

Edge Based Segmentation in Medical Images

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Abstract: Image segmentation is the method to fragment a given image into a number of Regions or objects. The level of detail to which the partition is carried depends on the problem being solved. Edge detection is mostly used techniques in digital image processing. Edge detection will preserve the structural properties of an image and filter out unwanted data. In this paper, Edge detection methods such as Sobel, Prewitt, Robert, Canny, and Laplacian of Gaussian (LOG) are used. These methods are used in image segmentation. Edge detection can be enhanced by combining with denoised image. Wiener filter, Gaussian Filter and Median Filters are used for noise reduction. The results of various methods are analyzed by implemented in MATLAB.

Keywords: Image processing, Image segmentation, Sobel method, Prewitt method, Canny method, Robert method.

I. INTRODUCTION

Partitioning the image into set of pixel is called segmentation. The main objective of image segmentation is to represent an image with uniqueness, to make it easier to analyse much more informative. The segmentation is based on grey level, colour, texture, depth or motion of an image. The output of image segmentation is a set of segments of whole image. The pixels with similar characteristics are grouped such as colour, intensity, or texture. The applications of image segmentation are:

- Medical imaging
- Object detection
- Face, finger and iris recognition
- Traffic control system
- Computer vision

II. EDGE BASED SEGMENTATION

Image Segmentation Algorithms are mostly based on two basic properties of intensity profile: Discontinuity based segmentation and similarity based segmentation. In the Discontinuity based segmentation technique, segmenting an image based on sudden change in intensity. Discontinuity mainly concerned with identification of isolated points, lines and Edges of an image. Edge detection is mostly used techniques in digital image processing. Two fundamental steps in performed in edge detection: First, Image smoothing done with help of various filtering techniques then edge point is detected. Edge detection Techniques are:

- The Robert Cross Method
- The Prewitt Method
- The Sobel Method
- The Laplacian of Gaussian Method
- The Canny Method.

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Edge detection is used to find margins of object or region within an image. Edge detection Techniques are done with different filtered images. First Colored image is converted into Gray scale image, and then various filter's applied in image to remove the noise in the image. In this paper, Median, Wiener and Gaussian filter's are used .Figure (1) is the result of various filtering technique applied in Osteosarcoma MRI images.

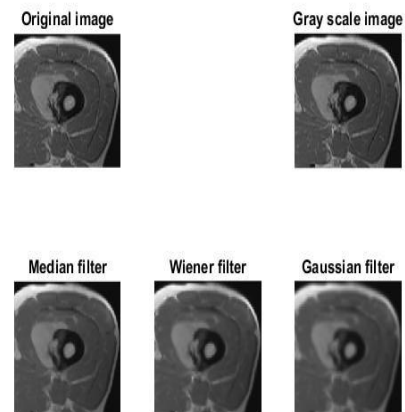


Figure 1

A. The Robert Cross Method

The Robert cross method is proposed by Lawrence Roberts .This is a first edge detection technique. The concept behind this method was to approximate the gradient of image through separate differentiation that is achieved by calculating sum of the squares of the differences between diagonally adjacent pixels.Its main disadvantages is very perceptive to noise. It does not produce good result to real edges unless they are very sharp.

The Robert method is specified by $BW = \text{edge}(A, 'robert')$. $BW = \text{edge}(A, 'robert', \text{thresh})$. Edge ignores all edges not exceed thresh value. If thresh value is not defined or empty. Edge selects the value automatically.

Figure (2) shows image are segmented using Robert cross method technique with various image filtering techniques.

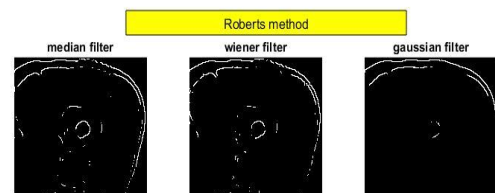


Figure 2

B. The Prewitt Method

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The prewitt method is based on convolving the image with a tiny, discrete, integer valued filter in vertical and horizontal direction. It produces more accurate result than Robert method. Its computational time is less expensive and faster method for edge detection.

