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A Review Paper on Noise Removal in Grey Scale Images

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Abstract— Image enhancement is the process of applying certain alterations to an input image so that the resulting image is greater to the first image for an individual application or set of determinations. This paper presents an analysis of various enhancement procedures and noise removal techniques for improving the contrast and visibility of images. There are various types of noises as discussed in this paper. We have also discussed various types of filters to remove these types of noises in the grey scale images.

Keywords— Noise Removal; Greyscale Images; Image Processing; Salt & Pepper Noise; Gaussian Noise.

I. INTRODUCTION

Image Processing is a system in which computerized pictures are taken care of by the strategy for advanced PC. Its essential point is to upgrade pictorial picture quality for better human explanation. Computerized picture handling is a wide subject and often incorporates strategy which can be perplexing; the significant center behind advanced picture preparing is extremely clear. The complete point of picture preparing is to use data contained in the picture that empowers the framework to understand, perceive and translate the data open from the picture plan. Picture handling can be grouped into three levels: low, mid, abnormal state preparing. The term improvement is subjective on that is upgrade for one individual can't be improvements for other. The standard objective of upgrade is to handle a picture with the end goal that the prepared picture is more reasonable then the info picture for client need. Presently a day's these strategies are relevant in various areas like some of them are remote distinguishing advancement, healing imagining, biotech, environment science, face acknowledgment, PC vision et cetera.

In various sorts of advanced picture handling, the essential operation is as per the following: at every pixel in a computerized picture we put an area around that point, examine the estimations of the considerable number of pixels in the area as indicated by some calculation, and afterward supplant the first pixel's quality with one taking into account the examination performed on the pixels in the area. The area then moves progressively over each pixel in the picture, rehashing the procedure when advanced pictures are mutilated by drive clamor amid securing, transmission and capacity, when they are brought by a camera with a defective sensor, or transmitted over an uproarious channel [1]. Commotion evacuation is a critical pre-handling step took after by different assignments, for example, object acknowledgment, edge location, highlight extraction and example acknowledgment.

For the most part, direct averaging channels can expel added substance Gaussian commotion, yet are inadequate against drive clamors. Edges and picture points of interest additionally get obscured because of straight separating. Then again, edge-saving channels will hold the edges and line structures yet have a tendency to enhance clamor. Distinctive techniques have been proposed in writing to address this issue. The best methodologies are nonlinear and versatile in nature. Contingent upon the clamor sort, we are required to apply the ideal decision of channels to acquire the best yield for a specific uproarious pixel..

II. TYPES OF NOISES

Noise in an image is a very common problem. An image gets adulterated with various sorts of noise amid his procedures of procurement, transmission/gathering, and capacity/recovery. Clamor might be named substitutive noise (incautious noise: e.g., salt and pepper noise, arbitrary esteemed motivation noise and so forth.) and added substance commotion (e.g., added substance white Gaussian commotion). Every Region at 100% Zoom.

A. Salt & Peepers noise

Salt and pepper noise is a type of noise regularly seen on pictures. It speaks to itself as haphazardly happening white and dark pixels. A compelling noise removing strategy for this sort of noise includes the utilization of a middle channel or a contra symphonious mean channel. Salt and pepper noise creeps into pictures in circumstances where snappy drifters, for example, broken exchanging, happen.

B. Gaussian Noise

Gaussian noise is measurable noise that has its likelihood thickness capacity equivalent to that of the ordinary dispersion, which is otherwise, called the Gaussian appropriation. At the end of the day, the qualities that the noise can go up against are Gaussian dispersed. A unique case is white Gaussian noise, in which the qualities at any sets of times are measurably autonomous (and uncorrelated). In applications, Gaussian noise is most ordinarily utilized as added substance repetitive sound yield added substance white Gaussian noise.

(a) Original Image (b) Image with Gaussian Noise

C. Perodic Noise

This noise is produced from hardware impedances, particularly in force signal amid picture securing. This noise has uncommon attributes like spatially needy and sinusoidal in nature at products of particular recurrence. Its shows up in type of conjugate spots in recurrence space. It can be advantageously evacuated by developing a thin band reject filter or notch noise.

(a) Original Image

(b) Image with Periodic Noise

D. Speckle Noise

This noise remains multiplicative noise. Their appearance is seen in reasonable imaging framework, for example, laser, radar and acoustics and so forth,. Dot noise can exist comparative in a picture as Gaussian noise. Its likelihood thickness capacity takes after gamma dispersion.

