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# A Novel Approach for Breast Cancer Detection

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*Abstract-* **Cancer is one of the most dangerous life-threatening diseases. Out of all the different types of cancer, breast cancer is the most common which is mostly seen in women of age 30-60. According to breastcanceruk.org, every 1 in 8 women in the UK is affected by breast cancer. Even though a permanent antidote is yet to be found for breast cancer, it can be prevented with early detection. The certain clinical method is used for the identification of cancer. Our approach for detection of a cancer tumour is by using Image processing technique through MATLAB code for the detection of type of tumor and the situ of the tumour. In the code a mammogram image is taken as input, then we perform Otsu -thresholding method to separate the tumour part from the background. Then we apply the ANN to find the required parameters. Accuracy, Selectivity and Specificity can be obtained through the algorithm.**

**Index Terms— Otsu Thresholding, Artificial Neural Network.**

## I.INTRODUCTION

Breast cancer is one of the major causes for increase in death rate. A cancer is a mass of tissue that grows out of control. According to the UK survey, it is known that every 1 out of 8 women are suffering from this cancer and in Australia 1 out of 13 are suffering from breast cancer during their lifetime. Although breast cancer can be fatal, people have the highest chance of survival if physician can detect the cancer at its early stages. Hence the radiologist recommends women over 40 years of age to obtain screening mammography regularly. The main objective of this paper is to construct an algorithm to serve as the initial step in the process and to be the second hand for the radiologists. We focus on the detection of cancerous tissues from mammogram, our goal is to locate suspicious regions in the mammogram images [7] and to distinguish the cancerous cells as the Benign and Malignant [10]. To increase accuracy and diagnostic performance of radiologist, several computers aided diagnosis scheme [23] have been developed to improve the detection of

(i) Masses
(ii) Microcalcification.

Masses are generally a space occupying lesions that are defined by their Shapes, Margin properties and even the spreading of the tumour. Based on these properties there are mainly two types, Benign is smoothly marginated and it does not spread and tumour would be present in the Breast. wherein in malignancy, it is differentiated by an indistinct border that recover speculated with time and it does spread outside the region of Breast. Figure 1 shows benign and malignant tumours. Microcalcification are the tiny deposits of calcium that appears as small bright spots in the Mammogram.

The previous research work carried out in this area:

In [1] a methodology for mass detection on digitized mammograms using k-means algorithm for image segmentation and co-occurrence matrix to describe the texture of segmented structures was proposed.

In [2] this method was successful in segmenting the cancer region of mammogram. Along with segmentation, pixels of cancer region are also identified.

In [3] they have presented a novel algorithm for the detection of suspicious lesions in mammography. Wavelet transforms are used in the proposed method, and a combination of adaptive global thresholding segmentation and adaptive local thresholding segmentation is used to segment the multiresolution sub images of the original mammogram. In [4] they stated that the advent of DICOM file format has been a major step in clinical radiology by allowing digital images to be easily stored and transferred electronically. Digital images can be manipulated in many ways and converted to different formats. DICOM is a standard image file format used by radiological hardware devices. This article will prove an overview of DICOM. This is a universal file type and can be displayed by installing DICOM software. In [5] they presented an algorithm that combines several artificial intelligent techniques with the discrete wavelet transform(DWT) for detection of masses in mammograms. In [6] they have considered a problem of computerised picture processing of mammographic images for early detection of breast cancer by determination of very significant microcalcifications. A verification technique was evaluated to differentiate between different groups of microcalcifications. Using a local operator technique in a decision tree structure microcalcifications could be detected with almost acceptable results.

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## II PROPOSED METHODOLOGY

The aim of our research is to create an algorithm that accepts a mammogram image and to detect benign and malignant tumour, based on their intensity shape and size [21] etc….. Secondly, a post processing is followed with Otsu-thresholding [20] to convert gray scale image into binary image, k-means clustering [11] to partition the obtain data set to k number of data spaces, ANN [10] to distinguish the type of cancer and SVM [15] to obtain the required parameters such as mean, standard deviation, variance etc….

A breast mass segmentation algorithm [24] has been proposed and implemented under the MATLAB GUI platform. Figure 2 shows the flow diagram of proposed methodology.

First, a preprocessing stage is required to remove areas that are not related to the detection region and to enhance the image.

**Pre-processing:**

Pre-processing is an important step in low-level image processing. The objective of pre-processing is to enhance [17] the intensity difference between foreground and background and obtain relevant representation of breast tissue structures.