The Prewitt method is specified by $BW = \text{edge}(A, \text{'prewitt'})$. $BW = \text{edge}(A, \text{'prewitt'}, \text{thresh})$. Edge ignores all edges not exceed thresh value. If thresh value is not defined or empty. Edge selects the value automatically. Fig. (3) shows image are segmented using Prewitt method technique with various image filtering techniques.

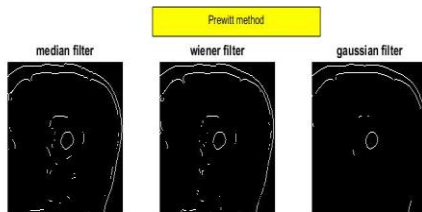


Figure 3

C. The Sobel Method:

The Sobel method is based on convolving the image with a tiny, discrete, integer valued filter in vertical and horizontal direction. It has better noise suppression. The Sobel method is similar to Prewitt, only difference is coefficient of mask can be adjusted. Its computational time slightly differ with Prewitt method.

The Sobel method is specified by $BW = \text{edge}(A, \text{'sobel'})$. $BW = \text{edge}(A, \text{'sobel'}, \text{thresh})$. Edge ignores all edges not exceed thresh value. If thresh value is not defined or empty. Edge selects the value automatically.

Figure (4) shows image are segmented using Sobel method technique with various image filtering techniques.

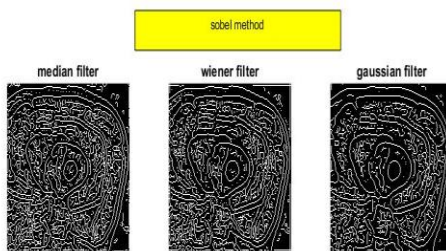


Figure 4

D. The Laplacian of Gaussian Method:

The concept behind this method is first image smoothing done with Gaussian filter to remove the noise from the image then it is operated by Laplacian operator. these two operations together is called Laplacian of Gaussian (LOG).

The Laplacian of Gaussian method is specified by $BW = \text{edge}(A, \text{'log'})$. $BW = \text{edge}(A, \text{'log'}, \text{thresh})$. Edge ignores all edges not exceed thresh value. If thresh value is not defined or empty. Edge selects the value automatically.

Figure (5) shows image are segmented using Laplacian of Gaussian method technique with various image filtering techniques.

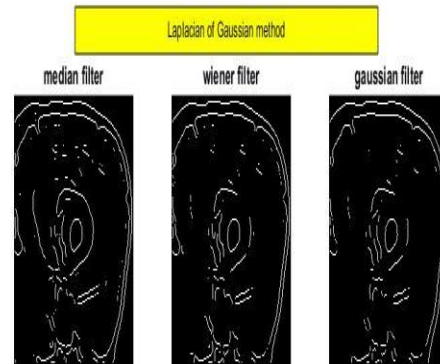


Figure 5

E. The Canny Method:

The canny method plays vital role in edge detection. The process of canny method is First, image smoothing done by Gaussian filter, then find the intensity of gradients of the image to compute edge strength then apply non maximal to the gradient magnitude finally apply threshold to non maximal suppression image.

The Canny method is specified by $BW = \text{edge}(A, \text{'canny'})$. $BW = \text{edge}(A, \text{'canny'}, \text{thresh})$. Edge ignores all edges not exceed thresh value. If thresh value is not defined or empty. Edge selects the value automatically.

Figure (6) shows image are segmented using Canny method technique with various image filtering techniques.

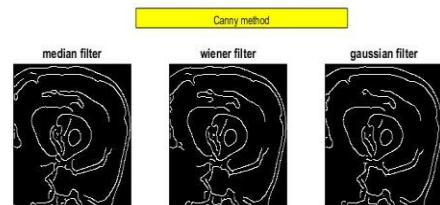


Figure 6

III. CONCLUSION

In this paper, various edge detection techniques used in image segmentation such as Robert, Prewitt, Sobel, Laplacian of Gaussian and Canny were discussed. The Sobel is a strong response to diagonal edges. The Prewitt is Sensitive to noise. Laplacian and Gaussian operator cannot be use for edge detection even it produces double edges, so LOG is much better than those two operators. Canny edge give less sensitive to noise when compare to other edge detection techniques.

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BIOGRAPHY



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