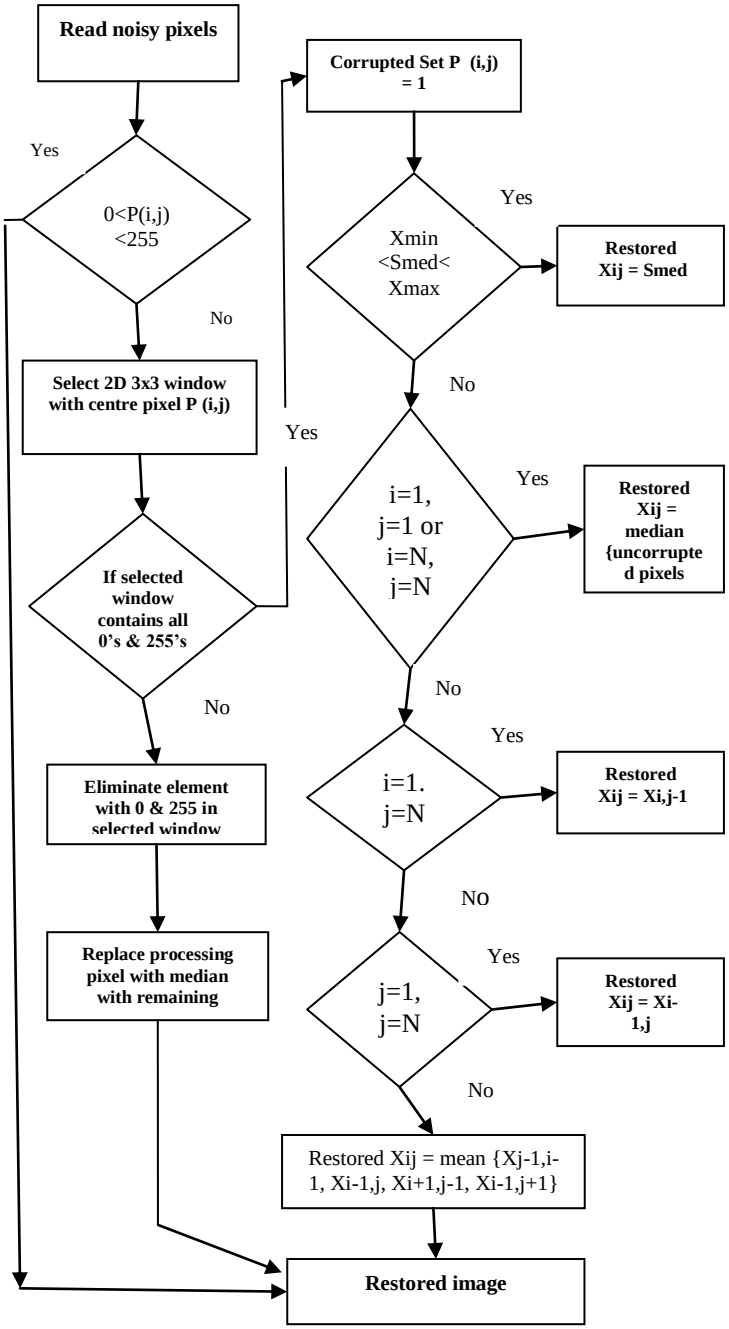

Fig.1: Flow Chart of Hybrid Approach of Removing Impulsive Noise

IV. CONCLUSION AND FUTURE WORK

In this paper, we have seen that the advantages of hybrid model for impulsive noise removal technique in the terms of providing removing high density from digital image without losing any type of information. This technique gives high quality image in the terms of PSNR and IEF factor. Removes high density salt and pepper noise and edge preventing by double padding is very important feature of this algorithm.

In future, we can pursue lots of work with this algorithm. Algorithm takes time at the time of processing noisy pixels in the window, so we can reduce time in future research. In this proposed, algorithm only suitable for the impulsive noise but in future apply on color image also with removes high density impulse noise.

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