

A Comprehensive Review On Different Edge Detection Techniques

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Abstract: *Edge detection is one of the most commonly used operations in image analysis and is also an essential pre-processing step in image segmentation. An edge is the boundary between an object and the background, and indicates the boundary between adjacent parts of image and overlapping objects. Here we are reviewing several techniques for edge detection like Sobel operator technique, Prewitt technique, Fuzzy Edge Detection technique, Canny technique, Roberts technique and Morphology based multi structure elements edge detection technique.*

Keywords: Boundary, Edge detection techniques, Image segmentation, Objects.

Introduction

The first step in image analysis is segment the image. Segmentation subdivides an image into its constituent parts or objects. The level to which this subdivision is carried depends on the problem being viewed. Some time need to segment the object from the background to read the image correctly and identify the content of the image for this reason there are two techniques of segmentation, discontinuity detection technique and Similarity detection technique. In the first technique, one approach is to partition an image based on abrupt changes in gray-level image. The second technique is based on the threshold and region growing. This paper discusses the first technique using Edge Detection method. Edge detection is a very important area in the field of image processing. Edge detection detects outlines of an object and boundaries between objects and the background in the image. Edge is a boundary between two homogeneous regions. Edge detection refers to the process of identifying and locating sharp discontinuities in an image [4].

Different edge detectors work better under different conditions. In order to choose the better technique, you must first know which edge detectors perform better under which conditions. That is the goal of this paper. In this paper we focus on one of the most famous and common used edge detection techniques like Sobel operator technique, Prewitt technique, Fuzzy Edge Detection technique, Canny technique, Roberts technique and Morphology based multi structure elements edge detection technique.

Literature Survey

- A. **Shihu Zhu, “Edge Detection Based on Multi-structure Elements Morphology and Image Fusion”, 2011** proposed the new method of edge detection based on multi-structure elements morphology and image fusion. Edges are detected using four different orientations SE (structure

element) where direction angles of all the structure elements are 0° , 45° , 90° , 135° and final edge result is got by image fusion using entropy weighted method. The proposed method not only can effectively eliminate the image noise, but also effectively maintain good edge information. [1]

- B. C.Naga Raju, “Morphological Edge Detection Algorithm Based on Multi-Structure Elements of Different Directions”, 2011** proposed an edge detection algorithm based on multi- structure elements morphology. The eight different edge detection results are obtained by using morphology gradient algorithm and final edge results are obtained by using synthetic weighted method. The proposed algorithm results are compared with the conventional mathematical morphological edge detection and differential edge detection operators such as Watershed method, Sobel operator and Canny operator and obtained the better edges over traditional methods. [2]
- C. Wenshuo Gao, “An Improved Sobel Edge Detection”, 2010** proposed a method which combines Sobel edge detection operator and soft-threshold wavelet de-noising for edge detection. This method used on images which include White Gaussian noises. The widely used operators such as Sobel, Prewitt, Roberts and Laplacain are sensitive to noises and their anti-noise performances are poor. This paper proposes an edge detection method which combines soft-threshold wavelet de-noising and Sobel Operator, its anti-noise performance is very strong. Firstly soft-threshold wavelet used to remove noise, then Sobel edge detection used for edge detection on the image. The effect by using this method to do edge detection is very good and can remove the noise effectively. [3]

- D. **Sabina Priyadarshini, “A New Edge Detection Method based on Additions and Divisions”, 2010** proposed a new technique of edge detection that employs simple additions and divisions and finds out fine edges. It makes use of a threshold that is computed automatically during the edge detection process and its simple to compute the threshold value. It is based upon simple arithmetic and logic operations, consisting of three procedures: image binarization, image contraction and image subtraction. The proposed method is a computationally simpler and performs better than Sobel’s method and require much lesser computation than Sobel’s method. [6]
- E. **Tapas Kumar, “A Novel Method of Edge Detection using Cellular Automata”, 2010** proposed a new approach of edge detection based on cellular automata. The algorithm will correspond to edge detection for grayscale images. The proposed conception of cellular automata for k gray levels of digital images is on the basis of bi-dimensional cellular automata. A result produced by Cellular Automata works satisfactorily for different gray level images and produce better edge detection effects as compared to Canny, Roberts, Prewitt and Sobel.[8]
- F. **Wafa barkhoda, “Fuzzy Edge Detection Based on Pixel’s Gradient and Standard Deviation Values”** proposed a new fuzzy based edge detection algorithm which used two different methods, gradient and standard deviation of pixels value, which form two set of edges which are considered as inputs for fuzzy system and then based on fuzzy logic, final decision is made by fuzzy system about whether each pixel is edge or non edge according to 5 fuzzy rules and fuzzy membership functions. This method showed the higher performance and quality of the extracted edges when compared to the other edge detection methods like Sobel, Robert, and Prewitt. [9]

- G. **Madhu S. Nair, “HBT Filter and Logarithmic Transform Based Edge Detection – A Modified Approach”, 2009** proposed a modified edge detection algorithm that used logarithmic transform and Hyperbolic Tangent (HBT) filter that preserves Contrast-Invariant Edge Similarity and gives better Structural Similarity Index (SSIM) and almost equal or higher PSNR values. The HBT filter along with logarithmic transform provides us the ability to view the frequency content of an image and has been applied to the image in frequency domain. The main drawback of this method is in the case of contrast variant and noisy images. The proposed algorithm gives better results for noiseless and luminance variant images. [10]
- H. **Jing Tian, “An Ant Colony Optimization Algorithm for Image Edge Detection”, 2008** proposed an Ant colony optimization based edge detection approach. Ant colony optimization (ACO) is an optimization algorithm based on real ants' behavior and inspired by the natural behavior of ant species. In real life, ants deposit pheromone on the ground in order to mark the path they used that should be followed by other members of the colony. The proposed algorithm establishes a pheromone matrix, which represents the edge information at each pixel position of the image. For this number of ants are dispatched to move on the image driven by the local variation of the image's intensity values. [11]

Conclusion

The purpose of this paper is to present a survey of various edge detection techniques for image segmentation like Sobel operator technique, Prewitt technique, Fuzzy Edge Detection technique, Canny technique, Roberts technique and Morphology based multi structure elements edge detection technique. This review paper provides the meaningful help to the researchers in understanding the concept of edge detection who are new in the field of image segmentation.

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