A Review Paper on Digital Mammography for Detection of Breast Cancer

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Abstract- Breast cancer is the second-most common and important cause of cancer death among women. It has become a major health problem in the world over the past 40-50 years, and its incidence has increased in recent years. Mammography is the best diagnosis technique for tumor detection. In this paper we define different techniques for early detection of breast cancer and also define analysis of classification of different method for detection of normal and abnormal tissue. This type of analysis is help to radiologists for better and early detection of cancer. So, we can reduce the mortality and also used for health care system.

Key Word : Digital Mammography, Breast Cancer

1. INTRODUCTION

In worldwide the automation system is used for different area for development and developing country. Breast cancer is the most general cancer among women. and in addition to detect finding high humanity rate. However there is unable to distinguish with certainty each and every year. Computer aided detection is used for finding detail analysis for mammogram.

Computerized detection of micro calcification on mammograms has very high accuracy. but on the other hand for finding malignant and benign using computerized method need some more accuracy.

2. TYPE OF BREAST CANCER

There are two types of breast cancer:

2.1. Invasive Breast Cancer

The cancer having abnormality in cell which have power to augment other part of body. It start from lobes or milk duct to with this the breast tissue. Malignant is the invasive type breast cancer which spread other part of body.

2.2 Non Invasive Breast Cancer

 The cancer having abnormality in cells lives in breast lobes or duct. Benign is a non invasive breast cancer which cannot spread out side breast but in breast lobes of ducts.

Fig. 1 Example for Benign cells and Malignant cells

Table 1. Comparision of Bening and Malignant Tomor

Sr. No.	Characristics	Bening	Malignant
1	Histology	Typical tissue of origin, Well diferentiation with no anaplasia	Poorly differentiate , Abnormal Cell Size and Shape
2	Growth	Slow	Rapid
3	Prognosis	Good	Poor
4	Metastasis	No	Yes
5	Recurrence	Rare	Common

In this review paper we defied different techniques for early detection of breast cancer and also give us the importance of momoghraphy. Using mammography techniques we define analysis for masses, this type of masses we categaraized in benign and malignant.

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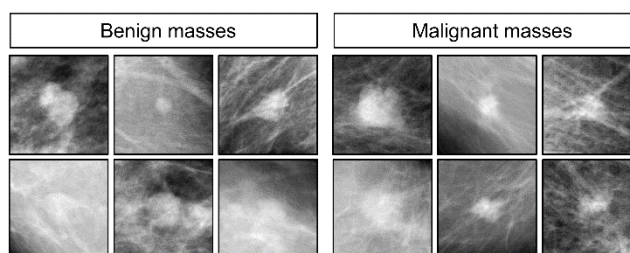*E-ISSN: 2321-9637*
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Fig. 2 Examples for Benign and Malignant Masses

3. MAMMOGRAPHY

Similar to in other medical analysis systems, X-rays are used as diagnostic tool in mammography for the examination of human breast. These type of

examinations are recorded as specialized images which are then observed by radiologists for any possible abnormality[27,28].
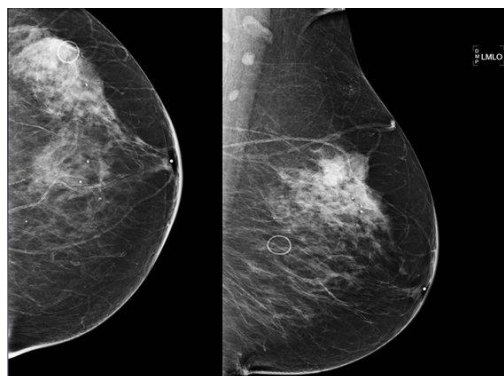
Fig. 3 Example for Mammography Images with abnormal masses

3.1. *MIAS Mini Mammographic Database :*
MIAS data base is to test the algorithm in presents days.
The MIAS data base was created by the mammographic analysis image analysis society-an organization of United Kingdom. This database includes several number of digital mammograms. In this type of data base program have been digitized 50 microns pixel with an 8-bit word. Every mammogram image has some extra information of ground truth by the radiologist [33].

