

# Image Denoising using Filters and Evaluating Its Edges with Detection Methods - A Review

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**Abstract**— Edge detection is one of the fundamental operation of the image processing to locate the rapid intensity transitions in an image. Objective of our work is to detect edges in the image without any noise. Edges contain important information of the image. Image de-noising is a basic and important feature in image processing to remove the noise. In this paper, to remove or reduce the noise from the image, we are discussing some old techniques which are described by the researchers.

**Key words:** Edge Detection, Sobel Operator, Laplacian Operator, Canny Operator, De-Noising, Gaussian Noise, Salt And Pepper Noise, Image Filter

## I. INTRODUCTION

Image processing is a type of signal processing, in which the input is an image (screen shot, photograph, logo) and the output may be either an image or set of characteristics related to that image. Edge detection is a part of image segmentation techniques which determines the existence of an edge in image to reduce the amount of data to be processed. Edge detection is a method which is used to identify points in a digital image at which the image brightness changes rapidly. Different types of edge detector operators are available now. In the ideal case, the output of applying an edge detector to an image may lead to a set of connected points that indicate the boundaries of objects in that image. There are several types of noises present in the environment. The aim of image processing is to maintain the quality of any image. Image de-noising is a very important part of image processing. Different filters are used in the process of identifying the image by locating the sharp edges which are discontinuous. These discontinuities bring changes in pixels intensities which define the boundaries of the object. In a particular image, edges determine object boundaries and are useful for segmentation, registration and identification of objects in a scene. Edges are classified into step, line, ramp and roof edges.

## II. LITERATURE REVIEW

There are several experimental works done on image denoising and detecting there edges. Various technologies and methodologies are used for edge detection of an image. Different filtering techniques are also used for the denoising an image. Image edge detection is done by various operators, like sobel, canny, prewitt, LoG etc. Edge detection techniques are very sensitive in noisy environment because the high ratio of amplitude. It is important to reduce noise before extracting the features from a noisy image. A review over some of those techniques are presented in this paper for edge detection and the de-noising of an image.

“Evaluate Combined Sobel-Canny Edge Detector for Image Procsging,”, Dr. Luma Salal Hasan 2013: In this

paper, presents a brief theory for the sobel kernel and canny edge detector. Then propose an algorithm which combined two detectors, the sobel detector which is widely used in digital image processing and canny edge detector that is another classical techniques. The design consists of three stages. Firstly added salt & pepper noise to the original noise free image file, then use the sobel detector for the file ,then apply canny detector on the results of the second stage to filter the pixel that signed out as an edge in the sobel detection by using Gaussian filter.

The proposed algorithm consist of three stages which depending on using hybrid edge detector (sobel and canny edge detectors) . If the input image file contains a weak edge ,sobel disable to detected. To filter these pixels, compute the canny edge detector. Figure 1 , shows the chart for the proposed hybrid algorithm.

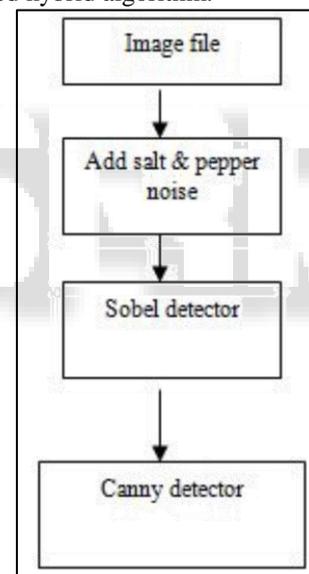


Fig. 1: Chart for Combined Sobel-Canny Edge Detector

From the result, deduce that when apply sobel- in the second stage for the salt & pepper noisy image detect the nearest noisy point in the image file as an edge but when apply the canny detector in the third stage , remove these point as possible by Gaussian filter depending on the value of sigma Also, deduce that the combined algorithm is work in the best state if the sigma is increased. The popularity of this method can be attributed to its optimality according to the best detection ,good localization and single response to an edge.

“Image Denoising Using Median Filter with Edge Detection Using Canny Operator”, 2014, Angalaparameswari Rajasekaran, Senthilkumar, P: In this paper, a novel approach to suppress noise from the image is conducted by applying the median filter. Interquartile range (IQR) which is one of the statistical methods used to detect

outlier effect from a dataset. Advantage of applying IQR filter is to preserve edge sharpness better of the original image. This paper compares and analyzes several kinds of image edge detection, including prewitt, sobel and canny with matlab tool. The experimental results on standard test images demonstrate this filter is simpler and better performing than median filter.

