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# Survey on Degraded Image Due To High Density Impulse Noise

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## ABSTRACT

Impulse noise has been introduced in the image during the image acquisition process and also caused due to the digital recording in the disks. The Noise removal is one of the major challenges in the field of image processing. Impulse noise removal is one of the most essential and significant preprocessing steps in digital image processing. Filters are good at noise suppression but their performance decreases in terms of edge preservation .In this case, the quality of the image gets totally degraded due to high density impulse noise in the image. The comparative study helps in identification of most proficient algorithms in terms of edge security and noise suppression to restore the original image. This paper presents a review of significant work in the area of image denoising using different image denoising techniques.

**Keywords :** Impulse Noise, Denoising Techniques, Noise Suppression, Filters, Edge Preservation

## I. INTRODUCTION

In the digital images, noise is raised during image acquisition or scattering. The demonstration of imaging sensors is influenced by a scope of components, such as environmental situation during image acquisition and the perfection of the detecting components themselves [1].During the time of image acquisition with a charge coupled device, the light level and sensor temperature are the principle factors influence the quantity of noise in the following image [1]. Noise in an image is the impact of errors in the image acquisition process that impact is the pixel estimation of the image does not reproduce the genuine intensities of real picture, over to noise, the image is an uneven rough, shed or blanketed exterior[2]. The aggregate image noise can shift from almost firm talks on a advanced photograph to optical radio astronomical images that are compound noise[2]. The second certainty in the form of noise is the transmission of information in the image is destroyed because of snooping in the channel utilized for transmission. For instance an image transmitted utilizing a remote system might be corrupted because of lightning or other atmosphere trouble.

## II. Image Denoising by Median Filter

A large number of methods have been presented to remove impulse noise from digital images. The Standard median filter and mean filter are utilized to diminish salt pepper noise and Gaussian noise separately. When these two noises exist in the image in the mean time, utilization of just a single filter technique cannot achieve the desired result [15]. The standard median filter [17] is a straightforward rank choice filter that attempts to remove impulse noise by changing the luminance estimation of the inside pixel of the filtering window with the median of the luminance values of the pixels contained inside the window. Although the median filter is basic and gives a reasonable noise removal execution, it removes thin lines and blurs image details even at low noise densities. The weighted median filter [13] and the center-weighted median filter [14] are adjusted median filters that give more weight to the proper pixels of the filtering window. These filters have been introduced to maintain a strategic distance from the characteristic disadvantages of the standard median filter by controlling the tradeoff between the noise suppression. Median filter [3] is a well-known nonlinear filter to eradicate the noise in the smooth regions in image. The median filter based impulse noise filters have been presented in [3,4,5,6,7, 8,9] already to explain this problem.

The median filters every pixel in the image thus and its adjacent neighbors are utilized to choose whether or not it is illustrative of its environment. Typically, rather than replacing the pixel value with the mean of neighboring pixel values, median filter replaces it with the median of those values. That is, the values from the surrounding neighborhood are first arranged into numerical order, and after that the estimation of the pixel in question is replaced with the median pixel value. The neighbourhood is referred to as the window. The window can have different shapes focussed on the target pixel. The square is an average shape decided for windows characterized for 2D images. It should be noticed that under typical conditions the median filter, is performed utilizing a window containing an odd number of pixels. In the event that the area under thought comprises of a significantly number of pixels, the median value chose as the yield is the normal of the two center pixel values. The typical median filter does not carry out well when impulse noise is greater than 0.2.

- A simple median utilizing 3×3 or 5×5-pixel window is sufficient only when the noise intensity is less than approx. 10-20%.
- When the intensity of noise is growing, a simple median filter remains many shots unfiltered.
- This filter does not conserve detail and it also smoothens non-impulsive noise.
- However, the median filter does not provide good job at high noise density, as it’s smoothing away from discontinuities.

## III. Image Denoising Using Decision Based

**Algorithm With Discrete Wavelet Transform**

A Decision Based Algorithm is a 2-D casement of size 3x3 is chosen [11]. The pixel values in the window are sorted in rising order, and stored in a 1-D array. If the pixel value in the array is either '0' or ‘255’, the correspondent pixel values are eliminated, and the median of remaining values are calculated. The pixel being processed is replaced by the median value intended. Decision based algorithm is to eliminate high-density [11] salt and pepper noise using customized sheer sorting method. The new algorithm has lower computation time when compared to other typical algorithms. Filtering the degraded digital image by preserving its minutiae is very vital part of image processing.

The discrete wavelet transform is applied to the result of the decision based algorithm [10]. Hence, the result of the resolution based algorithm is then changed into its four wavelet coefficient using 1 level db32 wavelet decomposition. To conserve edges and remove the noise [10], thresholding is applied on its feature coefficients. The best result is expected at the access of the greatest intensity value of the individual detail coefficient. Hence, with this threshold we will modify the detail coefficient. Relate inverse discrete wavelet transform on estimated coefficient and customized detail coefficients to get the restored image [10].

- The major *problem* of this method is that defining a robust *decision* is difficult.
- This method will not take into description of the local features as a result of which minutiae and boundaries may not be enhanced passably, particularly when the noise level is above 95%.

## IV. Weighted Nuclear Norm Minimization

The standard nuclear norm minimization regularizes each singular value uniformly to chase convexity of the objective function. However, this greatly restricts its ability and elasticity in dealing with many practical problems (e.g., denoising), where the singular values have clear physical meanings and should be treated differently. It presents the weighted nuclear norm minimization technique, where the singular values are assigned different weights. The solutions of the WNNM problem are analyzed under different weighting conditions. Then the weighted nuclear norm minimization applied to the image in order to take out the noise from the images. The WNNM procedure, however, is much well-organized in order to denoise the image than other filters.

Image denoising aims to rebuild the original image $x$ from its noisy revise $y = x+n$, where $\mathbf{n}$ is assumed to be impulse noise with zero mean and variance. Denoising is not only a significant pre-processing step for many vision applications, but also an ideal test bed for evaluating geometric image modeling methods.

Singular value decomposition system applied to the image with the similar patches for estimating the singular values. Lastly obtaining the clean and noise free image using weighted nuclear norm minimization process.

## V. Performance metrics:

Concentrate the execution of the identification schemes in recognizing the noisy pixels in the image at various impulse noise ratios.

**Peak Signal to Noise Ratio:** PSNR examination utilizes a standard numerical model to quantify a target contrast between two pictures. The PSNR block computes the Peak Signal to Noise Ratio, in decibels, between two pictures. This proportion is frequently utilized as quality estimation between the original and a compressed picture. The higher the PSNR, the better the quality of the compressed or reproduced picture. The greater PSNR, the less distortion.

**Mean Square Error:** MSE speaks the aggregate squared error between the compressed and the original image, while PSNR speaks to a measure of the peak error. The lesser the value of MSE, the lower the error, MSE is smaller, the execution is better, which means the filtered image is near to the original.

## VI. Conclusion

In this paper impulse noise is added to the original clean image. We have observed that all noise causes degradation in the image quality which results in loss of information. The de-noising of degraded image is performed using Weighted Nuclear Norm Minimization, Decision Based Algorithm with Discrete Wavelet Transform and Median filter. Weighted Nuclear Norm Minimization works well than Decision Based Algorithm with Discrete Wavelet Transform and Median filter whereas Decision Based Algorithm with Discrete Wavelet Transform works well for removing impulse noise compared to that of Median filter.

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