3.2. *Digital Database for Screening Mammography (DDSM) :*
DDSM data base is used for screening of mammography in digital film. the purpose of this type of data base is used for evaluate and compare the performance of computer-aided detection [33,34].

DDMS data base is compare with MIAS data base result of MIAS data base is good.

4. ANALYSIS OF DETECTION AND CLASSIFICATION TECHNIQUES OF MAMMOGRAPHIC IMAGES

Here the different types of techniques for detection and classification for normal and abnormal cells are discussed and compared.
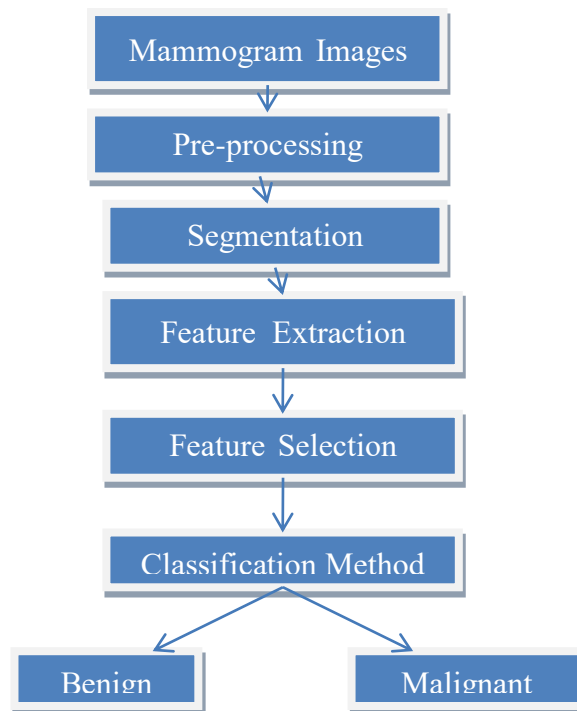
Fig. 4 Classification Block Diagram for Breast Cancer Detection

Ramlah Ramlan Dhara et.al .has observed that the method of image investigation on mammography using thresholding method. Automatic segmentation through thresholding method . The calculation results of the object of segmented part obtained from three different sides view, respectively. These values point out that the image processing techniques developed can be implemented to calculate the area of breast cancer and find out tumor size using thresholding method [27].

Basimalhadid et.al. has define the method for edge segmentation and watershed segmentation. In this paper first applied image processing thresholding, after that edge base segmentation and watershed segmentation applying in mammographic image for finding breast cancer. Out of them which methods are time consuming and simple method. Compare all techniques and they gives threshold method is very less time consuming but edge segmentation   and watershed segmentation take more time as compare to threshold method but gives good result [5].

Ibrahim Mohamed et. al. has proposed using frame work techniques   for feature extraction. Proposed

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method is used for fusion of dissimilar types of features, 2D-DWT with higher order statistics method for detection of breast cancer for classification efficient feed forward neural (EFFN) method is use and it gives 91% accuracy [12].

M. Karnan et.al. Proposed method for this paper is breast cancer categorize by texture features from segmented mammogram images for micro calcifications into normal, benign and malignant tumor. Proposed method to detect masses based on ten fold validation method used in BPA classifier. Here, they worked on 161 mammography images by MIAS data base. First segmentated image by MRFACO and feature extraction by combination of Rough set, Genetic and Ant Colony Optimization .This gives better result as compare to GLDC [15].

Mehul P. Sampat et. al. has Proposed a method for image enhancement of spiculations. Linear filter is applying on random transform of a mammogram images. The enhanced image is filtered by radial spiculation filters to detect spiculated masses and architectural of deformation.
Sensitivity of mammogram images is 80% at 14 false positive images with distortion of architectural. and as other side sensitivity of mammogram images is 91% at 12 false positive per image was obtained by a set of 45 images with spiculated masses [16].