The proposed algorithm in this paper focuses on how to effectively detect the noise and efficiently restore the image. Once pixel is detected as noise in previous phase, their new value will be estimated and set in noise reduction phase. The filters are used in the process of identifying the image by locating the sharp edges which are discontinuous. These discontinuities bring changes in pixels intensities which define the boundaries of the object.

Edges are basically discontinuities in the image intensity due to changes in the image structure. These discontinuities originate from different features in an image. A major advantage of the median filter over linear filters is that the median filter can eliminate the effect of input noise values with extremely large magnitudes.

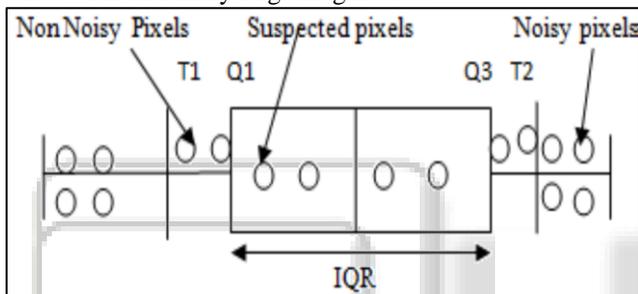


Fig. 2: IQR with T1 and T2

In this paper, a new and simple approach for removing salt and pepper noise from corrupted images has been presented.

The proposed filter use statistic in a way that removes outlier from a window of size  $k \times k$ . this filter can effectively reduce salt and pepper noise. Various edge detection algorithms and design methods have been described and discussed in this paper.

“Denoising and Edge Detection Using Sobel method” P. Sravya<sup>1</sup>, T. Rupa devi<sup>2</sup>, M. Janardhana Rao<sup>3</sup>, K. Jagadeesh<sup>4</sup>, T. Prasannakumar<sup>5</sup>, 2014: This paper presents a method which consists of sobel operator and discrete wavelet de-noising to do edge detection on images which include white Gaussian noise.

There were so many methods for the edge detection, sobel is the one of the method, by using this sobel operator or median filtering, salt and pepper noise cannot be removed properly, so firstly we use complex wavelet to remove noise and sobel operator is used to do edge detection on the image.

Applying an edge detection algorithm to an image may significantly reduce the amount of data to be processed and may therefore filter out information that may be regarded as less relevant, while preserving the important structural properties of an image. Edge detection is one of the key research works in the image processing. Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply. The point at which

image brightness changes sharply are typically organized into a set of curved line segments termed edges.

In an image like bacteria the information (micro cells) are very important, if it is corrupted with noise it will be difficult to segment the number of cells. Hence denoising may be useful for improving the SNR. By improving the SNR the segmentation is related to SNR. Thus the probability of detecting the number of cells may be improved. One technique for de-noising is wavelet thresholding.

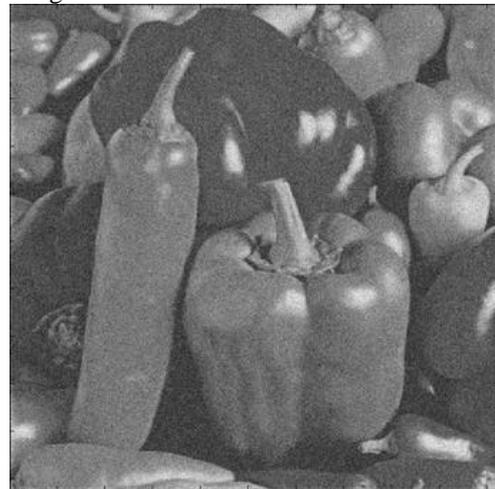


Fig. 3: The Original Image



Fig. 4: Complex Wavelet De-Noising



Fig. 5: Sobel Operator Image

As edges carry most important part of the information, here we used sobel operator and complex wavelet on white Gaussian noise images. By using the de-noising wavelet, image is noise free after that sobel operator is applied to detect edges. By using this method we will obtain the edges thick and dark which we can identify accurately.

### III. CONCLUSION

The edge detection is fundamental implementation in image processing which gives the contour of the object in an image. The ideal result of edge detection can trace the boundary of the object. This paper presents many approaches for edge detection and for the de-noising as well. A number of image de-noising techniques are used in this review paper, but we concluded that morphological techniques have better impact on noise removal task. In future we are going to work over some new morphological process to filter an noisy image.

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