

A STUDY ON CANNY EDGE DETECTION AND K-MEANS ALGORITHM.

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Abstract: Digital Image Processing deals with developing a digital system that performs operations on a digital image. Image processing involved various processes as segmentation, classification, recognition and restoration. Segmentation plays a vital role in image processing. Segmentation is a technique that extracts the interested region from the original image. Several algorithms and techniques have been buildup for image segmentation. Among the techniques of segmentation, Edge detection is used as the base of another segmentation technique. Edge detection techniques alter the image into edge image using the modification of gray tones in the images. Among the different edge detection techniques, canny edge detection is the best one to detect the wide range of edges in images. In image segmentation, K-means algorithm classifies the image into group of classes (cluster) based on their distance from one to another. In this paper, the techniques of image segmentation; canny edge detector and K-means algorithm are discussed.

Keywords: Image Segmentation, Edge Detection, Canny edge Detector, K-means algorithm.

I.INTRODUCTION

Digital image are made by the elements of picture called pixels. Pixels are structured in a rectangular array. The image size can be determined by the dimension of pixels array. The image width is the number of columns and the image height is the number of rows. Every pixel has its individual intensity value or brightness. If all pixels have the same value, the image will be in even shade. Black and white images only have intensity from the darkest gray (black) to lightest gray (white).

Color image have intensity from the darkest and lightest of three different colors Red, Green and Blue. The various mixtures of these colors intensities produce a color image. Image processing is processing of images using mathematical operations. The image processing generally deals with image acquisition, image enhancement, image segmentation, object recognition, image classification etc.

II.IMAGE SEGMENTATION

Image segmentation is the process of separating an image into region according to its color and objects of the image [1][2][3]. It is a key step for analyzing an image and compresses an image. It separates an image into regions which are called as objects and background. Image segmentation are categorized into two properties discontinuity and similarity [4]. Edged based segmentation, region based segmentation and special theory of segmentation are the techniques used to segment the image [5]. Edge based segmentation are used to segment a region by detecting the edges between two different regions. Edge based segmentation deliver a binary image as a result. The region based segmentation is used to partitioning an image into related region of joined pixels. Thresholding, Region growing, Region splitting and merging are the procedure of region based segmentation and the special theory of segmentation involve separating an image into pixel cluster.

Clustering and neural network are the technique used in this category of segmentation.

The rest of this paper is prepared as follows: section 3 describes the edge based segmentation algorithms, section 4 describes canny edge detection, section 5 describes K-means algorithm, and section 6 describes advantages and disadvantages.

III. EDGE DETECTION TECHNIQUES

Edge detection techniques alter the images into edge images using the modifications of gray tones in the images [11]. An edge are described by a discontinuity in gray level values. This process spots outline of an image. An edge filter is also used to get better presence of blurred image [12].

A number of edge detectors have been established by various researchers. Among them most important edge detection techniques are the Roberts, Prewitt, Sobel and Canny operators.

3.1 Roberts Edge Detection:

The Roberts Edge detector is used to spot edges by applying a horizontal and vertical filter in order. Roberts Edge detector is a simple one. The Roberts operator points the output values of pixel at the magnitude of the spatial gradient of the input point [11].

3.2 Prewitt Edge Detection:

In Prewitt Edge Detection, the edges are calculated by the magnitude and direction of an edge using the 3x3 neighborhoods for eight directions. The largest complexity mask is then selected as a resultant image [11].

3.3 Sobel Edge Detection:

The Sobel operator performs a 2-D spatial gradient dimension on an image and spots the region of high spatial frequency that relate to edges. Normally it is used to

discover the approximate complete gradient magnitude at each point in an input grayscale image.

IV. CANNY EDGE DETECTION

Among the different edge detection techniques, canny edge detection is the best one to detect the edges with high accuracy [6]. Without disturbing the features of edges, the canny edge detector detects the edges in the image [7]. Canny technique detects only the true edges in the image and remove all false edges. By using the Gaussian filter; the canny method produces thin edges [8].

The process of canny detection algorithm [9] is as follows:

- Smoothing.
- Finding gradient.
- Non-maximum suppression.
- Thresholding.
- Edge tracking.

Smoothing: The Gaussian filter is used to smooth the image. It removes the noise inside the image.

Finding gradients: The gradients of the image with huge magnitudes were marked. The gradient of the image is identified by applying Gaussian filter in both the vertical and horizontal directions.

Non-maximum suppression: Maximized magnitude value should be defined as edges and remaining pixels should be defined as a background of the image.

Thresholding: The hysteresis thresholding is introduced. There are two levels of threshold a.) t_h high level and b.) t_l low level. Pixel values are classified as edges when t_h is greater than t_l value.

Edge tracking: Eliminate the weak edges that are identified as low level. Final edges are connected to form strong edges.



Original Image



1. Robert



2. Prewitt



3. Sobel



4. Canny

V. K-MEANS ALGORITHM:

K-means algorithm is one of the most frequently used algorithm of clustering. K-means algorithm is an unsupervised algorithm of clustering [10]. It classifies the image into group of classes (cluster) based on their distance from one to another.

The k-means algorithm has the following steps:

Step 1: Initialize the number of clusters k .

Step 2: Assign a centroid which is nearest to the initial cluster k .

Step 3: When the next centroid is allocated, recalculate the location of k .

Step 4: Repeat the step 2 and step 3 until the centroids are moved longer.

VI. ADVANTAGES AND DISADVANTAGES:

In this paper the two algorithms, which are used to segment the image are discussed (1) *canny edge detection* (2) *K-means algorithm*.

The K-means algorithm runs with the minimum localization error. The canny algorithm holds an amount of adjustable parameter; this may disturb the time and the effectiveness of the algorithm.

The K-means algorithm permits stable edge strength capacity in both the bright region and dark region. In Canny edge detection, by providing the smoothing filter in the initial stage may cause the result of the image.

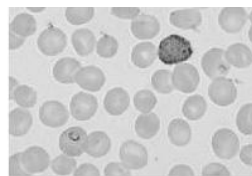
The K-means algorithm can be combined with other technique to get an improved vision of the image. The Canny edge detection holds complex computations and more time consuming.



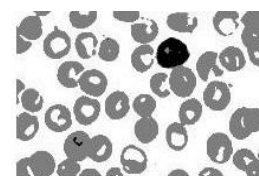
Original image



Canny edge detector



Original image K-means



VII. CONCLUSION

The Canny Edge detection holds a number of changeable parameters. This will affect the time of computation and effectiveness of the algorithm. In this technique the smoothing filter straight affects the outcome of the image. This may cause some information lost. The Canny Edge detection performs superior than K-means. The K-means algorithm can be combined with further technique to create hybrid algorithm.

VIII. REFERENCES

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