A Review on Breast Cancer Detection Using Image Processing Techniques

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Abstract- *Breast Cancer is the most common malignancy in women and is the second most common leading cause of cancer deaths among them. At present, there are no effective ways to prevent and cure breast cancer, because its cause is not yet fully known. Early detection is an effective way to diagnose and manage breast cancer and can give a better chance of full recovery. Mammography has proven to be the most effective tool for detecting breast cancer in its earliest stage and it continues to be the primary imaging modality for breast cancer screening and diagnosis. This tool allows the detection of other pathologies and may suggest the cancer nature such as normal, benign or malignant.*

In this proposed work, the mammogram images are initially preprocessed using different methods. This will be done by comparing two methods and best method will be determined. For this in first preprocessing is done using median filter and wiener filter.

Then the region of interest will be determined using otsu's thresholding algorithm and adaptive thresholding method. Features of the mammogram images will be extracted using wavelet transform and bior transform and to determine the information from the images Support Vector Machine classifier and minimum distance classifier will be used. Then both the results will be compare based on its accuracy.

Keywords-Mammogram images, minimum distance classifier, otsu's thresholding, Support vector machine

I. INTRODUCTION

Medical imaging technologies are widely used in clinical diagnosis to guide therapeutic and surgical intervention and to monitor disease progression, recurrence and treatment response and to improve surgical navigation. Extensive research indicates that the application of computers to medical image analysis may lead to significant reduction in health care costs by increasing the speed of diagnosis, avoiding the need for expensive treatments and surgical procedures and reducing mortality rate through early screening programs. Mammography is a specific type of imaging that uses a low-dose X-ray system to examine breasts which is used to aid in the early detection and diagnosis of breast diseases in women. Among women around the globe, breast cancer is both the most common cancer and the leading cause of cancer-related deaths [1]. In India, breast cancer is the second most common cancer in females after cervical cancers [2]. Cancer is the result of normal cells developing mutations which make them grow too fast and uncontrollably.

In the case of breast cancer, these cells are located in the breast tissue. Both the number of people getting breast cancer and the number of people killed by breast cancer are rising faster in the developing world than in developed nations [1].

Mammography can identify an abnormality that looks like a cancer, but turns out to be normal called a false positive. Such a misdiagnosis means more tests and diagnostic procedures, which would be more stressful for patients. Several treatments are available for breast cancer patients, depending on the stage of the cancer. Doctors usually take many different factors into account when deciding how to treat breast cancer. These factors may be the patient's age, the size of the tumor, the type of cancer a patient has and many more So there is a need to work more on image post processing step to find cancer area from the image itself which is very effective for diagnosing the cancer cell.

II. LITERATURE REVIEW

Sangeetha R. and Dr. Srikanta Murthy K, 2017 their paper, "A novel approach for detection of breast cancer at an early stage using Digital Image Processing techniques", presents the novel techniques for the detection of breast cancer using preprocessing, segmentation using Otsu's thresholding algorithm, feature extraction using gray level co-occurrence matrix and classification using Baye'sclassifier[1].

Jisna Jose, Ms. Anusha Chacko, and D.AntoSahaya Dhas,2017, "comparative study of different image denoising filters for mammogram preprocessing", they explains and compared different types of filters[2].

Rajesh Garg, Bhawana Mittal, Sheetal Garg 2011, "Histogram Equalization techniques for Image Enhancement explains different methods of histogram equalization", with flowcharts and compared it using different parameters[3].

B.K.Gayathri, P.Rajan, 2016, "A Survey of Breast Cancer detection based on image segmentation techniques",explains different types segmentation methods for

mammography images. There methods and compared according to its accuracy, speed,etc[4].

Abdul Quyyam, A.Basit,2016, "Automation Breast Segmentation and cancer detection via SVM in Mammograms", gives the information about segmentation and detection of microcalcification cells using support vector machine classifier[5].

