Detection of Breast Micro Calcification in Digital Mammogram Using Image Processing Techniques

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Abstract – Micro calcification in digital mammogram are an important early sign of breast cancer and their early detection is very important to improve its diagnosis. Computer- based detection system can assist the radiologist to improve the diagnostic accuracy. Digital Mammogram is the low cost and effective for early detection of masses or abnormalities which related to the high risk factor of breast cancer. Micro calcification corresponds to high frequency components of the image spectrum classification corresponds to high frequency components to classify the digital mammogram. In this paper a new algorithm is proposed for breast micro calcification detection and classification in digital mammogram based on the image processing techniques. The presented algorithm includes three main parts includes pre-processing, feature extraction and classification The main aim of this proposed method helps the doctor to predict and detect the early detection of breast cancer which based on breast micro calcification.

Index Terms – Micro calcification, Digital Mammogram, classification.

1. INTRODUCTION

Breast are made up of fatty tissue, fibro tissue and glandular tissue .Breast cancer is a malignant masses that starts in the cells of the breast. Computer assisted detection (CAD) technology was introduced to help radiologist by guiding their attention to suspicious feature that deserve careful consideration when imaging a patient. The malignant tumor is a group of affected cells that grow into surrounding tissue or spread to distant area of the body[1,2] .The Micro calcification is the tiny specks of mineral deposits (calcium) that can be scattered throughout the mammary gland, or occur in clusters. It is important scattered risk elements which is used to find the breast cancer [2, 3].

2. DIGITAL MAMMOGRAM

The Digital Mammogram is a low energy x-ray (Usually around 30KUP) to examine the human breast and it is used as a diagnostic and screening tool. The main goal of digital mammogram is the early detection of breast cancer typically through classification and detection of characteristic masses of micro calcification. Breast density cannot be assessed by examine the physical breast, so digital mammogram helps to find the micro calcification in the breast .Digital mammography imagining generate two types of images for analysis, raw"(for processing) and vender post processing ("for presentation") of which post processed images are commonly used in clinical practice[4,5].

3. DATA SET

The data for classification of breast micro calcification is arrived at digital mammogram images. The mammogram images should be 12-14 gray level depth [6].

4. METHODOLOGY

The main contribution of our proposed work summarized below:

a) Improvement of Digital mammogram images.

b) Categorization of breast lesion characteristics: the characteristic of calcification and masses are categorized based on size, shape, angle, position, scattering and density and also the severity of abnormality is determined based on appearing symptoms in different categories.
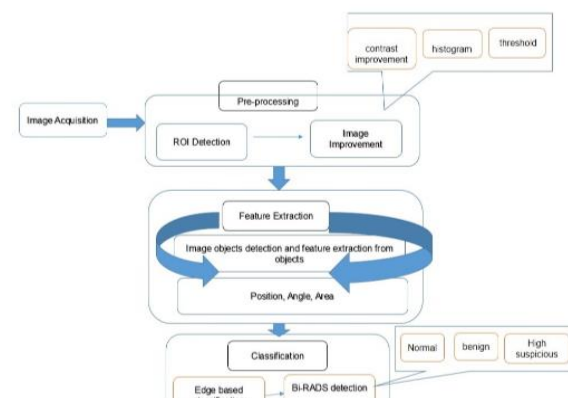
4.1. Proposed algorithm

Fig 1: Proposed methodology

The proposed algorithm includes 3 main stages and they are prepressing, feature extraction, classification Fig 1.shows.

4.2. Preprocessing

Preprocessing of a digital mammogram improves the appearance of an image and makes it easier for visual interpretation, understanding and analysis. The step of preprocessing are described below:

4.2.1. Region of Interest (ROI's) detection

The first important stage of our preprocessing method is to remove additional margins, which makes the digital mammogram images smaller and reduces the computational burden. As shown in Fig 2, some feature of micro calcification are very similar to regions of tissues such as pectoral muscle.
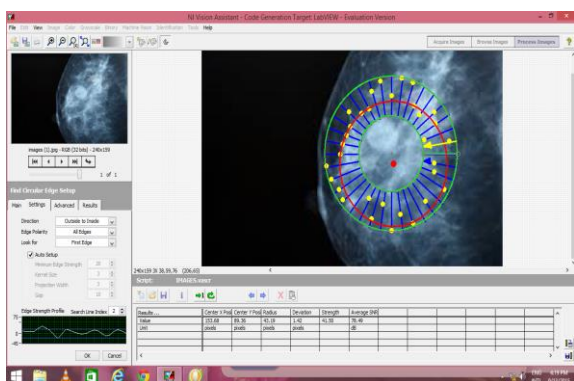

Fig 2: ROI's Detection

4.2.2. Image Improvement

Improvement of digital mammogram is very essential process for classifies the calcification in tissue of breast. The process steps are described below:

