A New Technique for Pectoral Muscle Detection

Farag H. Alhsnony

***Abstract*—Previous works on breast tissue identification and abnormalities detection notice that the feature extractionprocess is affected if the region processed is not well defined. Thereby, it is important to split the mammogram into regions to achieve optimal breast parenchyma measurements, breast registration or to put into focus a technique when searching for abnormalities. Detection and suppression of pectoral muscle can also help in image registration for further analysis of breast abnormalities In this paper a proposed new automated technique for segmenting a digital mammogram into breast region with pectoral muscle suppression. This technique uses bit depth and edge processes for pectoral muscle detection and suppression.**

***Index Terms*—Digital mammography, pectoral muscle detection.**

I. Introduction

Breast cancer is the most common form of cancer and the second cause of cancer deaths among women. Mammography is one of the best technologies currently being used for diagnosing breast tumor but it has a low negative predictive value, which leads to more needless breast biopsies so it is necessary to use some other ways to analyses and ameliorate the image such as determination the breast border and pectoral muscle detection, helping in image registration for further analysis of breast abnormalities [1].

Extracting the Pectoral Muscle is an important operation in mediolateral oblique view (MLO), where the pectoral muscle, slightly brighter compared to the rest of the breast tissue, can appear in the mammogram [2]. Previous work related to pectoral muscle suppression used Hough Transform [3], [4], assuming that the boundary between the pectoral muscle and the breast can be approximated by a straight line [5]. Other related works are that of Yam et al [6] whose work introduces a curvature component to the Hough estimation and that of Ferrari et al [7] who propose a polynomial modeling of the pectoral muscle.

II. The Proposed Technique

Edge detection is a fundamental tool used in most image processing techniques to obtain information from the frames as a precursor step to feature extraction and object segmentation. This process detects outlines of an object and boundaries between objects and the background in the image. The basic edge detection operator is a matrix area gradient operation that determines the level of variance between different pixels. The edge detection operator is calculated by forming a matrix centered on a pixel chosen as the center of the matrix area. All the gradients based are calculating the strength of the slope in Directions which are orthogonal to each other [1].

In this paper, canny edge processes is used. The Canny algorithm uses an optimal edge detector based on a set of criteria which include finding the most edges by minimizing the error rate, marking edges as closely as possible to the actual edges to maximize localization, and marking edges only once when a single edge exists for minimal response [8]. This method uses detection in image bit depth to obtain more contrast in the image. After edge detection using the canny filter a smoothened curve is drawn to suppression segment the pectoral muscle area. Test set of images is obtained from digital mammography device.

In this paper mammography image databases, especially MIAS [9] and DDSM [10] are used Both comprised of scanned and digitized SFM images. Algorithm has been tested on the set of 30 digital mammography images.

III. Breast Analysis

This section details the segmentation of mammograms for identifying the pectoral muscle in the breasts. The proposed approach utilizes edge processes for the segmentation. The edge processes are applied on the binary scale mammography images to segment the pectoral muscle region.

IV. Pectoral Muscle Determination

Pectoral muscle appears at approximately the same density as the dense tissues of interest in the image. Therefore, edge processes of pectoral muscle are important in order to limit the search for the breast abnormalities only to the breast “Soft tissue" region. For detection of pectoral muscle many different approaches have been used.

In border detection, the mammogram image is converted into pixels in to binary bits in the image. From the binary image the border points are extracted and it is mapped with the original image. Image enhancement refers to attenuation, or sharpening of image features such as edges, boundaries, or contrast to make the processed image more useful for analysis. Image enhancement techniques can be improved if the enhancement criteria can be stated precisely.

Determination of the breast region and non-breast region is a necessary prerequisite for further bilateral subtraction. This section presents the border detection method using edge algorithm. The present proposal chooses the suitable edge method and interdicted good results as shown in the following Fig. 1and Fig. 2.

Manuscript received October 9, 2012; revised March 1, 2013.

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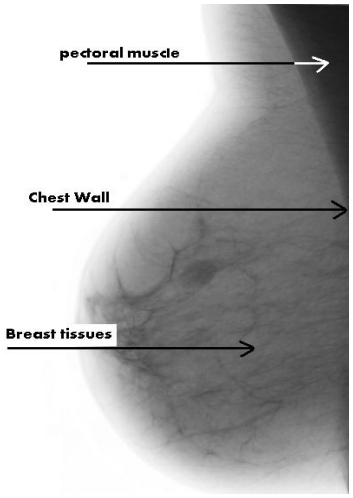

Fig. 1. A selected mammogram image for edge processing.

