COMPARISON OF MEAN FILTER WITH MEDIAN FILTER

MAHABOOB.SHAIK,
Research scholar, Dept of ECE,
JJT University, Jhunjhunu, Rajasthan, India

DR.OMPRAKASH,
HOD, Department of ECE,
JJTU,Jhunjhunu, Rajasthan,INDIA

ABSTRACT— *a picture is considered as an accumulation of data and the event of commotions in the picture causes corruption in the nature of the pictures. So the data connected with a picture tends to misfortune or harm. It ought to be essential to reestablish the picture from clamors for getting most extreme data from pictures. In this paper we can perceive how diverse sorts of commotion will influence the nature of the pictures and the data in pictures. As a cure, the quality and the data from the noised picture can be recovered utilizing diverse sorts of channels. In this work Gaussian commotion, Salt and Pepper clamor, Speckle clamor and Poisson commotion are being considered and it can be lessened utilizing Gaussian channel, Wiener channel, Mean channel and Median channel. The exploratory result demonstrates the examination and the execution of various sorts of channels to denoise the noised pictures from various sorts of commotions with mean square mistakes and PSNR values.*

Index Terms— *Gaussian noise, Salt and Pepper noise, Mean filter, Median filter.*

I. INTRODUCTION:

Picture delousing assumes a crucial part in advanced picture handling. There are numerous plans for expelling commotion from pictures. The great denoising plan must ready to recover as quite a bit of picture subtle elements despite the fact that the picture is profoundly influenced by commotion [1]. In like manner there are two sorts of picture denoising model, straight model and nonlinear model. For the most part direct model are being considered for picture denoising, the primary advantages of utilizing straight commotion expelling models is the rate and the restrictions of the direct models is the models are not ready to protect edges of the pictures in a proficient way Non-straight models can safeguard edges in a greatly improved manner than direct models yet moderate.

II. WAVELET TRANSFORM

In advanced picture preparing, Wavelet change is essential device for investigating the picture attributes. For better breaking down reason we change the picture from other space to wavelet area. As a rule there are numerous changes are accessible like the Fourier change, Wavelet change and Hilbert change. The Fourier change is a standout amongst the most broadly utilized and prominent change for breaking down reason however it gives just the recurrence abundancy representation not the time data. So it is not pertinent to utilize the Fourier change in applications which we require both time and in addition recurrence data in the meantime. Fourier change is a standout amongst the most effective apparatuses for preparing the stationary sign (flag that as no adjustment in the properties of sign) and it is not relevant for non-stationary signs (signal with there is change in the properties of sign). Wavelets permit channels to be built for Stationary and in addition non-stationary signs. So Wavelet change is being favored contrasting with other change. Wavelet changes permit the both the segments of stationary and additionally non-stationary sign to be investigated. Wavelet applications includes picture signal handling and sifting. It likewise incorporates other region applications like non-direct relapse and pressure.

III. MEAN FILTER:

There are two sorts of sifting plans in particular

straight separating and nonlinear sifting. [3] Mean channel goes under straight sifting plan. Mean channel is otherwise called averaging channel. The Mean Filter applies veil over every pixel in the sign. Each of the segments of the pixels goes under the veil are being arrived at the midpoint of together to frame a solitary pixel that is the reason the channel is also called normal channel. Edge saving criteria is poor in mean channel. Mean channel is characterized by

$$\text{Mean filter} \quad (x_{1\ldots\ldots}x_N) = \frac{1}{N}\sum_{i=1}^{N} x_i$$

Where (x1 … .. xN) is picture pixel range. Mean channel is helpful for expelling grain clamor from the photography picture. As every pixel gets summed the normal of the pixels in its neighborhood is discovered, nearby varieties brought about by grain clamor are diminished significantly by supplanting it with normal quality.

IV. MEDIAN FILTER

Middle channel is the nonlinear channel. The fundamental thought behind the middle channel is to locate the middle quality by over the window, supplanting every passage in the window with the middle estimation of the pixel.

