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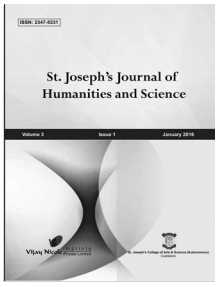


# Overview of Different Noises and Noise Reduction Techniques in Images

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## ABSTRACT

Image processing is a processing of given images which is captured from some of device. Such as, Image scanner, digital camera, CT scan and etc. The digital images may include noises, which are included to the images while capturing, transmitting, storing and processing them. To take away this noise from an image by using various noise reduction techniques. Noise reduction is used to provide the quality of an image. In this paper, we aim to provide a survey of several noises and noises reduction techniques.

**Keywords:** Image Processing, Gaussian Noise, Salt and Pepper, Speckle Noise, Poisson Noise, SA-DCT, Wiener filter, MSE, PSNR.

## 1. INTRODUCTION

Digital image processing is a processing of digital image by using computer algorithms or mathematical functions to recover the quality of an image. The outcome of errors in an image acquisition process is called noise. Because the noise in image always presented due to acquisition coding, transmitting, storing and processing stops. Noise is referred as unwanted or random signals. It is a random variation of brightness or color information in image. Some of the ways, which noises are made in an image. They are,

1. If the image is captured from digital camera, It may contain noises because of camera miss-focused.
2. The image can acquire noise while scanning image by using image scanner.
3. Noise can acquire by electronic transmission of image data.

The important problem of image processing is to remove the noise from a digital image. Noise reduction is used in process of removing noise from a digital image. It is used in provide the quality of an image. However edge deduction is one of the most popular methods in digital image processing. It aims to decrease number of data in a digital image.

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## 2. LITERATURE REVIEW

| Year | Author | Title | Methodology | Advantages | Disadvantages |
|---|---|---|---|---|---|
| 2015 | Pooja Kumari, Pulkit Chaurasia, Prabhat Kumar. | A Survey on Noise Reduction in Images. | Focusing on standard noises and its filtering techniques. | Proposed the canny edge detection algorithm, Image Enhancement with reduction in spatial domain and image quality measures. | Requires more details about the measures of image quality. |
| 2015 | Ajai Kumar Boyat, Brijendra Kumar Joshi. | A Review Paper: Noise Models in Digital Image Processing | Focusing on difference types of noise with it functions. | Describe various noises with better solution to remove it. | Difficult to take out all types of noise appears in an image. |
| 2016 | D.Saranya, V.Radha. | A Brief Study in Noise and Filtering for Dermoscopic Images. | Focusing on various types of noises for removing noises in medical images | Describe several filtering with better outcomes. | |
| 2016 | Gursharan Kaur, Rakesh Kumar, Kamaljeet Kaninth | A Review Paper on Different Noise Types and Digital Image Processing. | Focusing on types of noises and its removing techniques. | Describe various noises with clear information. | Require more information about noise removing techniques. |
| 2016 | Himanshu Chauhan, Dr.Sandhya Tarar. | Image Processing Edge Detection Technique using Iterative Enhancement Wavelet used for Traffic Control Problem. | The algorithm used for detecting edges with less false detection using Iterative Enhancement wavelet transformation (IEWT). | It helps to discover the edges in image more perfectly with less calculation cost and less time. | |
| 2016 | Dr. R Siva Ram Prasad, S.Suresh. | A Review on Edge Detection Algorithms | Focusing on different types of edge detection methods and its operators. | Describe standard edge detection algorithm with its function. | Unable to find which one provides better solution. |

## 3. NOISE TYPES

Here we specify some of standard noise for removing noise in an image.

### 3.1 Gaussian Noise

Gaussian noise rises in amplifiers or detectors. So it is also known as electronic noise [2]. Gaussian noise having Probability Density Function (PDF), because it is a statistical noise. It is equal to the normal distribution. This normal distribution is also known as the Gaussian distribution. It is additive in nature, in each pixel is not dependent and signal intensity of each pixel is also not dependent. Thus if Gaussian noise is zero. Then every pixel is affected in image [3.4].

### 3.2 Salt and Pepper Noise

It is otherwise known as impulsive noise which is actually the intensity spikes. This noise acquires during data transmission [5]. An image is uncorrupted by impulsive noise. But some pixel values are modified

in images. The values of image pixel are modified by corrupted pixel values. It may be minimum or maximum pixel values. These values are depended upon the number of bits used. In this noise black pixel is represented by 0 and white pixel represented by 1. The salt and pepper noise is usually caused by sudden image signal changes, failures of memory cell, cameras sensor cells broken, synchronization errors in image digitizing or transmission [3, 4].

### 3.3 Speckle Noise

Speckle noise, appears in all the coherent imaging systems. Such as, acoustics, radar and laser etc. This type of noise follows the gamma distribution. It is designed by random values multiplied by pixel values. So it is called multiplicative noise. It is affected by signal from elementary scatters, gravity, pedestal image and sea waved [1].