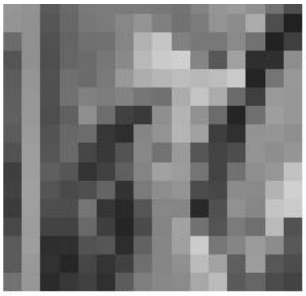
(a) Original Image

(b) Image with Speckle Noise

E. Photon Noise

The presence of this noise is seen because of the factual way of electromagnetic waves, for example, x-beams, noticeable lights and gamma beams. The x-beam and gamma beam sources discharged number of photons per unit time. These beams are infused in patient's body from its source, in restorative x beams and gamma beams imaging frameworks. These sources are having irregular vacillation of photons. Result assembled picture has spatial and worldly haphazardness. This noise is likewise called as quantum (photon) noise or shot noise. This noise follows the Poisson distribution and is given as

(a) Original Image



(b) Image with Photon Noise

F. Structured Noise

Structured noises are occasional, stationary or non-stationary and an intermittent in nature. On the off chance that this noise is stationary, it has altered adequacy, recurrence and stage. Organized noise brought on by impedances among electronic segments. Noise presents in correspondence divert are in two sections, unstructured noise (u) and organized noise (s). Organized noise is

likewise called low rank noise. In a sign preparing, it is more preferred standpoint (more practical) to considering noise model in a lower dimensional space.

(a) Original Image

(b) Image with Structured Noise

III. LITERATURE SURVEY

(Irum, Sharif, Raza, & Mohsin, 2015) is made out of an arrangement of morphological standard and understood operations disintegration widening and trimmed standard middle channel. It expels the settled drive clamor (salt and pepper) exceptionally well without bending the picture highlights, shading parts and edges. Strategy uses the converse property of the most rudimentary administrators of scientific morphology in particular disintegration and expansion. A one of a kind arrangement of these administrators with trimmed middle channel has been formed that adequately evacuates the salt and pepper clamor from shading pictures. The outcomes assess the execution of proposed half and half channel. Proposed channel adequately expels the commotion from edge districts and inward locales of uproarious pictures without bending the elements and shading parts.

(M & Narayanan, 2015) proposed an Efficient Mixed Noise Removal Technique from Gray Scale Images utilizing Noisy Pixel Modification Technique. The proposed separating procedure comprises of two stages: the boisterous pixel recognition step utilizing fluffy strategy and the blended clamor sifting step. Clamors tended to in this technique are a mix of salt and pepper commotion and Gaussian commotion .This strategy diminishes blended clamors impressively without trading off nervous sharpness. In this paper, an effective blended commotion expulsion system from dark scale pictures is introduced. Broad PC reproductions demonstrate that it beats altogether numerous other surely understood calculations. The proposed strategy can be utilized as a part of numerous customer electronic items to expel blended because of its execution and low many-sided quality.

(Afifi & Hussain, 2015) proposed a modified Poisson blending technique. Rather than utilizing pixel powers, the angle area is utilized as a part of Poisson picture altering; be that as it may, it suffers from two fundamental issues: shading draining and draining ancient rarities. In this paper, a modified Poisson mixing (MPB) method is exhibited which guarantees reliance on the limit pixels of both target and source pictures as opposed to only those of the objective. The issue of draining relics is decreased. This makes the proposed system reasonable for use in video compositing as it evades the flickering brought about by draining antiques. To decrease the issue of shading dying, we utilize an extra alpha compositing step. Our trial comes about utilizing the proposed system demonstrates that MPB lessens the draining issues and produces more characteristic composited pictures than different procedures.

(Patel & Sinha, 2015) proposed work combines gray level clustering and contrast enhancement algorithm which aims at improving contrast features and the suppression of noise. This technique is very helpful to visualize breast tumors of breasts of higher density that further helps in detection of breast cancer. The breast mammograms were enhanced without any loss of image details. The method is simple and computationally effective. The proposed methods maintained the mean brightness while preserving the details of the image and do not produce any unwanted artifacts that occurred in conventional methods. Future work may aim at establishing the utility of the techniques by using receiver operating characteristic (ROC) that could be implemented in computer-aided diagnosis (CAD) system.

(Yang & Lee, 2015) proposed an effective denoising algorithm for Poisson-Gaussian noise is proposed using the contour let transform, hidden Markov models and noise estimation in the transform domain. Author supplements the algorithm by cycle spinning and Wiener filtering for further improvements. The HMM algorithm adopts an independent mixture model to match the non-Gaussian nature of the contour let coefficients and adopts hidden Markov models to characterize the key dependencies between the contour let coefficients. Furthermore, this method estimates optimal HMM parameters using the EM algorithm. The Poisson Gaussian noise variance in contour let domain is obtained by filtering the noise variance of each pixel with the square of

the contour let filter coefficients. Using the estimated HMM parameters of the signal and noise variances, the signal-dependent noise is reduced through Bayesian estimation.