123	125	126	130	140
122	**124**	**126**	**127**	135
118	**120**	**150**	**125**	134
119	**115**	**119**	**123**	133
111	116	110	120	130

Median value calculation

115,119,120,123, 124,125,126,127,150

Median value=124

The example of neighbor's pixels is known as the "window", when the window contains odd number of qualities in it than the middle is straightforward: it is only the inside worth after every one of the sections in the window are sorted numerically in climbing request. In any case, for a considerably number of passages, there is more than one focus esteem; all things considered the normal of the two focus pixel qualities is utilized. One of the significant issues with the middle channel is that it is moderately costly and complex calculation. For finding the middle it is important to sort every one of the qualities in the area into numerical request and this channel moderately moderate, even it is performed with quick sorting calculations like speedy sort. However the fundamental calculation can be improved to some degree for the velocity reason..

V. WIENER FILTER:

The primary point of the Wiener channel is to sift through the picture that has been ruined by clamor. Wiener channel depends on a factual methodology. Wanted recurrence reaction can be obtained utilizing this channel. Approaches took after by wiener separating are of various edge. For performing separating operation it is must to know about the phantom properties of the first flag and the clamor, in accomplishing the criteria one can get the LTI channel whose yield will be as close as unique sign as could be allowed. Wiener channels have described by the accompanying: a. Presumption: sign and (added substance) clamor are stationary straight arbitrary procedures with known unearthly qualities. b. Prerequisite: the channel must be causal where this necessity is fizzled it bringing about a non-causal arrangement Periodic clamor can be successfully evacuated by adjusting the adequacy range segments modified by the commotion, and two recurrence separating techniques are presently accessible, i.e., Wiener sifting and score sifting. Be that as it may, a Wiener channel requires a precise clamor model, which might be hard to get in different viable cases. Moreover, a Wiener channel is additionally entangled in calculation.

VI. GAUSSIAN FILTER

The The Gaussian sifting plan depends on the top recognition. The top discovery depends on the way that crests are to be motivations. The key point is that this channel amends the ghastly coefficient of enthusiasm, as well as all the abundancy range coefficients inside the channel window. A few properties of Gaussian channel are

1.The weights give higher noteworthiness to pixels close to the edge (lessens edge obscuring).

2.They are straight low pass channels.

3.Computationally effective (extensive channels are actualized utilizing little 1D channels).

4.Rotationally symmetric (play out the same in all bearings).

5.The level of smoothing is controlled by σ (bigger σ for more serious smoothing

VII. IMAGE NOISE:

Clamor in pictures is brought about by the irregular variances in brilliance or shading data. Clamor speaks to undesirable data which debases the picture quality. Clamor is characterized as a procedure which influences the gained picture quality that is being not a part of the first picture content. [2]Digital picture commotion may happen because of different sources. Amid obtaining process, advanced pictures change over optical signs into electrical one and afterward to computerized flags and are one procedure by which the clamor is presented in advanced pictures. Because of normal wonders at transformation prepare every stage encounters a change that increases the value of the force of a pixel in a subsequent picture. All in all picture commotion is viewed as an undesirable by-result of picture catch.

The sorts of Noise are taking after:-

• Amplifier commotion (Gaussian clamor)

• Salt-and-pepper commotion

• Shot commotion (Poisson clamor)

• Speckle commotion

A. GAUSSIAN NOISE

Gaussian clamor is factual in nature. Its likelihood thickness capacity equivalent to that of ordinary appropriation, which is generally called as Gaussian dissemination. In this sort of commotion, estimations of that the clamor are being Gaussian-dispersed. An exceptional instance of Gaussian clamor is white Gaussian commotion, in which the qualities dependably are factually autonomous. For application reason, Gaussian clamor is likewise utilized as added substance background noise produce added substance white Gaussian commotion. Gaussian clamor is generally characterized as the commotion with a Gaussian abundancy dispersion, which expresses that nothing the relationship of the commotion in time or the unearthly thickness of commotion. Gaussian clamor is generally said as repetitive sound depicts the relationship of commotion. Gaussian clamor is at times compared to be of white Gaussian commotion, however it may not as a matter of course the situation.

