



REVIEW OF POPULAR EDGE DETECTION TECHNIQUE

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Abstract

Edge detection is terminology in image processing and for computer vision. Edge detection is in the forefront of image processing for object detection, so it is crucial to have good understanding of edge detection operators. In the present study, comparative analyses of different edge detection operators in image processing are presented. It has been observed from the present study that the performance of canny edge detection operator is much better than Sobel, Roberts, Prewitt, Canny in respect to the image appearance and object boundary localization. The software tool that has been used is MATLAB.

Keywords: Edge Detection, Digital Image Processing, Image segmentation.

I. INTRODUCTION

Edge detection is a technique of image processing. With the help of edge detection we can detect and localize the boundaries of an object in an image. Image detection is used for dividing an image in different parts and data extraction in areas such as image processing. Most conventional edge detectors are designed based on some models of edges. For examples, gradient-based methods [1,2] assume edges as the set of pixels where the gray level has a high rate of change, or in a Canny edge detector [3], edges are considered as step functions corrupted by Additive White Gaussian Noise (AWGN). It works by detecting discontinuities in brightness.

The purpose of detecting sharp changes in image brightness is to capture important events and changes in properties of the world. It can be shown that under rather general assumptions for an image formation model, discontinuities in image brightness are likely to correspond to: [\[1\]\[2\]](#)

- discontinuities in depth
- discontinuities in surface orientation
- changes in material properties and
- Variations in scene illumination

We applying an edge detector to an image may lead to a set of connected curves that indicate the boundaries of objects, the boundaries of surface markings as well as curves that correspond to discontinuities in surface orientation. When we 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. If the edge detection step is successful, the subsequent task of interpreting the information contents in the original image may therefore be substantially simplified. However, it is not always possible to obtain such ideal edges from real life images of moderate complexity.

II. EDGE DETECTION TECHNIQUES

The edge portrayal of an image extremely reduces the quantity of data to be processed. This description of an image is easy to assimilate into a huge amount of object recognition algorithms used in various application like computer vision and image processing. Edge detection technique is use for extract the exact edge line with good orientation. Edge detection is an image segmentation techniques which determines the presence of an edge or line in an image. Edge detection methods transform original images into edge images. The detection operation begins with local cessation at each pixel element in an image. The edge detection is a important variations of a gray level image.

(A). Robert Edge Detection

The Roberts edge detection technique is introduced by Lawrence Roberts (1965). The Roberts edge detection technique compute 2-D spatial gradient measurement on an image. This technique reiterate region high spatial frequency which often correspond to edges. The input to the operator is a grayscale image, as is the output. Pixel values at each point in the output represent the estimated absolute magnitude of the spatial gradient of the input image at that point.

+1	0
0	-1

0	+1
-1	0

G_x

G_y

(B). Sobel Edge Detection

The Sobel edge detection performs a 2-D spatial gradient measurement on an image. This technique reiterate region high spatial frequency that correspond to edges. Typically it is used to find the approximate absolute gradient magnitude at each point in an input grayscale image.

-1	0	+1
-2	0	+2
-1	0	+1

+1	+2	+1
0	0	0
-1	-2	-1

G_x

G_y

(C). Prewitt Edge Detection

The Prewitt edge detection is proposed by Prewitt in 1970. The Prewitt Edge filter is use to detect edges based applying a horizontal and verticle filter in sequence. Both filters are applied to the image and summed to form the final result. The two filters are basic convolution filters of the form.

+1	+1	+1
0	0	0
-1	-1	-1

-1	0	+1
-1	0	+1
-1	0	+1

G_x

G_y

(D). Canny Edge Detection

Canny edge detection is a popular edge detection algorithm. It was developed by John Canny in

1986.it is multistage algorithm and we will go through each stages.

1. Apply Gaussian filter to smooth the image in order to remove the noise
2. Find the intensity gradients of the image
3. Apply non-maximum suppression to get rid of spurious response to edge detection
4. Apply double threshold to determine potential edges
5. Track edge by hysteresis: Finalize the detection of edges by suppressing all the other edges that are weak and not connected to strong edges.

EXPERIMENTAL RESULT

This section presents the relative performance of various edge detection techniques such as Roberts edge detector, Sobel Edge Detector, Prewitt edge detector, Canny Edge Detector. The edge detection techniques were implemented using MATLAB R2009a, and tested with an image (Quantum Global Campus). The objective is to produce a clean edge map by extracting the principal edge features of the image. The original image and the image obtained by using different edge detection techniques are given in figure.

CONCLUSION

Edge detection is the initial step for object recognition. We have different type of operator for edge detection. We detect the edge of an image which are based on discontinuity intensity levels. We have been observed that the canny edge detector produces higher accuracy in detection of object edges. The performance of various edge detection techniques is carried out by using MATLAB software. It is observed from the results Roberts, sobel edge detectors produce almost same edge map. Canny result is superior one when compared to all for a selected image. so many edge detection techniques are available in the literature, since it is a challenging task to the research communities to detect the exact image without noise from the original image.

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