



# Early Breast Cancer Tumor Detection on Mammogram Images

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**Abstract**— This proposed work discusses about the breast cancer detection at the earlier stage on mammogram images using k-means algorithm. This approach has been done in three steps. The primary step is pre-processing, which removes noises in the images. Then canny edge detection is used to detect the edges of images. After finding the edges morphological operation is done to get clear mass. Then original image overlapped with the erode image to get clear view of tumor. K-means algorithm is used to classify the tumor level based on the count of pixel values in the mammogram images. Further the level of the tumor has been analysed and classified. In this proposed work identifies tumor level based on the pixel count as well as it also detects the tumor in the earlier stage itself.

**Keywords**— Mammogram, tumor, Segmentation, Edge detection, Canny, Median Filter, Thresholding.

## I. INTRODUCTION

Breast cancer is one of the leading cancers in the female population and it is most dangerous disease to women. About 25% of all cancers diagnosed in women are breast cancers and about 20% of all lethal cancers are breast cancers. Detection and diagnosis of breast cancer in its early stage increases the successful treatment and complete recovery from disease. It is the leading cause of death due to cancer in women. Earlier approaches did not prevent breast cancer successfully. An effective technique is necessary to propose to detect cancer in the early stages is very important. Mammography has been proven to be the most reliable method and it is the key screening tool for the early detection of breast cancer. It is highly accurate, but like most medical tests, it is not perfect. On average, mammography will detect about 80-90% of the breast cancers in women without symptoms. It works fairly well in the postmenopausal women and is inexpensive. A mammogram mainly contains two regions: the exposed breast region and the unexposed non-breast region. It is necessary to first identify the breast region for the reduction of the processing and then to remove the non-exposed breast region.

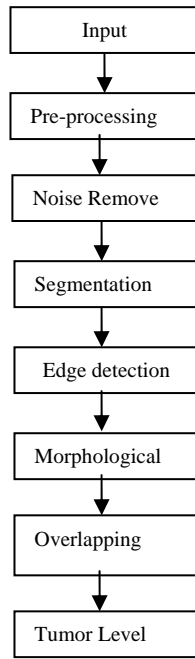
## II. RELATED WORK

Various algorithms and techniques have been proposed for preprocessing, segmentation, edge detection and morphological operations of the breast masses in digital image mammogram. Amit Chaudhary and Tarun Gulati [1] has been proposed a 2-D spatial gradient quantity a image and highlight regions of high spatial frequency. The

proposed operator contains a pair of three convolution kernels. Ireaneus Anna Rejani and Thamarai Selvi [2] have been proposed a work on classification of breast cancer using SVM classifier. The proposed work is divided into three main stages. Shanmugavadivu et al [3] have been proposed a work on detection of masses in digital mammogram using Wavelet Transformation and removes non-breast region also. Saheb Basha and Sathya Prasad [4] have been developed a work on detection of breast cancer mass using morphological and Fuzzy c-means clustering. Fuzzy c-means clustering is used in pattern recognition. Pitchumani Angayarkanni and Nadira Banu Kamal [5] have been proposed a work on mammogram image segmentation and classification using morphological and rough set approach. The main objective of this approach is to build a CAD system. Monica Jenefer and Cyrilraj [6] have been proposed an efficient image processing methods for breast cancer detection. The proposed technique follows step by step procedure. Nalini Singh and Ambarish [7] have been proposed a work on breast cancer mass detection in mammogram using K-means and c-means clustering. The proposed work implemented by using k-means and fuzzy c-means clustering. Sutton and Bezdek [8] have been developed a work using window means and standard deviations features. This can be able to reduce the number of mislabeled pixels with respect certain regions within the image. Pratihtha and Kirar [9] have been introduced a work detection of tumors using canny edge detection techniques.

## III. PROPOSED WORK

In this paper the tasks are divided into four stages, first the pre-processing task is done. Image pre-processing techniques are necessary, in order to find the orientation of the mammogram, to remove the noise and to enhance the quality of the image. Before any image processing algorithm can be applied on mammogram, pre-processing steps are very important to limit the search for abnormalities without undue influence from background of the mammogram. In that pre-processing the noise can be removed using the median filter and then the mammogram image can be enhancement using Gaussian filter. Second the segmentation is done using the threshold value for partitioning the mammogram image into multiple segments to identify the mass easily. Next, the edge detection is done using canny algorithm on mammogram image.