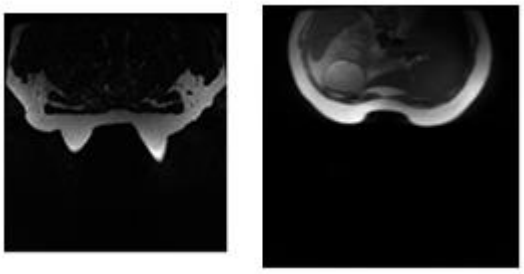

*Fig 1: Benign and Malignant tumour*

**Mammogram image:**

The mammogram image obtained will be in DICOM format [4] and it does not contain noise as the image will be captured in ambient environment and we need to convert it to JPEG as MATLAB does not support DICOM image format.

**Image Enhancement:**

The obtained JPEG mammogram image will undergo RGB conversions, dilation and erosion [18]. In RGB conversion, the image will be converted into black and white image to have more accuracy while differentiating the type of cancer. Dilation adds pixels to the boundaries of objects to the obtained image, whereas erosion removes pixels on object boundaries.

**Post-Processing:**

The second stage of our algorithm is to separate the regions [12] that contains masses from the background i.e., to partition the type of cancer from the image. The following methods are applied in post processing stage.

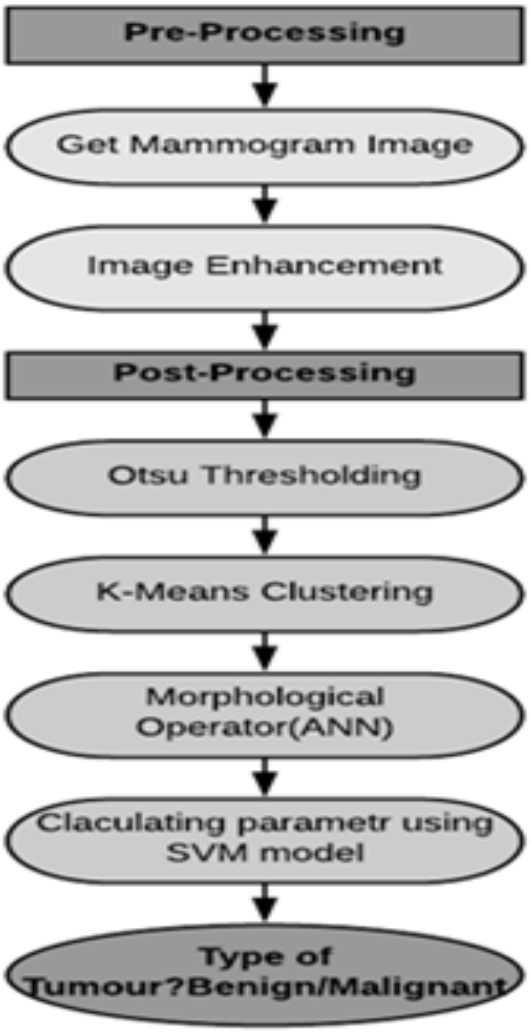


*Fig 2: Block Diagram of proposed algorithm*

**Otsu-Thresholding:**

This method is used for the reduction of a gray level image to a binary Image.

**K-means Clustering Algorithm:**

It is a method of clustering observation into a specified number of disjoint clusters. K refers to the number of clusters specified [11]. Later 3 clusters of segmented images are formed as shown in the figure.

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**Artificial Neural Network Algorithm:**
This method is based on a collection of connected units or nodes. In our algorithm ANN [10] is used to distinguish Benign and Malignant based on their tumour margin property.

**Support Vector Machine(SVM):**
SVM method [15] is used to give a set of training examples each belonging to one or two categories. Here it is used to obtain the required parameters such as mean, standard deviation and variance etc... from the assigned categories.

## III. EXPERIMENTAL RESULTS AND ANALYSIS

The described algorithm has been tested on many mammographic images taken from the Diagnostic lab provided by Celera Diagnostics, Karnataka. Each image consists of 512 × 512 pixels. Using above techniques, Benign and Malignant cancer cells can be detected. Figure 3 shows a sample mammogram image [16]. Figure 4 shows the Otsu thresholding image [20]. Figure 5 illustrates dilation and erosion images. Figure 6 shows the procedure of K-means algorithm [11]. Figure 7 illustrates detected cancer cells [9]. The selected image processing method is implemented and tested in MATLAB GUI simulation. Figure 8 is the parameter values of the selected mammogram image. We are Confident that Breast Cancer detection and classification procedure [26] is developed and it can be an assist to radiologists that require them the further information.