Nagla S. Ali Ibrahim, Nagla F. Soliman,Mahmoud Abdullah, and Fathi E. Abd El-Samie,2016,their paper "An algorithm for pre-processing and segmentation of mammogram images", they focused on preprocessing and segmentation of the mammogram imges. Preprocessing is mainly using mdian filter, local thresholding and histogram equalization methods. Segmentation is done using Otsu's thresholding algorithm[6].

M.M.Fathima, Dr. D. Manimegalai, Ms.S.Thaiyalnayaki, "Automatic detection of tumor subtype in mammograms based on GLCM and DWT Features using SVM", explains feature extraction methods that is gray level co-occurrence matrix and discrete wavelet transform[7].

Otsu N., "A Threshold Selection Method from Gray-level Histograms,"

III. METHODOLOGY

The proposed methodology consists of following techniques

- Image Preprocessing
- Image segmentation
- Feature extraction
- Feature classification

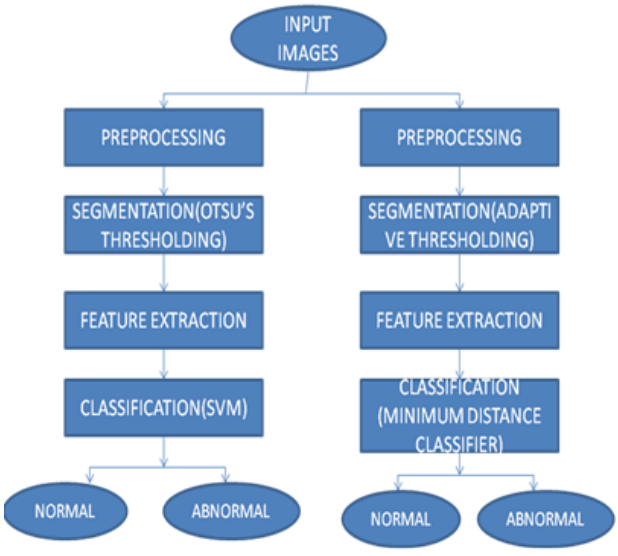

Figure1: Block diagram for proposed work

Image Preprocessing

In this stage regions of interest are enhanced and the unwanted regions of the image are deemphasized. The enhancement procedure results in a better description of the objects of interest, thus improving the sensitivity of the detection system and leading to better classification of the abnormalities in the case of diagnosis. The enhancement of the contrast of the regions of interest and the suppression of noise is performed in this stage. Median filtering and gray level transformations are done in this work to enhance the regions of interest.

This can be achieved by using Median filter and histogram equalization techniques and it will compare with the method done by using wiener filter.

Segmentation

Image segmentation is typically used to locate objects and boundaries (lines,curves, etc.) 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. Segmentation is a stage where a significant effort is made to delineate regions of interest and discriminating them from background tissue. In many cases the segmentation approach dictates the outcome of the entire analysis, since feature extraction and further classification of the abnormality depend on the accuracy of the segmented regions.Image segmentation is the process of subdividing the image into its constituent parts to obtain the required object from the background. Segmentation is done based on discontinuity and similarity of pixels. Discontinuity includes identification of isolated points or edges or lines. Similarity includes grouping of similar pixels

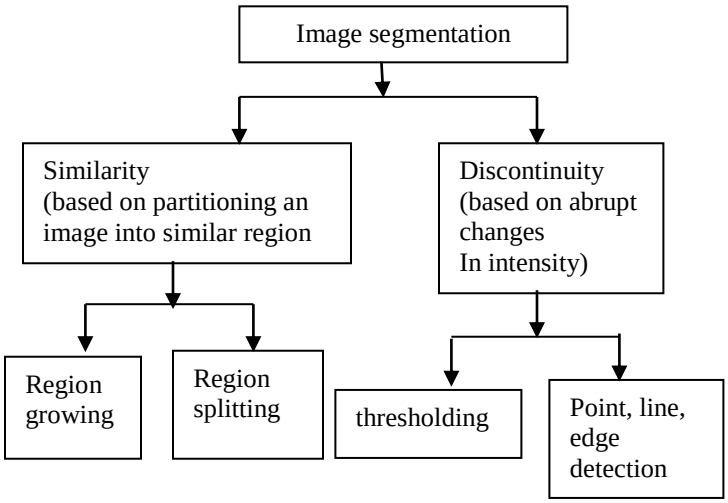

Figure2: Image segmentation classification

The filtered image is processed Otsu's thresholding algorithm and compared with adaptive thresholding methodto obtained region of interest.