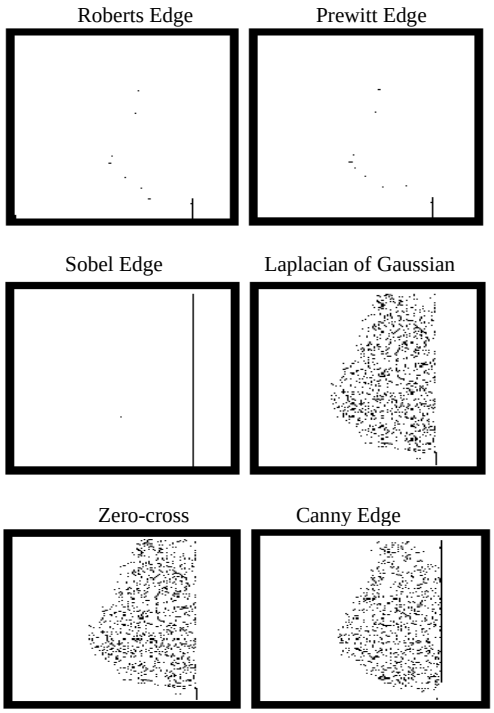

Fig. 2. A Comparison among some edge methods for a mammogram image processing.

From the previous analysis and discussion it is recommended to use the canny edge detection method to detect the pectoral muscle boundaries. The Fig. 3-Fig. 7 show a typical image that processed.

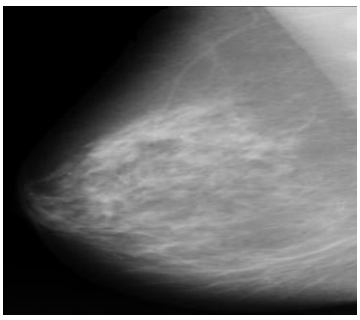

Fig. 3(a). An original breast mammogram image MIAS (mdb007).

Fig. 3(b). A pectoral muscle detection and suppression.

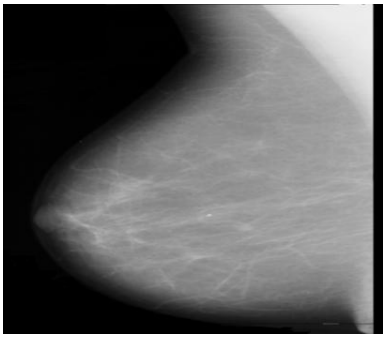

Fig. 4(a). An original breast mammogram image(mdb009).

Fig. 4(b). A pectoralmuscle detection and suppression.

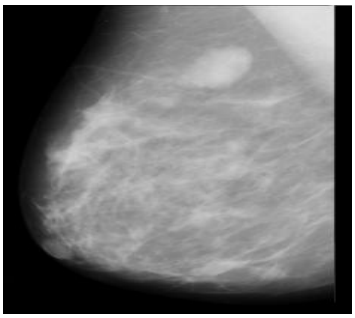

Fig. 5(a). An original breast mammogram image(mdb015).

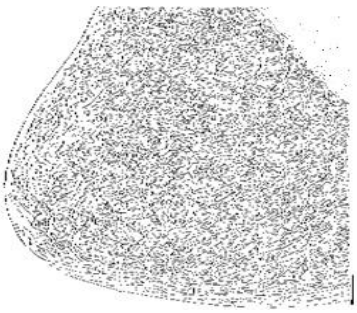

Fig. 5(b). A Pectoral muscle Detection and suppression.

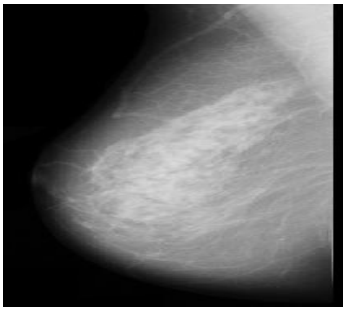

Fig. 6(a). An original breast mammogram image(mdb022).

Fig. 6(b). A pectoral muscle detection and suppression.

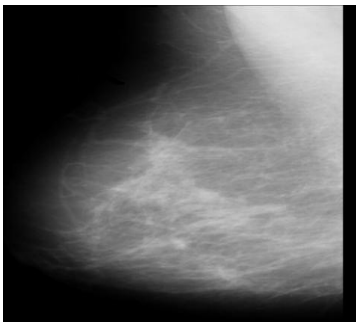

Fig. 7(a). An original breast mammogram image(mdb093).

Fig. 7(b). A pectoral muscle detection and suppression.

From the above figures, using the canny edge detecting technique, it is seen that the proposed technique is quite simple and accurate for determining the breast pectoral muscle and suppression.

V. Conclusions

An efficient detection of breast pectoral muscle from digital mammograms images has been introduced in this paper. It is based on the canny edge method. Simulation results show that the proposed model yield significantly superior image quality when it is compared to the other well-known algorithms. Moreover, they are easy and simple to implement.

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