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A Survey on Edge detection by The Neighbourhood Window Based approach

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ABSTRACT: Edge detection has an application area from astronomy to medicine, where focus is mainly on object than that of unwanted background image. As a result various edge detection algorithm have been developed. Edge detection is most frequently used technique in image processing. In this technique of edge detection, a novel and efficient algorithm uses hexagonally structured operator to increase accuracy as well as performance of calculating edge detection. The proposed method uses The Neighbourhood Window Based approach for image Binarization. In this algorithm, the threshold value of pixel is calculated by estimating the mean of Gray scale values of its neighbouring pixel, in an image. This technique also compare the algorithmic performance of canny edge detection algorithm.

KEYWORDS**:** Edge detection, Gray Scale Vector, Hexagonal image processing, Hexagonally Structured operator, Thresholding

I. INTRODUCTION

In today's World of digitization, Edge detection is one of the fundamental steps in image processing, image pattern recognition, image analysis and computer vision techniques, particularly in the areas of feature detection and feature extraction. Therefore various techniques were developed for processing images. Binarization is the process of converting a pixel image to a binary image.The high quality binarized image can give more accuracy in character recognition as compared original image because noise is present in the original image.

Hexagonal image structure is substitute image structure to traditional square image structure for image processing and computer vision. Edge detection of an image sensitively reduces the amount of data and filters out useless information, while protecting the important structural properties in an image. However, there are various methods for edge detection and majority of the method can be grouped into two groups, Laplacian and Gradient. The Laplacian method searches for zero crossings in the second derivative of the image to find edges. The gradient method detects the edges by looking for the maximum and minimum in the first derivative of the image. An edge has the one-dimensional shape of a ramp and calculating the derivative of the image can highlight its location.

Edge detection is one of the basic importance aspect in image processing. The parts on which immediate changes in Gray tones occur in the images are called edges. Promoting from the direct relation between their edges and physical qualities of the materials, these qualities can be documented from edges. Because of these qualities, edge detection techniques gain importance in terms of image processing

Steps in edge detection are as follow:

- Smoothing Remove as much noise as possible, without destroying the true edges.
- Enhancement apply a filter to improve the quality of the edges in the image (sharpening).
- Detection govern which edge pixels should be rejected as noise and which should be retained

For structure of hexagonal pixel each square pixel is separated into 7*7 smaller pixels called sub pixels [17]. The light intensity for each sub-pixel is similar as that of the pixels from which the sub-pixels are separated. A hexagonal pixel is also called hyperpel and each virtual hexagonal pixel is formed as shown in figure by 56 sub-pixels forming the hexagonal structure. The size of each constructed pixel is,

$$56\text{-}49/56 = 12.5$$

So, the number of hexagonal pixel is 12.5 percent less than the number of square pixels used in the similar image.

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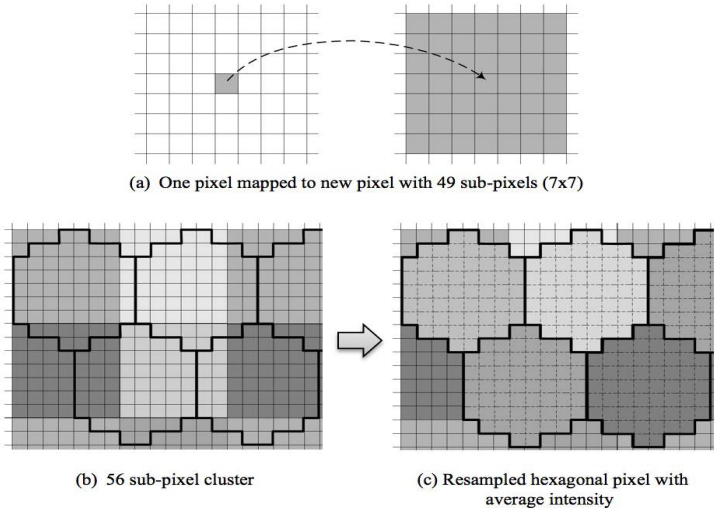

Figure 1 .Hexagonal pixel at sub pixel level

II. RELATED WORK

In real world, Image is represented using square pixel structures containing thousands of pixels. An image is 2D function f(x,y) where x,y are coordinate of system.

The various edge detection techniques were available for computing quality edge detection such as Robert, Sobel Laplacian of Gaussian, Canny and Prewitt are applied on the square pixels grid and hexagonal pixels grid [1]. Edge detection techniques were applied on the square pixels and hexagonal pixels. Hexagonal lattices have been explored for around forty years [13], [15], [17], making hexagonal sampling attractive for practical applications, although only recently attempts have been made to apply processing techniques directly to hexagonal images. An overview of the advancements in edge detection techniques can be found in [12], including an approach of Canny edge detection on a hexagonal grid.