SALT AND PEPPER NOISE:

In [2], [9], salt and pepper commotion model, there is just two conceivable qualities „a" and „b". The likelihood of getting each of them is under 0.1 (else, the commotion would extraordinarily command the picture). For 8 bit/pixel picture, the power esteem for pepper commotion ordinarily discovered closer to 0 and for salt clamor it is close to 255. Salt and pepper clamor is a summed up type of commotion ordinarily found in pictures. In picture criteria the commotion itself speaks to as arbitrarily

happening white and dark pixels. A viable commotion lessening calculation for this sort of clamor includes the utilization of a middle channel, morphological channel. Salt and pepper commotion happens in pictures under circumstances where snappy homeless people, for example, defective exchanging occur. This sort of commotion can be created by failing of simple to-advanced converter in cameras, bit blunders in transmission, and so forth

C.POISSON NOISE:

[2]Poisson clamor is otherwise called shot commotion. It is a sort of electronic commotion. Poisson commotion happen under the circumstances where there is a factual vacillations in the estimation brought about either because of limited number of particles like electron in an electronic circuit that convey vitality, or by the photons in an optical gadget.

D.SPECKLE NOISE:

In [2],[8],[10], Speckle commotion is a kind of granular clamor that generally exists in and causes debasement in the picture quality

.Speckle commotion tends to harm the picture being procured from the dynamic radar and engineered gap radar (SAR) pictures. Because of irregular changes in the arrival signal from an item in traditional radar that is not large as single picture handling component. Dot commotion happens. Spot clamor expands the mean dark level of a neighborhood. Dot clamor is more significant issue, bringing on challenges for picture translation in SAR pictures .It is essentially because of sound handling of backscattered signs from different dispersed targets.

VIII. SIMULATION RESULTS

Figure.1 Image affected by different types of noise

Fig.1. (a) speaks to the first picture being taken for our test reason. Fig 1(b) speaks to the picture being influenced by Salt and Pepper commotion. Salt and pepper clamor is commonly found in this picture. The common power esteem for pepper clamor is near 0 and for salt commotion is near 255 It speaks to itself as arbitrarily happening white and dark pixels.Fig1(c) speaks to the picture influenced by Gaussian commotion. Here we can watch that clamor can take here are Gaussian-dispersed. Fig.1 (d) speaks to the picture influenced by Poisson

clamor and Fig 1(e) speaks to the picture being influenced by dot commotion. As we see from above results Noise in pictures causes corruption in picture quality. So the data connected with the pictures is harmed as we said before. It is must to reestablish the picture from commotions for getting most extreme data from pictures. As a cure, the quality and the data from the noised picture can be recovered utilizing distinctive sorts of channels.

(a) Salt and Pepper noised image is filtered by Mean Filter

(d) Gaussian noised image filtered by Wiener Filter

(b) Salt and Pepper noised image is filtered by

(e) Gaussian noised image filtered by

(c) Salt and Pepper noised image is filtered by Wiener Filter

(f) Gaussian noised image filtered by Median Filter

(g) Poisson noised image filtered by Wiener Filter

(j) Speckle noised image filtered by Wiener Filter

(h) Poisson noised image filtered by Mean Filter

(k) Speckle noised image filtered by Mean Filter

(i) Poisson noised image filtered by Median Filter

(l) Speckle noised image filtered by Median Filter

Figure 2 - Denoising using different filters

RESULTS ANALYSIS:

The performance analysis of different filter for different types of noises is quantized through Mean Square Error (MSE) value, Mean Absolute Error (MAE) and Peak to Signal Noise Ratio (PSNR) value

Table 1: Median Filtering For Different Noise Types of Noises

Different noises	MSE	MAE	PSNR
Salt & pepper noise (10%)	30.2666	2.81	33.3212
Gaussian noise	304.0395	13.90	23.3015
Poisson noise	44.2809	4.96	31.6686
Speckle noise	215.7863	11.34	24.7863

From the outcomes we acquired, it demonstrates that the salt and pepper clamor influenced picture is adequately denoised with middle channel so we get low MSE and low MAE and high PSNR esteem contrasted with other sifted commotion and middle channel indicates normal evacuation of clamor for Poisson noised picture. Be that as it may, when contrasted with salt and pepper and Poisson clamor, Gaussian and dot commotion creates high MSE and MAE values. So it is watched that Median channel is not a fitting channel for Gaussian and Speckle clamor.