### 3.4 Poisson Noise

Poisson noise is presented on the image due to the statistical nature of electromagnetic waves. Such as X-ray, visible light and gamma rays. The x – rays and gamma rays emit several number of photon per unit time. So it is otherwise known as photon (Quantum) noise or shot noise. This type of noise normally happen due to number of photons are captured with sensors. That is requiring to detecting statistical fluctuations in a measurement [4].

## 4. PROPOSED ALGORITHMS

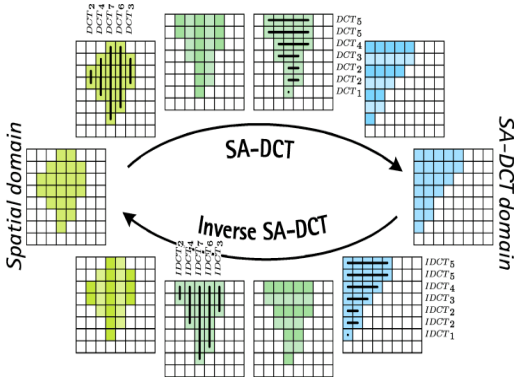
In this work two types of algorithms were proposed to remove the noise in various types of noise. The result values are obtained from MATLAB Tool using by Image Quality Measures like MSE, PSNR.

The proposed algorithms are,

1. Shape Adaptive Discrete Cosine Transform (SA-DCT).
2. Wiener filters.
3. Image Quality Measures.

### 4.1 Shape Adaptive Discrete Cosine Transform (SA-DCT)

SA-DCT is technique for removing noise present in an image. It can be used for analysis and synthesis of arbitrary shaped image segment, where the image was affected by noise. SA-DCT does not require expensive matrix inversions or iterative. The results obtained after the adaptive filtering estimates a very good image quality.




That is the picture of the SA-DCT and its inverse transformation is computed by cascaded application of one – dimensional varying – length DCT transforms along with columns and rows.

## 4.2 Wiener Filters

Wiener filter is a class of optimum linear filter which involves implementation of desired signal sequence from another associated sequence. It is optimal in terms of mean square error. It reduces overall mean square error in the process of inverse filtering and noise smoothing. To estimate this we calculate the process of original image and additive noise [6].

## 4.3 Image Quality Measures

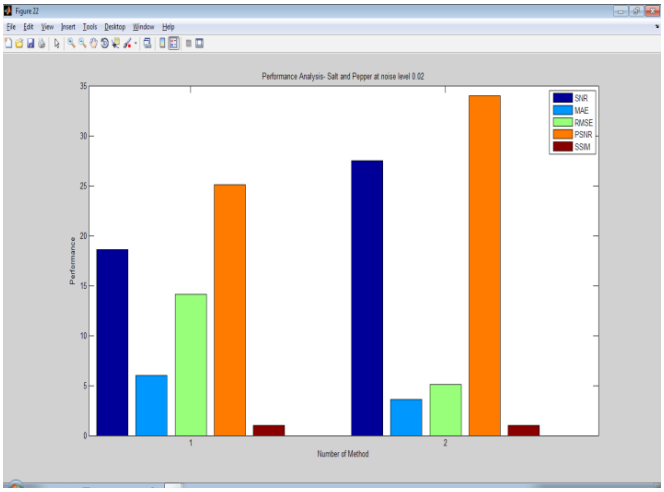
It is essential for many digital image processing applications to measure image quality. Image quality assessment is closely related to image similarity assessment in which quality is depended on the differences between a corrupted image and the original, or unmodified image. [1] It has been measured in terms of metrics such as,

a) Mean Squared Error (MSE).

b) Peak Signal to Noise Ratio (PSNR).

### 4.3.1 Mean Squared Error (MSE)

It is used to find difference between the original image and unclear image.




| FILTER | TEST IMAGE | MSE | PSNR |
|---|---|---|---|
| Wiener Filter | Image 1 | 199.1750 | 25.1385 |
| | Image 2 | 181.9382 | 25.5316 |
| | Image 3 | 248.2289 | 24.1823 |
| Shape Adaptive – Discrete Cosine Transform | Image 1 | 27.2500 | 33.7771 |
| | Image 2 | 19.7403 | 35.1773 |
| | Image 3 | 41.3357 | 31.9675 |

### 4.3.2 Peak Signal to Noise Ratio (PSNR)

It is a classical index distinct as the ratio between the maximum feasible the power of corrupting noise and power of a signal.

## 5. CONCLUSION

In this paper it is described about different types of noises which appear in the images with its various type of noise reduction techniques. Thus, summarized that noise is an unwanted bits appear in the digital image. This makes low quality of image. Various noise types have various effects on the digital image. We can identify which type of noise appears in an image. In future, we analysis which one is the best de-noise technique.

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