Feature Extraction

Features of the segmented region are extracted in this stage such as size, shape and texture. The extracted feature must be carefully chosen because desired classification task is expected to perform using this representation instead of using complete region. In this work features are extracted to classify type of breast tissue to distinguish normal and cancerous breasts using wavelet transform and bior transform. These extracted features can be used for the classification.

Feature Classification

Classifier is a mathematical model used to classify the regions of interest into different classes. The extracted features are used to classify the mammogram images into either benign or malignant with high accuracy. Support Vector Machine and minimum distance classifier will be used to in this work and their results will be compare.

Support Vector Machine

SVM is the supervised machine learning classification technique that is widely used in the cancer diagnosis. SVM functions by selecting critical samples from all classes which is known as support vectors and separated by generating linear function.

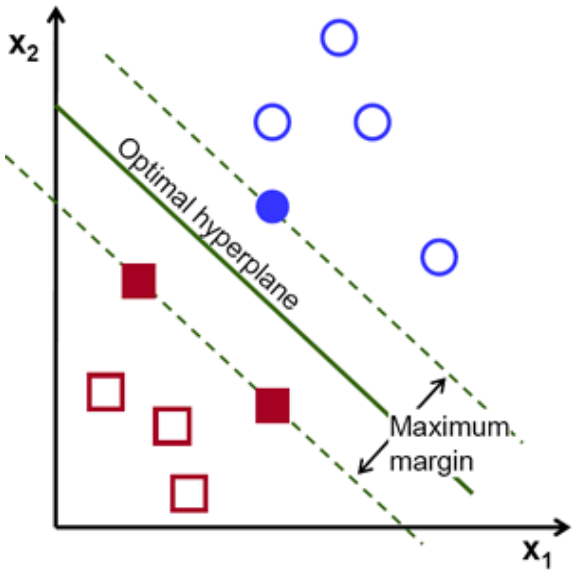

Figure3. SVM generated hyperplanes[5]

The filled blue circles and filled brown squares form the support vector that separate the two classes shown in Figure 3. Support vector machine is composed of **N** given support vectors **z** and a set of weights **w**. SVM uses a set of support vectors for discrimination with efficient memory use. It uses Kernel functions for the decision function. The disadvantages of support vector machines include no probability estimates: they can be computed by using a k-fold-cross-validation and when there are more features (dimensions) than the number of observation.

Minimum Distance Classifier

Minimum distance classification technique is one of the techniques used for classifying the images. Among the various techniques used for classifying the images, minimum distance classification is used for classifying the images according to the closest region of interest. In minimum distance classification technique initially the mean value for all classes of images is calculated in each band of data. The minimum distance is initialized to be the high value. The Euclidean distance from each unknown pixel to the mean vector for each class is calculated. All pixels are classified to the closest region of interest class. The distance is defined as an index of' similarity so that the minimum distance is identical to the maximum similarity. Selecting the minimum distance value among all distances does the classification of pixel. When a pixel is assigned to a corresponding class the number of pixels classified to that class is incremented. It is to indicate that the pixel is classified under this class. After all the pixels are classified it will be possible to conclude how many pixels are associated to a particular class.

IV. EXPECTED OUTCOME

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This proposed methodology will discuss automatic removal of the artifacts, and noise from mammogram images. It will identify the microcalcification clusters at an early stage and classify as normal or abnormal.100 images will be gone through all the methods. Performance will be determined using confusion matrix. Due to this accuracy of result will increase and thus it will lead to true positive and true negative results.

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