A COMPLICATED DECISION-BASED EXPERIMENT USING A MEDIAN FILTER TO REMOVE SALT AND PEPPER NOISE FROM COLOURED IMAGES

[1]P.Ravi Kumar, [2]T.Anitha, [3]S.Hareesh, [4]V. Mahesh Kumar
[1,2,3]Dept of Electronics and Communication Engineering, Sree Venkateswara College Of Engineering, Nellore (Dt), Andhra Pradesh, India.
[4]Dept of Computer Science and Engineering, Sree Venkateswara College Of Engineering, Nellore (Dt), Andhra Pradesh, India.

ABSTRACT
Digital pictures serve as the primary information source for many different sectors, including science and engineering, in the modern world. These digital photos are saved and transmitted in various forms in accordance with the requirements. Yet, this digital image gets distorted with many types of noise during transmission. We focus on impulse noise in this instance since it primarily affects visuals and is noted as salt and pepper noise. The image is losing useful information as a result of this noise. There have been many different filtering methods employed in the past to eliminate this impulse noise, but our suggested approach will produce nevertheless high noise levels, improved filtering. The suggested approach that provides a higher peak signal to noise removal (PSNR) factor at various background densities. The suggested algorithm is contrasted to other prior algorithms including MF, SMF, AMF, and AWMF.
Keywords: Saltnoise, pepper noise and advance decision based median filter

1. INTRODUCTION

Impulse noise is one of the various forms of noise that typically taints digital pictures connected to digital signals. Impulse noise is made up of a collection of randomly selected pixels with extreme contrast values. Hence, even a tiny amount of impulse noise will significantly distort the image compared to other sounds. As a pre-processing stage in image processing, picture noise reduction is crucial. Potential distortions in digital photographs are introduced by the imperfect imaging equipment. Electronic image sensors, film granularity, channel noise, etc. can all contribute to noise disturbances. As high noise levels are never desired, noise reduction must be applied before the picture can be utilized for further research. Impulse noise, also referred to as intensity spikes, is what is referred to as "salt & pepper noise". Dead pixels, ADC errors, transmission faults, issues with the pixel components in camera sensors, incorrect memory locations, or timing issues during the scanning or imaging process are the usual causes of this. There are just two possible values for it: a and b. Each usually has a chance of less than 1. The image has a "salt and pepper" appearance because the noisy pixels are alternately set to the minimum or highest intensity values. Pixels that are not damaged remain unaltered. The typical intensity value for salt and pepper noise for an 8-bit picture is 0,1 correspondingly.

2. LITERATURE SURVEY MEDIAN FILTER

Among the types of nonlinear filters is the median filter. The "salt and pepper" noise in the image, or impulse noise, is not very well removed. Rather than utilizing the mean efficiency, the major objective of this median filter is to substitute each pixel's grey level with the median of the grey levels in its immediate vicinity. We provide the kernel size, list the pixel values represented within the kernel, then calculate the median level for median filtering. initially it consider 3*3 matrix to determine the median value and replace it into our noisy pixel suppose the median value is 0 or 255 then it increases the window size to 5*5 if the median value in this matrix also contains 0 or 255 then it is again increase the window size to 7*7. In the median filter algorithm, Assume each pixel in the image to be the centre pixel of the currently chosen window and examine each pixel for salt and pepper noise. Considering the following 7x7 matrix as our processing matrix, with 255 (the underlined pixel) as the processing pixel.

0	100	20	255	126	200	39
254	220	100	103	159	176	54
44	89	255	203	99	0	147
45	213	231	**255**	255	199	121
0	255	255	86	255	123	37
94	255	147	254	255	20	10
0	79	146	210	211	255	56

Table1:7×7matrix

By this 7X7 matrix, accordant to median filter algorithmic program first a 3X3 matrix is designated.

255	203	99
231	**255**	255
255	86	255

Table2:3×3matrix

Sort them in ascending order to determine Median. And 255 is the median of above table so we cannot replace it in the Noisy pixel.

Now Increase the Window Size to 5X5.

220	100	103	159	176
89	255	203	99	0
213	231	**255**	255	199
255	255	86	255	123
255	147	254	255	20

Table3:5×5matrix

Sort them in ascending order to find Median. And **203** is the median of above table so replace it with the Noisy pixel.

220	100	103	159	176
89	255	203	99	0
213	231	**203**	255	199
255	255	86	255	123
255	147	254	255	20

Table4:5×5matrix

Suppose if the median in 5x5 matrix is 0 or 255 then we will increase the window size 7x7.