3.1 Schematic Diagram of proposed work

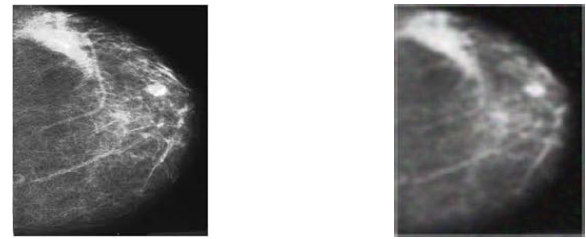
It displays only edges in the mammogram image. Finally, Morphological filtering is applied on the edge detected mammogram image to get clear mass. Then the original image overlapped with the erode image. K-means algorithm is used to classify the tumor level based on the pixel values in the mammogram image. Further the level of the tumor has been analysed and classified as four stages.

3.1 PRE-PROCESSING

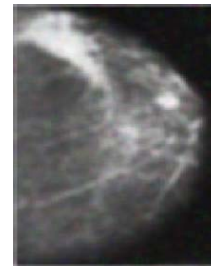
In that pre-processing task there are two works is done first noise can be removed using the median filter. Then the mammogram image enhancement using the Gaussian filters. Noise refers to the unwanted area of the mammogram image. The pre-processing has been divided two phase.

3.1.1 Noise Removal

The noise can be removed using four filtering technique, the techniques are Mean filter, Median filter, Wiener filter and Linear filter. In that above filtering technique Median filter is the best one compare to another. The Mean filter is a simple sliding-window spatial filter that replaces the cancer value in the window with the average of all the pixel value in the image window. The window is usually square but can any shape. The Median filter is a nonlinear digital filtering technique; it is used to remove the noise. The reduction is a typical pre-processing step to improve the results. It is one of the best filtering techniques for removing the noise. Then the Mammogram Enhancement is done using the Gaussian filter. The Gaussian filter is a filter whose impulse response is a Gaussian function. Gaussian filters have the properties of having no overshoot to a step function input while minimizing the rise and fall time. It is used to enhance the mammogram image.



(a) Input Image (b) Noise Removal image

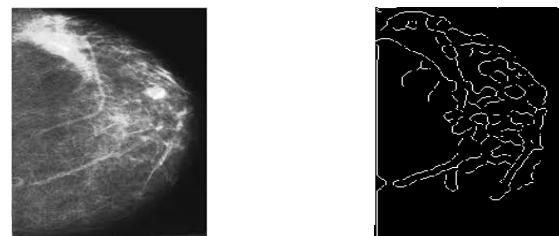


(c) Mammogram Enhancement image

Fig.1 Pre-processed images using Median and Gaussian filter

3.2 SEGMENTATION AND EDGE DETECTION

Image segmentation is the process of partitioning the digital image into multiple segments. The aim of segmentation is to simplify the representation of an image into more meaningful and easier to analyse. Image segmentation is done using the Thresholding technique. The mammogram image can be segmented and then edge can be detected using canny edge detection technique. We can get the clear border of the mass using edge detection. The edge detection technique is used to find out the discontinuities in the images. There are two categories of edge detection, thus they are gradient and Laplacian. Three fundamental steps of Edge Detections are image smoothing, detection of edge points, edge localization. The best edge detection is canny edge detection technique.

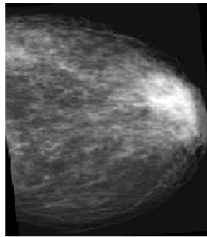


(a) Input image (b) edge Detected image

Fig 2. Segmentation and Edge Detection images

### 3.3 MORPHOLOGICAL OPERATION

The morphological operation is done to get the clear view of the mass. Erosion, hole filling and dilation is done. Finally the erode image can be overlapped with the original image. In that grayscale dilation adds pixels to the boundaries of objects in an image, while erosion removes pixels on object boundaries. The number of pixels added or removed from the objects in an image depends on the size and shape of the structuring element used to process the image.



(a) Erosion image

Fig 3. After Morphological image

## IV. EXPERIMENTAL RESULTS

The Following table contains the classification of tumor based on their pixel values. The pixel value is lower than 100, it considered as stage 1. Pixel value between 100 to 200, it consider as stage 2. The pixel value between 200 to 300, it consider as stage 3. Finally, the pixel value is above 300, it consider as stage 4.

No	Pixel Values	Tumor Level
1	Below 100	Stage 1
2	100 to 200	Stage 2
3	200 to 300	Stage 3
4	Above 300	Stage 4

Table1. Classification of Tumor level

## V CONCLUSION

The proposed method identifies the tumor level based on the count of pixel values in the region of tumor. This work is done using K-means algorithm to detect the breast cancer in early stage. The pre-processing task is performed first to remove noise and enhance the mammogram. Then the segmentation is done using Thresholding technique. After that edge detection is applied to get a clear border of the mass. To get a clear view of the mass morphological filtering is done which includes grayscale dilation, hole-filling and erosion. To overlap the original image with erode image for getting a clear view of the tumor. This proposed technique is performed well and identify tumor level in the earlier stage itself.

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