Nabin Kharel et. al .has research on hybrid image enhancement method using CLAHE and Morphology. This method helps to enhance image for another computation in CAD system for early detection of breast cancer using mammogram images. After enhancing of mammogram images, apply for other processing techniques for image segmentation, feature extraction of images. Based on image segmentation and feature extraction we have to classify images for normal and abnormal tissue [21].

JinshanTang et.al. has describe method for early detection for cancerous cell using computer aided detection (CAD). In this paper development of CAD system and the development techniques for early detection for breast cancer. And also focus on Detection of calcifications, detection of masses, detection of architectural distortion, detection of bilateral symmetry, image enhancement, and image retrieval. Here they selected 19 mammogram images using MIAS data base, out of them 84.2% true positive image and 2.2% false positive images [13].

Dheeba J. et. al. has describe method for classification of digital mammogram images for breast cancer detection. In this paper using Particle Swarm Optimized Wavelet Neural Network (PSOWNN) for

classify normal and abnormal cells on selecting Laws Texture Energy measures for mammogram images for selected region by applying a pattern classifier. Here they are using 219 mammogram images from mammogram screening clinical centre. Computer aide detection system is used to analyze receiver operating characteristic curve. Using receiver operating characteristic curve sensitivity and specificity are available from diagnostic system. available results when applying area under the curve proposed algorithm is 0.96853 with
sensitivity 94.167% and specificity of 92.105%.Limitation for this method is if we apply traditional method they dives better result as compare to this results [8].

R. Sangeetha et.al. has Proposed method for detecting the cancer at the early stage. Early detection for microcalcification stage can be useful for giving good treatment at before time and saving the patients life .The proposed method is to identify the micro calcification clusters at a very initial stage and classify them as normal or cancerous cell with very high accuracy and also give true positive and true negative results for this classification [28].

Anuj Kumar Singh et. al. has proposed method in this paper is detection of cancerous cell and normal cell in mammogram images. Here they are applying Max-Mean and Least-Variance technique for detection of tumor. limitation for this paper is apply manual selected threshold parameter and also size of averaging filter [2].

Samir M. Badawy et. al. has describe method for classification of normal as well as abnormal tissue by applying double thresholding based segmentation for mammograms images for detection of breast cancer. Using manual thresholding method applying digital mammogram images process time is less and also cover less storage area.In this paper they consider four images of different types, like Fatty-glandular , Fatty , Dense-glandular , Fatty-glandular after applying double thresholding based segmentation method find out malignant tissue [30].

Prannoy Giri et. al. has presented a method of classification of breast cancer. DDSM (Database Digital Database for Screening Mammography) data base which contains about 3000 texture features used to classify for detection of breast cancer. Using texture features are detect from the Region of Interest of the mammogram images to describe the micro calcifications. These type of features are used for decreasing Principle Component Analysis(PCA) for better detection of Masses. These type of features are compared with Back Propagation algorithm (Neural Network) for better understanding for cancerous cell

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patter in the mammography image. For different classification method is used for features analysis like Statistical Features, SGLDM features, GLDC and Laws features are evaluated and added to Neural Network [24].

Muhammad Talha has describe in method to classify normal and abnormal cancerous cell using MIAS (Mammographic Institute Society Analysis) data base for enhanced clarity and better result. Genetic Programming based filter is proposed in fusion of Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) features areused as an input classifier. The proposed method gives 96.97% accuracy, 98.39% sensitivity and 94.59% specificity using SVM classifier. Limitation for this paper is large number of time required to train GP filter [18].

R. Ramani et. al. has presented a paper for applying various types of pre-processing techniques like average filter, adaptive median filter, average or mean filter, and wiener filter. The comparison of these four types of filters are applied on 322 mammogram images from MIAS data base.
Output of adaptive medial filter is good and gives better image quality as compare with other filters [29].