(Ansari & Mangla, 2015) had proposed a method for Eliminating Noise from Mixed Noisy Image by using Modified Bilateral Filter. To remove noise from images neighborhood processing is to be used. In Neighborhood processing, a function is applied to a neighborhood of each pixel. During this a rectangular mask (usually with sides of odd length) is moved over the given image. As we do this, we create a new image whose pixels have grey values calculated from the grey values under the mask. Mixed noise is considered as mixture of Gaussian noise and impulse noise. Some of the techniques are implemented in the work and analyzed in terms of various performance matrices. By understanding advantages, drawbacks and limitation of these techniques, we proposed an optimum technique for removing mixed noise from color image. Author proposed a SBF technique for this purpose.

(Murugan & Avudaiappan, 2014) had done a comparative Analysis of Impulse Noise Removal Techniques on Gray Scale Images. This paper researches the execution of four de-noising strategies for expelling the High Density Impulse Noise. They are Adaptive Bilateral Filter (ABF), Fuzzy Peer Group Filter (FPGF), Switching Bilateral Filter (SBF), and Boundary Discriminative Noise Detection Filter (BDND). In this paper, High Density Impulse commotion recognition and decrease strategies were executed and the outcomes were thought about by utilizing five execution parameters. They are Peak-Signal-to-Noise-Ratio, Mean Square Error and auxiliary closeness record measure, Mean Absolute Error, and Maximum Difference. The trial comes about demonstrate that the BDND de-noising technique performed well than alternate strategies.

IV. TYPES OF FILTERS TO REMOVE NOISE

A. Median Filter

Ordinarily, by a long shot most of the computational exertion and time is spent on figuring the middle of every window. Since the channel must process each passage in the picture. The fundamental downside of the middle channel is the same quality is utilized for both loud and the fine data values and the reestablished picture contain undesirable noise in a few districts and loss of data in a few locales. It can channel the picture in half of boisterous level. This won't works above half noise level. To beat these downsides The Adaptive Median Filter is presented.

B. Adaptive Median Filter

As a propelled technique contrasted and standard middle separating, the Adaptive Median Filter performs spatial preparing to save detail and smooth non-incautious noise. The window is supplanted by the mean or the middle value. This channel switches in the middle of Mean and Median .A prime advantage to this versatile way to deal with middle sifting is that rehashed utilizations of this Adaptive Median Filter don't dissolve away edges or other little structure in the image. This channel likewise not ready to work at the high noise densities.

C. Decision Based Algorithm

In this calculation, picture is de-noised by utilizing a 3X3 window. On the off chance that the handling pixel worth is 0 or 255 it is prepared or else it is left unchanged. This technique can remake the picture at low noise densities and it creates the spilling impact, to conquer this DBUTMF calculation was introduced.

D. Unsymmetric Trimmed Median Filter

This filter is called trimmed middle filter on the grounds that the pixel values 0's and 255's are expelled from the chose window. This methodology expels noise in preferable path over the ATMF. Alpha Trimmed Mean Filtering (ATMF) is a symmetrical filter where the trimming is symmetric at either end. In this system, even the uncorrupted pixels are likewise trimmed. This prompts loss of picture subtle elements and obscuring of the picture. With a specific end goal to defeat this disadvantage, An Unsymmetrical Trimmed Median Filter (UTMF) is proposed. In this UTMF, the chose 3 X3 window components are organized in either expanding or diminishing request. At that point the pixel values 0's and 255's in the picture (i.e., the pixel values in charge of the salt and pepper noise) are expelled from the picture. At that point the middle estimation of the rest of the pixels is taken. This middle quality is utilized to supplant the loud pixel.

E. Wiener Filter

The reason for the Wiener filter is to sift through the noise that has ruined a sign. This filter depends on a measurable methodology. Generally every one of the filters are intended for a sought recurrence reaction. Wiener filter manages the sifting of

a picture from an alternate perspective. The objective of wiener filter is decreased the mean square blunder however much as could reasonably be expected. This filter is fit for decreasing the noise and debasing capacity. One technique that we accept we know about the otherworldly property of the noise and unique sign. We utilized the Linear Time Invariant filter which gives yield comparable with regards to the first flag as much conceivable.