3. PROPOSED METHODOLOGY ADBMF

Advanced decision based median filter is the best method to take off this impulse noise which DBMF, which substitutes the pixel value using the median value of the pixels in the execution window, evaluates just the faulty pixels. The main aim of our proposed algorithmic rule is tore place our noisy pixels into median value derived by this algorithm if the median value is 0 or 255instead of increasing window size it moves to then ext position either left or right it also depends on the middle-axis value. suppose if the median value is 0 then it moves to the right side until it sets to 1-254 and the median value is 255 then it moves to left side until it sets to 1-254.if all the pixel values in 3*3 matrix is 0 or 255 then only it increases the window size to 5*5. By treating each pixel as the centre pixel of the currently chosen window, our suggested algorithm examines each pixel in the image for the existence of salt and pepper noise. Assume the following 7x7 matrix as the processing matrix. Our treatment pixel is 255 (the 255 is highlighted in the matrix beneath).

0	100	20	255	126	200	39
254	220	100	103	159	176	54
44	89	255	203	98	0	147
45	213	231	**255**	255	199	121

Table5: 7×7 matrix

From the given 7X7 matrix, The suggested approach first chooses a 3X3 matrix, as shown below:

255	203	98
231	**255**	255
255	88	255

Table6:3×3matrix

Since Pij = 255 in this instance, the centre pixel is a processing pixel, it is a noisy pixel. The currently displayed window's sorting is in ascending order.

88	98	203	231	**255**	255	255	255	255

Table7:Ascendingorderof3×3matrix

In this case, the median value is likewise 255 (a noisy pixel), therefore verify the overall number of 0s and 255s.The total number of pixels in the current window, T, is here 5, and T 9.Find a noise-free pixel by moving to the array's left side.

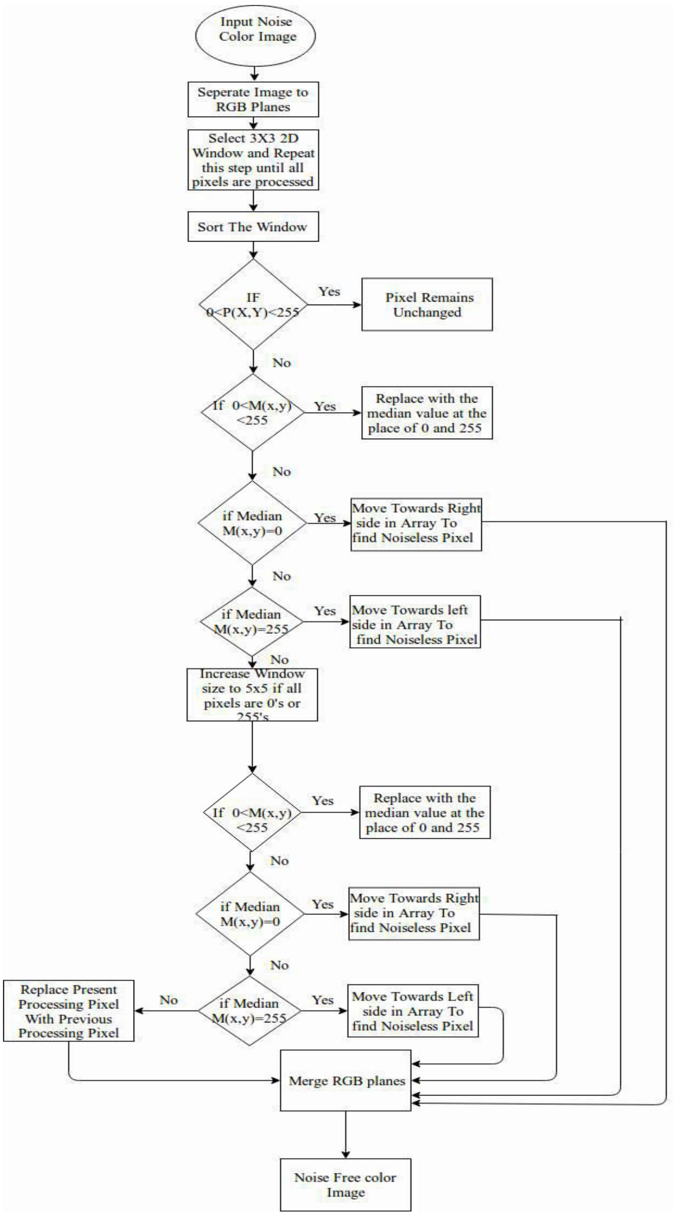
88	98	203	**231**	255	255	255	255	255

Table8:Ascendingorderof3×3matrix

Suppose if the noisy pixel is 0 then move towards right side in array to find noiseless pixels. Whenever this resultant matrix is computed, substitute the current processing pixel with the noiseless pixel located here (number 231).