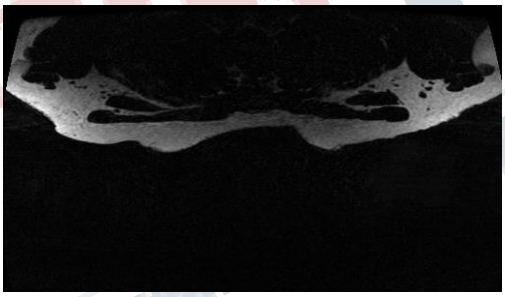

*Fig 3: Mammogram Image*

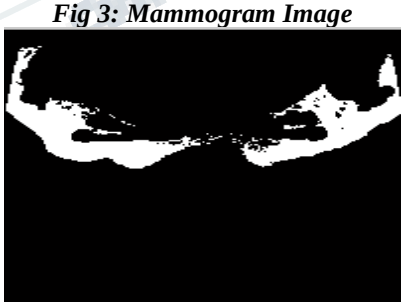

*Fig 4: Otsu Thresholding Image*

*Fig 5: Dilation and Erosion Images*

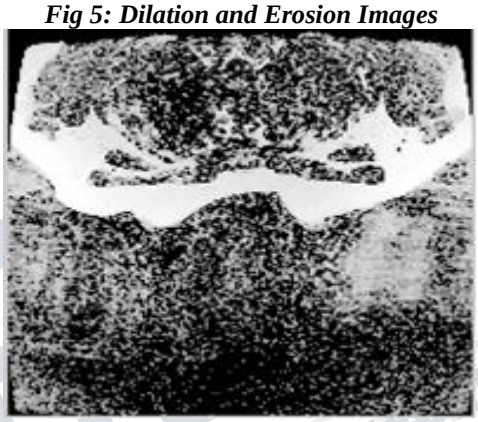

*Fig 6: K-means Clustering Algorithm Images*

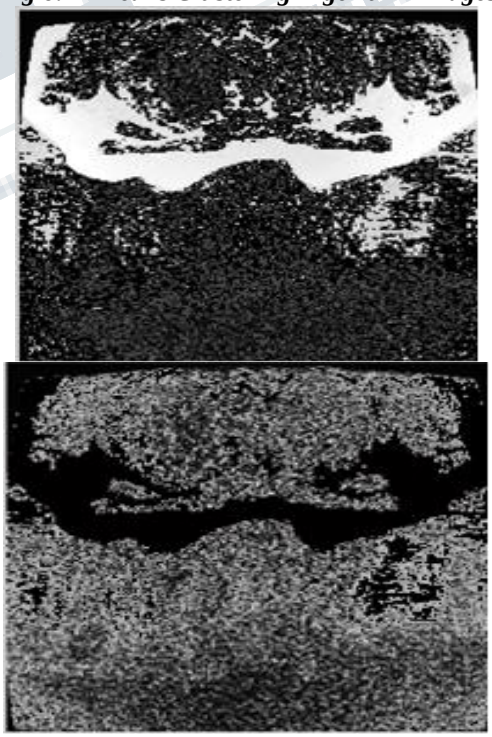

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*Fig 7: Cancer detected image and it is been classified as Malignant*

## IV. CONCLUSION

This paper presents K-means clustering algorithm for breast cancer detection and classification of cancer types. The individual pixels of an image is processed for detecting and classifying into a high resolution image frames. Given the test results, we can able to detect the cancer part and classify it to benign or malignant and giving a second opinion to radiologists. ANN has been implemented for classification of cancer cells of breast cancer tumour. MATLAB software package version 13 is used to implement the algorithm of its current work. Additional research on different features to better characterize microcalcifications can be done to improve the true positive and negative false rate. Further development can be done for fine tuning of the used parameters under image analysis. Even to reduce the false rates many filters, Gaussian distribution of masses and also the local texture. We conclude that the proposed system gives fast and accurate classification of breast cancer.

| Parameters | Values |
|---|---|
| Accuracy | 84.58 |
| Specificity | 95.29 |
| Sensitivity | 94.28 |

*Table I: Parameter Values of the cancer detected image.*

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