4.2.2.1. Contrast Adjustment

The contrast is the ability resolve spatial difference in the digital mammogram and it is the ability to resolve intensity differences.
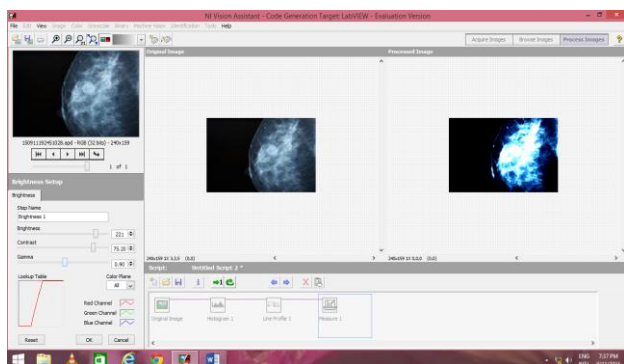

Fig 3: Representation of Contrast Adjustment

Fig 3 described the contrast adjustment with the gamma values.it clearly shows the

Highly suspicious micro calcification.

Contrast = I Brightest – I Darkest/ I Brightest + I Darkest, Where I Brightest > I Darkest,

As the above equation says when the different between I Brightest – I Darkest is high, the contrast tends towards 1(unity) indicating that the digital mammogram images has a large range of contrast.

4.2.2.2. Intensity Value

Fig 5 shows the cursor around the digital mammogram, the read out shows cursor (x, y) coordinates and the intensity value of the particular location.

4.2.2.3. Threshold

Threshold specifies the gray scale intensity that is used as threshold level. The bright objects shows, the threshold range used include threshold to the maximum possible intensity depending on the image type.

The Dark objects type shows the threshold range used include threshold to the minimum possible intensity depending on the image type, and the equation are

$S=T(r)$

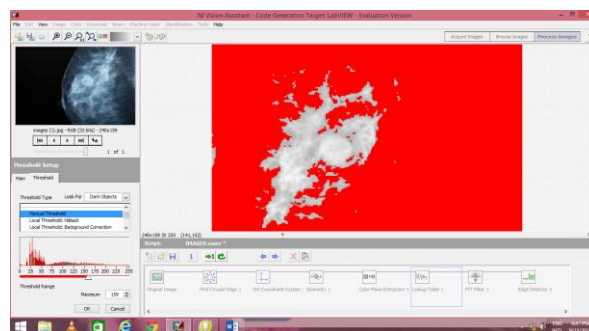Where S & r are input and output of the image.

Fig 4: Representation of Threshold

The main effect of threshold transformation would be produces an image of higher contrast than the original image by darkening the levels below and brightening the levels below and brightening the levels below the brightening the levels above around particular value.

4.2.2.4. Histogram

The histogram can be a very useful tool for determining the intensity distribution of a digital mammogram and it gives quantitative (numeric) information about the distribution of the number of pixels per gray level value, it is a techniques in computer image processing to improve contrast in images.it

carries more details about the digital mammogram and the equation are

H (k) = n_k

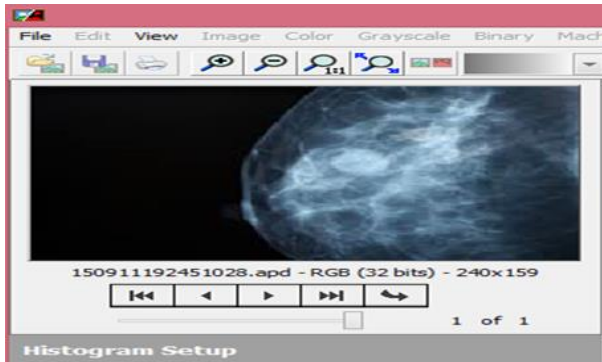Where n_k as the number of pixels with the gray level value k.
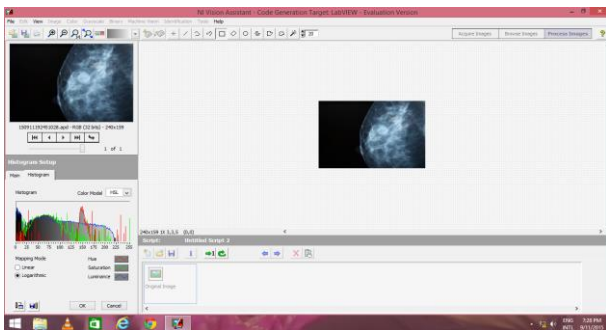

Fig 5: Representation of Histogram Setup

Fig 6: Representation of Histogram

Standard Dataset:

The standard dataset which is used for detecting the micro calcification is shown below

a) Calculate the total number of picture elements in the digital mammogram images.

b) Selection of affected image from the preprocessed image which is high density pixels and then non-zero element combination of set value to determine the percentile of affected particles in particular digital mammogram.