255	203	98
231	**231**	255
255	88	255

Table9:3×3matrix



Advantages

The median in this algorithm is not affected by large or small values.
It is most widely used as it is very effective at removing noise while preserving edges.
This method is effective at removing of 'salt and pepper' noise.
Median value can be easily represented graphically.
Median is the middle value of the series,so it is not affected by the extreme value like mean.
It is very simple.
It gives the output in exact manner.
It requires very less time to identify the noisy pixels.

Applications

Medicine: CT scans, MRIs, ultrasounds, etc.
Remote sensing: A meteorological technique used to locate natural resources like trees and water and predict the weather.
Communication: HDTV, video conferencing, watermarking, etc.
Automated visual inspection in the textile, food, aerospace, and other industries.
Crowd control by image analysis from cameras used for traffic control.
Defence: RADAR, nighttime vision equipment, etc.
Robotics: driverless cars, surface probing, etc.

Results and Discussions

NOISE DENSITY IN (%)	PSNR IN DB	
	MF	ADBMF*
10	38.30	38.942
20	34.40	35.030
30	31.60	32.195
40	29.47	29.837
50	27.67	27.739
60	25.94	25.716
70	24.18	23.602
80	22.02	21.268
90	19.01	18.620

Table10:Comparison table of PSNR values

NOISE DENSITY IN (%)	SSIM	
	MF	ADBMF*
20	0.9942	0.9950
50	0.9744	0.9782
70	0.9741	0.9509

Table11:Comparison table of SSIM values

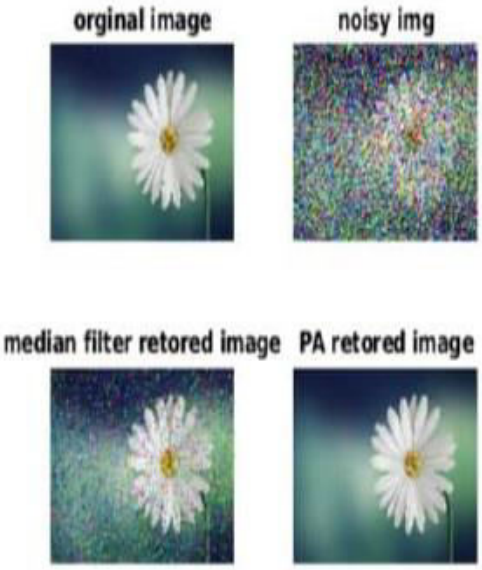


Figure1: Output images compared with median and ADBMF

Conclusion:

In this study, we use various PSNR values to analyse photos that have substantial impulsive noise contamination. In comparison to the median filter, which applies the filtering just to the noisy pixels in the image while leaving the unaltered pixels alone, enhanced decision-based median filtering is an upgraded filtering technique. When filtering, the ADBMF method is utilised to cut down on the amount of noisy pixels. The benefit of this method is that it keeps the edge data while dealing with high density impulse sounds. It is gives larger PSNR and SSIM values compared to all other existing methods so the efficiency is very high.

REFERENCES

1. Thota Susmitha., Ganeswara Rao M.V, “Implementation of Adaptive Median Filter for the Removal of Impulse Noise”, Electronics & Communication Technology, Vol.2,SP-1,Dec.2011.
2. S. E. Umbaugh, Computer Vision and Image Processing, Prentice-Hall, Engle wood Cliffs,NJ,USA,1998.
3. T.S.Huang, G.J.Yang,-“A fast two dimensional median filtering algorithm, ”IEEE Transactions algorithm on Acoust., Speech and Signal Processing, 1979, vol.27, no.1, pp.13-18.

4. S.J.Ko, and Y. H.Lee, 1991. Center weighted median filters and its applications to the image enhancement, IEEE Transactions, pp984-993
5. Gonzalez and Woods,Digital image processing, 2nd edition,PrenticeHall,2002.
6. Changhong Wang, Taoyi Chen, and ZhenshenQu, "A novel improved median filter for salt-and-pepper noise from greatly corrupted images",IEEE2010,pp.718-722.
7. DamienGarcia,Eng.,Ph.D. Assistantprofessor,Departmentofcomputerscience,UniversityofMontreal,QC,Canada,"Ahybridmedian filter to retain the edges and fine details inagrayscaleimage".
8. Survey of digital images decorrelation techs,UniversityofNevada,Reno,Dept.ofComp.Science&Engineering.,Reno,2003