Computer Aided Identification and Analysis of Fibro adenomas

Mousumi Chakraborty

Dept. of Computer Science & Engineering, RCC Institute of Information Technology, Kolkata, India

ABSTRACT

Fibroadenoma is one of the most common benign breast lesions, has a characteristic age-specific incidence and is associated with other pathological entities in 50% of cases. The clinical or imaging diagnosis of fibroadenoma may be erroneous, and in some cases is found to be invasive cancer. The clustering of such entities, their correlation with age, and the risk of synchronous breast malignancy are uncertain.If it can be detected earlier and treated properly then the patient can survive. Computational techniques in the processing of mammographic images allow us to assist the oncologist with a Computer Aided Diagnosis (CAD) system. The overall objective of the work is to implement and evaluate a method for the analysis of fibro adenoma. Here we present a detection system to analyze lesions. The threshold method and region growing method is used to segment the images and to detect the affected part. The above mentioned processes are tested on different mammographic images randomly retrieved from popular search engine.

Key words-
Fibro adenoma; Computer Aided Diagnosis; Segmentation

1. INTRODUCTION

Fibroadenoma of the breast is a benign tumor and one of the most commonly encountered breast lesions. It constitutes one of several pathological entities within the broader definition of benign fibrocystic breast disorders. Although much more common in the young age group, Fibro adenoma can occur in older women as well.

The automatic diagnosis of lesions using the various computational technique is the most important and major utilization of medical image processing and computer-aided diagnosis system. Nowadays, fibro

*Computer Aided Identification and Analysis of Fibroadenomas | **M. Chakraborty***

adenoma is a very common concern of the women of the developing countries. The cure of this disease is related to early detection and proper treatment. An automated method to analyze the fibroadenomaimages and to extract the diagnostic features of the images can be helpful to detect the disease. In this project, the mammogram images of affected breast tissues are used as preliminary data items.

Automatic extraction of lesions from digital mammogram images is a challenging task. Here, we have developed an automated image analysis system to identify the fibro adenoma to match the expert theory. In order to extract the texture information of lesion properly, segmentation method has been utilized. The mammogram is segmented in different regions. We divide segmentation methods into eight categories: (1) thresholding approaches, (2) region growing approaches.

This paper consists of the following sections: section two deals with the segmentation approaches, section three deals with the proposed methodology and experimental result.

2. MORE ABOUT FIBRODENOMAS

Fibroadenomas are benign and don't increase the risk of developing breast cancer. They are thought to occur because of an increased sensitivity to the female hormone estrogen. A fibro adenoma usually has a smooth rubbery texture and can move easily under the skin. Sometimes refer to them as "breast mice" because they tend to run away from your fingers. Fibro adenomas are usually painless, but some people may feel some tenderness or even pain. Fibro adenomas are very common and it is not unusual to have more than one. Often developing during puberty, they are mostly found in young women, but can occur at any age. In most traditional mean age of female sexual development was in the early 11s, over the past decade in developed countries, this age has been decreasing.

Breasts are made up of lobules (milk-producing glands) and ducts (tubes that carry milk to the nipple), which are surrounded by glandular, fibrous supporting tissue and fatty tissue. Fibro adenomas develop from a lobule. The glandular tissue and ducts grow over the lobule and form a solid lump.

Fibro adenomas range in size from one to five cm, (0.39 inches to nearly two inches). Giant fibro adenomas can be the size of a small lemon, about 15 cm (5.9 inches). Most fibro adenomas are about 1 to 3cm in size and are called simple fibroadenomas. Occasionally, a fibroadenoma can grow to more than 5cm and may be called a giant fibroadenoma. Those found in teenage girls may be called juvenile fibroadenomas.

Most fibroadenomas stay the same size. Some get smaller and some eventually disappear over time. Sometimes fibroadenomas get bigger, particularly in teenage girls and pregnant and breastfeeding women, but often get smaller again.

The exact cause of fibroadenomas is unknown. They seem to be influenced byestrogen, because they appear most often in premenopausal or pregnant women, or in women who are postmenopausal and taking HRT (hormone replacement therapy). Most fibroadenomas change in size during the menstrual cycle, when women's hormone levels are changing. Thus, during the menstrual cycle the same adenoma can become more noticeable or it may shrink to the point where it is not readily palpable.

Fibroadenomas are usually single lumps. About 10% to 15% of women have several lumps that may affect both breasts. Lumps may be any of the following:

[1]   Easily moveable under the skin

[2]   Firm

[3]   Painless

[4]   Rubbery

Lumps have smooth, well-defined borders. They may grow in size, especially during pregnancy. Fibroadenomas often get smaller after menopause (if a woman is not taking hormone therapy).