5. FEATURE EXTRACTION

The Feature Extraction is a general terms for methods of constructing combinations of the variables. The data with sufficient accuracy. The main aim of Feature Extraction are used to detect and isolate various described portions or shapes (features)of a digitized mammogram like area, angle, shapes, position, length and etc.,
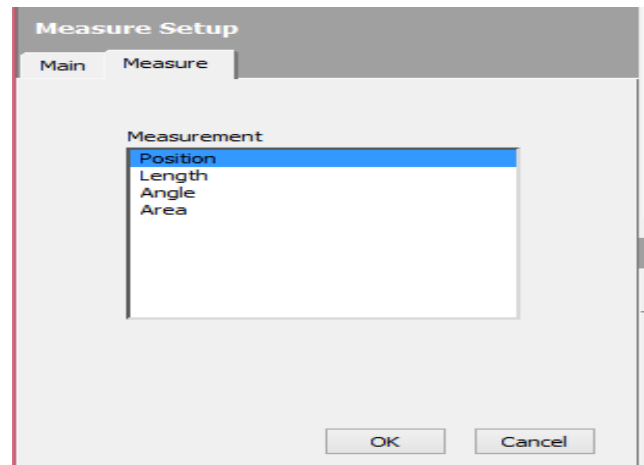

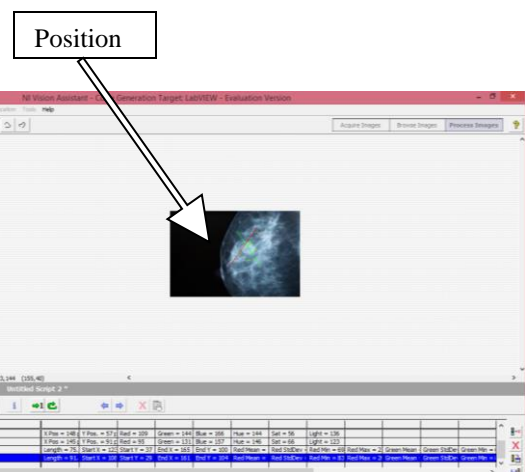Fig 7: Representation of Measure Setup

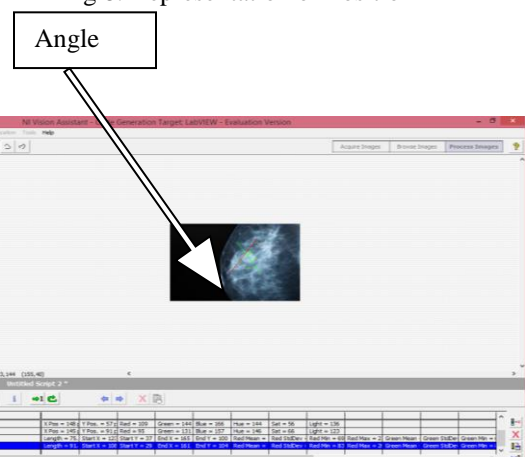Fig 8: Representation of Position
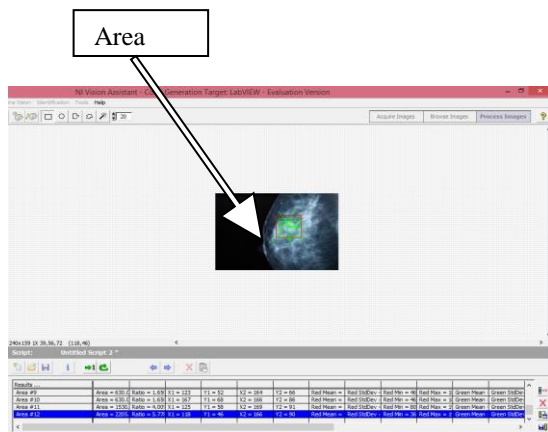

Fig 9: Representation of Angle

Fig 10: Representation of Area

6. CLASSIFICATION

American college of radiology (ACR) [5,6] classifies mammographic images using BI-RADS in 6 general categories considering breast lesions:

- BI-RADS 1:Normal
- BI-RADS 2:Benign finding
- BI-RADS 3:partial Benign
- BI-RADS 4:suspicious finding
- BI-RADS 5:highly suspicious

6.1. Edge based Segmentation

It is important techniques detected edges in an image are assumed to represent object boundaries and are used to identify these objects [7].

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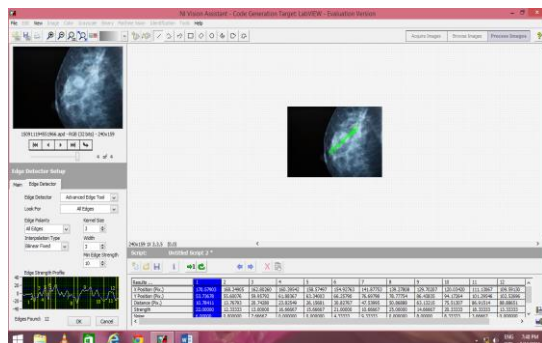

Fig 11: Representation of Edge based Segment

7. CONCLUSION

In this paper, a new breast micro calcification detection and classification proposed method based on image processing techniques. The present algorithm includes 3 main parts including preprocessing, Feature extraction and classification. The mammographic segmentation using techniques present in this paper is efficient in getting the malignant breast micro calcification which helps the doctor to concentrate more on that particular region for examination treatment. The main aim of this proposed method helps the doctors to predict the early detection of breast cancer which associate on breast micro calcification. In future work it may be planned to develop an automatic algorithm to acquire a breast lesion.

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