Table 2: Wiener Filtering for Different Types of Noises

Different noises	MSE	MAE	PSNR
Salt & pepper noise (10%)	372.7257	10.44	22.4169
Gaussian noise	159.8514	9.33	26.0936
Poisson noise	38.5027	4.43	32.2759
Speckle noise	125.8301	8.08	27.1330

The got results demonstrates that the Poisson clamor influenced picture is viably denoised with Wiener channel so we get low MSE and low MAE and high PSNR esteem contrasted with other sifted commotion and Wiener channel indicates normal evacuation of clamor for Speckle and Gaussian noised picture. In any case, when contrasted with Poisson clamor, Salt and Pepper commotion separated picture demonstrates high MSE and MAE values. From this we presume that wiener channel is not appropriate for Salt and Pepper noised picture.

IX. CONCLUSION

The got results demonstrates that the Poisson clamor influenced picture is viably denoised with Wiener channel so we get low MSE and low MAE and high PSNR esteem contrasted with other sifted commotion and Wiener channel indicates normal evacuation of clamor for Speckle and Gaussian noised picture. In any case, when contrasted with Poisson clamor, Salt and Pepper commotion separated picture demonstrates high MSE and MAE values. From this we presume that wiener channel is not appropriate for Salt and Pepper noised picture.

X. FUTURE WORK

Sifting strategies alongside discovery calculations demonstrates better results and once the separating plans are done in wavelet space then proficient results will be found.

XI. REFERENCES

[1] Astola, J., Kuosmanen, P., "Fundamentals of Non-linear Digital Filtering", CRC Press, New

York, Boca Raton, 1997.
[2] Charles Boncelet, "Image Noise Models" in Alan C.Bovik, Handbook of Image and Video Processing, 2005.
[3]Gajanand Gupta, "Algorithm for Image Processing Using Improved Median Filter and Comparison of Mean, Median and Improved Median Filter" (IJSCE) ISSN: 2231-2307, Volume-1, Issue-5, November 2011.
[4] Gonzalez.R., Woods.R., "Digital Image Processing", 2nd ed. Prentice-Hall, Englewood Cliffs, NJ. 2001. [5] G.Shi Zhong, "Image De-noising using Wavelet Thresholding and Model Selection", Image Processing, 2000, Proceedings, 2000 International Conference on, Volume: 3, 10-13 Sept. 2000 Pages: 262.
[6] James C. Church, Yixin Chen, and Stephen V. Rice Department of Computer and Information Science, University of Mississippi, "A Spatial Median Filter for Noise Removal in Digital Images", IEEE, page(s): 618- 623, 2008.
[7] MathWorks.2011 http://www.mathworks.com/help/toolbox/images /r ef/medfilt2.html.
[8] M. Rosa-Zurera, A.M. Co´breces-A´lvarez, J.C. Nieto-Borge, M.P. Jarabo-Amores, and D. Mata-Moya. "Wavelet denoising with edge detection for speckle reduction in SAR images" EUSIPCO Poznon, 2007. [9] P.Y. Chen, C.Y. Lien, "An efficient edge-preserving algorithm for removal of salt-and-pepper noise", IEEE Signal Processing Letters 15, 833–836, 2008.
[10] Sedef Kent, Osman Nuri Oçan, and Tolga Ensari, "Speckle Reduction of Synthetic Aperture Radar Images Using Wavelet Filtering", in Astrium EUSAR 2004 Proceedings, 5th European Conference on Synthetic Aperture Radar, May 25–27, 2004, Ulm, Germany, 2004.