3.SEGMENTATION

In computer vision, segmentation refers to the process of partitioning a digital image into multiple segments.Image segmentation is typically used to locate objects and boundaries in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Due to the importance of image segmentation a number of algorithms have been proposed but based on the image that is

inputted the algorithm should be chosen to get the best results.

3.1DIFFERENT SEGMENTATION PROCEDURE

All image processing operations generally aim at a better recognition of objects of interest, i. e., at finding suitable local features that can be distinguished from other objects and from the background. The next step is to check each individual pixel to see whether it belongs to an object of interest or not. This operation is called segmentation and produces a binary image. A pixel has the value one if it belongs to the object; otherwise it is zero. Segmentation is the operation at the threshold between low-level image processing and image analysis. After segmentation, it is known that which pixel belongs to which object. The image is parted into regions and we know the discontinuities as the boundaries between the regions.

The different types of segmentations are

•**Pixel-Based Segmentation:**

Point-based or pixel-based segmentation is conceptually the simplest approach used for segmentation.

•**Threshold based segmentation:**

Histogram thresholding and slicing techniques are used to segment the image. They may be applied directly to an image, but can also be combined with pre- and post-processing techniques.

• **Edge based segmentation.**

With this technique, detected edges in an image are assumed to represent object boundaries, and used to identify these objects.

• **Region based segmentation.**

Where an edge based technique may attempt to find the object boundaries and then locate the object itself by filling them in, a region based technique takes the opposite approach, by (e.g.) starting in the middle of an object and then "growing" outward until it meets the object boundaries

•**Clustering techniques**.

Although clustering is sometimes used as a synonym for (agglomerative) segmentation techniques, we use it here to denote techniques that are primarily used in exploratory data analysis of high-dimensional measurement patterns. In this context, clustering methods attempt to group together patterns that are similar in some sense. This goal is very similar to what we are attempting to do when we segment an image, and indeed some clustering

techniques can readily be applied for image segmentation.

•**Matching.**

When we know what an object we wish to identify in an image (approximately) looks like, we can use this knowledge to locate the object in an image. This approach to segmentation is called matching.

3.2. SEGMENTATION APPROACHES

3.2.1. Thresholding

Thresholding approaches segment scalar images by creating a binary partitioning of the image intensities. A thresholding procedure attempts to determine an intensity value, called the threshold, which separates the desired classes.

The segmentation is then achieved by grouping all pixels with intensity greater than the threshold into one class, and all other pixels into another class.

Thresholding is a simple yet often effective means for obtaining segmentation in images where different structures have contrasting intensities or other quantifiable features.

The partition is usually generated interactively, although automated methods do exist. For scalar images, interactive methods can be based on an operator's visual assessment of the resulting segmentation since the thresholding operation is implementable in real-time.

Thresholding is often used as an initial step in a sequence of image processing operations. Its main limitations are that in its simplest form only two classes are generated and it cannot be applied to multi-channel images. In addition, thresholding typically does not take into account the spatial characteristics of an image.

3.2.2. Region Growing

Region growing is a technique for extracting a region of the image that is connected based on some predefined criteria. These criteria can be based on intensity information and/or edges in the image. In its simplest form, region growing requires a seed point that is manually selected by an operator, and extracts all pixels connected to the initial seed with the same intensity value.

Its primary disadvantage is that it requires manual interaction to obtain the seed point. Thus, for each region that needs to be extracted, a seed must be planted. Split and merge algorithms are related to region growing but do not require a seed point. Region growing can also be sensitive to

noise, causing extracted regions to have holes or even become disconnected. Conversely, partial volume effects can cause separate regions to become connected.

4. PROPOSED METHODOLOGY

Searching and detecting anatomic features are essential stages in the machine learning process in the medical field. Anatomic features represent quality of the images and also the adequacy of the medical test. More importantly for the diagnosis of vital information of tissue, it can assist doctors by identifying the location of the diagnostic features like fibroadenoma. The lesion needs to be extracted as the Region of Interest (ROI) for further processing. Our detection algorithm includes noise removal, segmentation using low-pass filter, and thresholding or region growing algorithm respectively.

Algorithmic steps

- Image Denoising: The purpose of the stage is to make the image free from any unwanted noise.The low-pass filter is used in to denoise the cervical cancer image.