V. CONCLUSION

Image enhancement gives an assortment of techniques to adjusting picture to accomplish outwardly worthy picture and are utilized to enhance the visual appearance of a picture or to change over the picture to a structure more qualified for examination by a human or machine. For instance, to make a picture lighter or darker, or to increment or diminishing difference or to expel noise from pictures. Noise conceals the critical points of interest of pictures and corrupts it. One the strategy used to upgrade the picture quality is histogram adjustment to enhance the perceivability of low complexity picture. Additionally middle separating strategy is connected to expel salt and pepper noise from loud pictures. In this paper we have talked about different sorts of noises and filters to evacuate these noises. It is reasoned that a hearty framework is required to be created to expel these noises from dark scale pictures.

References

[1] I. Irum, M. Sharif, M. Raza, and S. Mohsin, "A Nonlinear Hybrid Filter for Salt & Pepper Noise Removal from Color Images," J. Appl. Res. Technol., vol. 13, no. 1, pp. 79–85, 2015.

[2] J. M and N. K. Narayanan, "An Efficient Mixed Noise Removal Technique from Gray Scale Images using Noisy Pixel Modification Technique," in IEEE ICCSP, 2015, pp. 336–339.

[3] M. Afifi and K. F. Hussain, "MPB: A modified Poisson blending technique," Springer Comput. Vis. Media, vol. 1, no. 4, pp. 331–341, 2015.

[4] V. Murugan and T. Avudaiappan, "A Comparative Analysis of Impulse Noise Removal Techniques on Gray Scale Images," Int. J. Signal Process. Image Process. Pattern Recognit., vol. 7, no. 5, pp. 239–248, 2014.

[5] K. Malik and B. Smolka, "IMPROVED BILATERAL FILTERING SCHEME FOR NOISE REMOVAL IN COLOR IMAGES," in Polish-Japanese Institute of Information Technology Bilateral Filter, 2014, pp. 2–8.

[6] B. C. Patel and G. R. Sinha, "Gray level clustering and contrast enhancement (GLC–CE) of mammographic breast cancer images," Springer CSI Trans. ICT, vol. 2, no. 4, pp. 279–286, 2015.

[7] B. M. Jabarullah, S. Saxena, and C. N. K. Babu, "Survey on Noise Removal in Digital Images," IOSR J. Comput. Eng., vol. 6, no. 4, pp. 45–51, 2012.

[8] S. Ansari and K. Mangla, "Eliminating Noise from Mixed Noisy Image by using Modified Bilateral Filter," IJARCET, vol. 4, no. 5, pp. 2327–2332, 2015.

[9] S. Yang and B.-U. Lee, "Poisson Gaussian Noise Reduction Using the Hidden Markov Model in Contourlet Domain for Fluorescence Microscopy Images," Springer PLoS ONE, vol. 10, no. 9, p. e0136964, 2015.

[10] R. Soman and J. Thomas, "A Novel Approach for Mixed Noise Removal using ' ROR ' Statistics Combined WITH ACWMF and DPVM," Int. J. Comput. Appl., vol. 86, no. 17, pp. 11–17, 2014.

[11] H. Gómez-moreno, P. Gil-jiménez, S. Lafuente-arroyo, R. López-sastre, and S. Maldonado-bascón, "A "' Salt and Pepper "' Noise Reduction Scheme for Digital Images Based on Support Vector Machines Classification and Regression," Hindawi Sci. World J., vol. 2014, no. 5, 2014.

[12] V. Crnojević and N. Petrović, "Impulse Noise Filtering Using Robust Pixel-Wise S-Estimate of Variance," EURASIP J. Adv. Signal Process., vol. 2010, no. 1, p. 830702, 2010.

[13] M. J. Tanakian, M. Rezaei, and F. Mohanna, "Digital video stabilizer by adaptive fuzzy filtering," EURASIP J. Image Video Process., vol. 2012, no. 1, p. 21, 2012.

[14] S. Marukatat, "Image enhancement using local intensity distribution equalization," EURASIP J. Image Video Process., vol. 2015, no. 1, p. 31, 2015.

[15] T. M. Khan, M. A. U. Khan, Y. Kong, and O. Kittaneh, "Stopping criterion for linear anisotropic image diffusion: a fingerprint image enhancement case," EURASIP J. Image Video Process., vol. 2016, no. 1, p. 6, 2016.

[16] https://en.wikipedia.org/wiki/Standard_test_image

[17] www.standardtestimage.com