Other edge detection methods on a hexagonal grid have been developed in [6],[9],[14],[15],[16]. Many edge detection algorithms that exist for conventional images are based on components. They powerfully aligned with the horizontal and vertical axes, and hence they are not readily adjustable to a hexagonal lattice. Only a small number of edge detection operators have been designed for use on hexagonal images, namely Sobel [19] and Prewitt [15], [18] operators, which have been modified from existing edge detection operators designed for use on conventional rectangular grids. The use of square structured operators is computationally less efficient when compared with hexagonally structured operators, in hexagonal grid, 12.5 % less pixels needed to represent same image resolution when compared with square pixel grid. In addition hexagonal operators typically contain fewer operator values than the corresponding square operators, thus achieving a significant overall reduction in computation For example, for a given 256 x 256 , removing boundary pixels,63504 pixels will be processed. If the same image is re-sampled onto a hexagonal based image there will be 55566 pixels processed by an equivalent hexagonal gradient operator [2]. The detail methodology of Canny Edge detector has been studied [3]. G.T. Shrivakshan ET at. Presented various approach for edge detection with comparison of available techniques [4].

III. SYTEM MODEL

Image Enhancement referred as conversion of image quality to better and more understandable level for further processing including feature extraction and image interpretation. Basically image enhancement techniques include Grayscale conversion, Histogram conversion, Colour composition Feature Extraction include operations to quantify image quality through various functions and parameters. Features involved in image includes Spectral feature,

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Geometric feature, Textural features. Edge detection is mainly concerned with Geometric feature. The system comprise RGB colour image to Grayscale image conversion to perform for image enhancement. The obtained output is further processed by median filter for achieving noise restraining. Finally we get Output by Neighbourhood window based approach for feature extraction. The edge detection is an essential task in the fields of image processing and computer vision. It is a process of partitioning the digital images and is used to locate the boundaries into a finite numbers of meaning full regions and easier to analyse. Thresholding is an important technique in image processing. The output of the thresholding process is a binary image whose Gray level value 1 (white) will indicate the background and Gray level value 0 (black) will indicate a pixel belonging to a drawing, print or target.

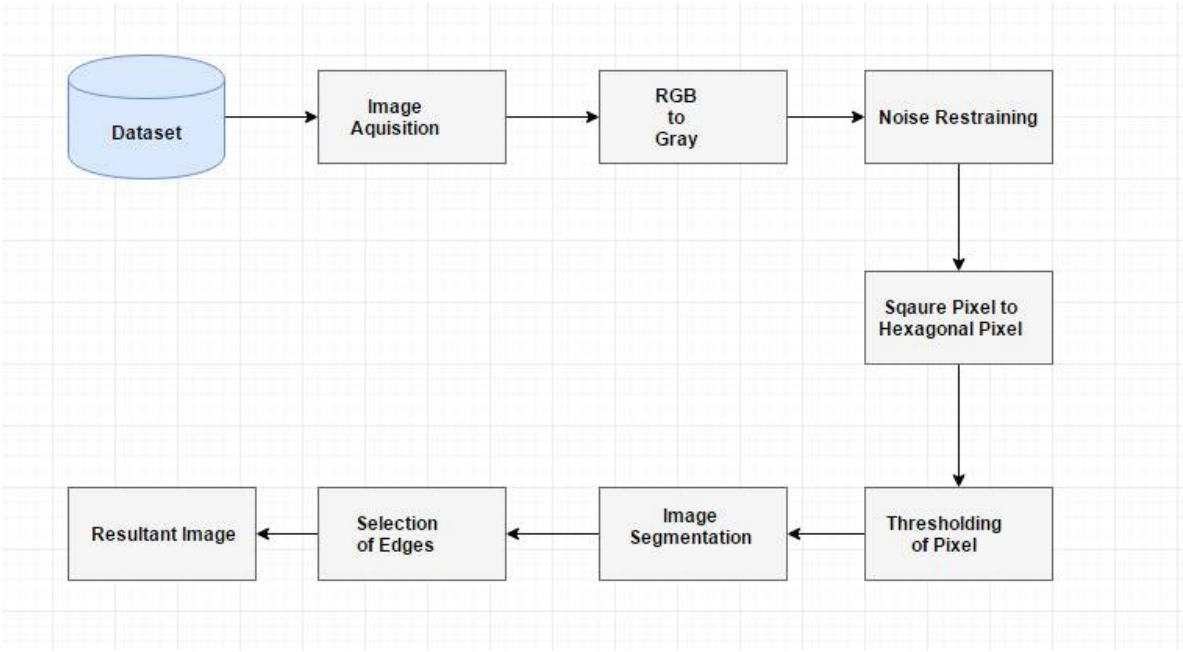

Figure1: Architecture Diagram of Proposed System

IV. CONCLUSION

An edge detection in image processing based on Neighbourhood Window Based approach is proposed. A new segmentation algorithm is developed in a way that each pixel in the image has its own threshold value by calculating the statistical information of the Grayscale values of its neighbourhood pixels. It is possible to get the edge of the image as the result of the proposed algorithm.It is possible to get better result by proposed algorithm than by canny operator. In the proposed algorithm, it takes less time to get an accurate result when small size structural operator is selected. And the continuous contour of an image is easy to get when the large size structural operator is selected. The proposed algorithm also has an obvious advantages in noise diminution, which is a good edge detecting algorithm with wide applicability.

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