- Image Segmentation: The image segmentation step involves divide and

segmentation of the enhanced images. The used method is thresholding and region growing approaches.
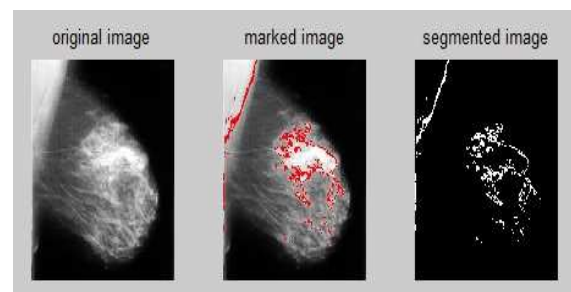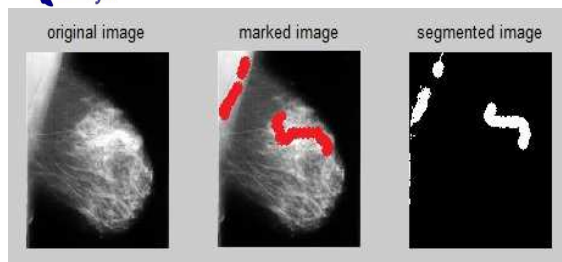
5. EXPERIMENTAL RESULTS
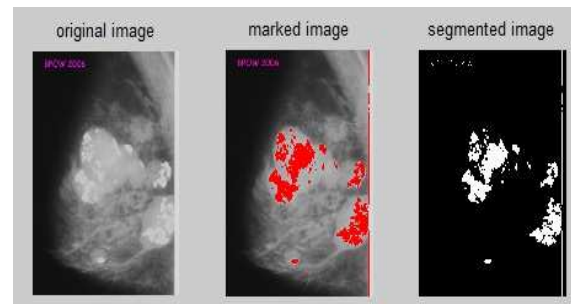
(a)
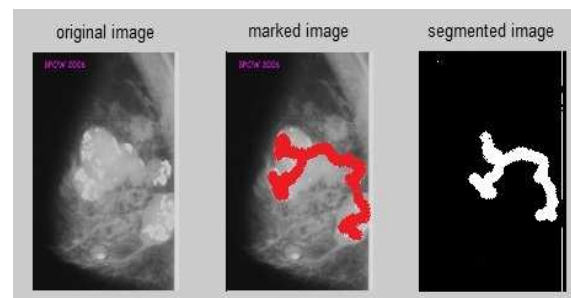
(b)

Fig.1. Lesion Detection Using (a) Thresholding Method (b) Region Growing Method

(a)

Computer Aided Identification and Analysis of Fibroadenomas | **M. Chakraborty**

(b)

Fig.2. Lesion Detection Using (a) Thresholding Method (b) Region Growing Method

Here Fig.1. & Fig.2.depicts the output of same mammographic image using threshold method and region growing method respectively.

6. CONCLUSION

In this project we propose automated machine learning based fibroadenoma detection method. The purpose of the work is to assist the physicians in clinical studies. In Future work, we can include more segmentation methods like clustering approaches, Markov random field models, artificial neural networks, deformable models, atlas guided approaches etc. An enhanced mammographic images will also remove false positives of the lesion region detection outputs. So including of some enhancing algorithm may improve the accuracy of our work. Future scope will also involve images taken at different time oscillation of the test. The system may also be combined with other diagnostic feature extraction algorithms to provide a better diagnostic method to the doctors.

7. ACKNOWLEDGEMENT

8. REFERENCES

[1]. Ron Greenberg, Yehuda Skornick, Ofer Kaplan, Sep 1998, "Management of Breast Fibroadenomas", Journal of General Internal Medicine, 13(9), pp. 640-645.

[2]. Moshe Shabtai, Patricia Saavedra-Malinger, Esther L. Shabtai, Dan Rosin, Josef Kuriansky, Michal Ravid-Megido, Menachem Ben Haim, Amram H. Ayalon, Nov2001, "Fibroadenoma of the Breast: Analysis of Associated Pathological Entities-A Different Risk Marker in Different Age Groups for Concurrent Breast Cancer", IMAJ, vol.3, pp. 813-817.

Computer Aided Identification and Analysis of Fibroadenomas | **M. Chakraborty**

[3]. Dzung L. Pham, ChenyangXu, Jerry L. Prince, Jan 1998, "A Survey of Current Methods in Medical Image Segmentation", Annual Review of Biomedical Engineering.

[4]. 4.SamyaMuhuri, MonalisaBhattacharjee, September 2014, "Automated Identification & Analysis of Cervical Cancer", Proceedings of the 3rd World Conference on Applied Sciences, Engineering and Technology, pp. 516-520.

[5]. **About Author**

MousumiChakrabortyis an M.Tech.inComputer Science andEngineering from West Bengal University ofTechnology, Kolkata,India. She received the B.Tech degree in Computer Science and Engineering also from West Bengal University of Technology,Kolkata, India in 2012. She is interested in Image and Video Processing.