Anindita Roy et. al. has presented a method of to classify breast cancer detection by fractal dimension and lacunarity features using thermogram. Theyexamined that the fusion of fractal dimension and lacunarity features gives estimate the accuracy is 95.94% of 128 images and 86.11% on a recently created DBT-TUJU breast thermogram dataset of 36 abnormal images as compared to 79.31% and 78.94% using texture features, respectively of 128 images and 86.11% on a recently created DBT-TUJU breast thermogram dataset of 36 abnormal images as compared to 79.31% and 78.94% using texture features, respectively. The experimental results expose that the fractal features are more effective in disease affected region based abnormality in breast tissue prediction from both mammograms and thermograms [1].

Al Mutaz et. al. has describe the method for classification using SVM classifier. They apply SVM classifier on 120 screening digital mammogram data base. The detection of breast cancer here they are used statistical texture features to classify using Support Vector Machine. and other linear and non linear classifier also compared with SVM performance. Using SVM classifier accuracy of detection of normal and abnormal tissue is 82.5% [3].

PavelKrálet.al.has observe for detection of breast cancer from mammographic images based on Local Binary Patterns (LBP). From MIAS and DDSM databases applying proposed LBP method for classification of normal cell and cancerous cell. and it gives accuracy is about 84% [25].

Shankar Thawkar et. al. has found of this paper is to classify detection of breast cancer using Adaptive neuro-fuzzy inference system. they applying this method for finding cancerous tissue .Using Adaptive neuro-fuzzy inference method gives accuracy is 98.92% , sensitivity of 99.10%, specificity of 98.72% and area under the curve AZ = 0.999 ± 0.000 [31].

5. CONCLUSION

In this review we have conclude that benign and malignant detection of breast cancer is done using SVM,NN and ANN classifier , different types of optimization techniques is used. Detection of breast cancer image pre-processing techniques is applied for noise remove and enhance the part of tumor in image.

Table 2 A Comparison Analysis For Different Classification Method And Detection of Breast Cancer

Author Name	Classification Method	Accuracy	Sensitivity	Specificity	Data Base	Advantages/ Disadvantages
Shankar Thawkar et. al.	Adaptive neuro-fuzzy	98.92%	99.10%	98.72%	651 Mammogram	Minimize mortality rate
Saraswathi D. et al.	FCRN		98.1%	92.105%	322 Mammogram	Archive good classification accuracy
Samir M. Badawy et. al.	Double thresholding				4 Different types of images	Reducing processing time but and processing storage area.
Sitti Ramlah	Thresholding					Calculate area of

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Ramlan Dhara et. al.						breast cancer
Anindita Roy et. al.	thermogram	95.94%			128 Mammogram images	
Pavel Král, Ladislav Lenc	Local Binary Patterns	84%			MIAS data base and DDSM	
Muhammad Talha	Fusion of DCT and DWT	96.97%	98.39%	94.59%	MIAS data base	
Mellisa Pratiwi et. al.	GLCM	93.98%			MIAS data base	
Arden Sagiterry et. al.	LAWS & NN	93.90%			MIAS data base	
Rouhi R et. al.	cellular neural network and GA	96.47%	96.87%,	95.94%,	MIAS data base and DDSM	
Anuj Kumar Singh et. al.	Max-Mean and Least-Variance technique				MIAS data base	
Monica et. at.	Modified Watershed Segmentation, Feature Extraction [GLCM] and SVM classification	98%	97.5%	100%	MIAS data base	
Dheeba J et. al.	Particle Swarm Optimized Wavelet Neural Network		94.167%	92.105%	216 Mammogram images	Better accuracy than traditional method.
R. Ramani	Pre-processing Techniques				322 MIAS data base	Quality of adaptive median filter is good
M. Karnan et. al.	BPA classifier				161 MIAS data base	
Osareh A, et. al.	SVM, K-nearest neighbors and probabilistic neural networks classifiers		98.80%	96.33%		
M. A Saleem Durai et. al. 2010	Fuzzy Classification and Intensity	91.66%	95%	85%	MIAS data base	

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	based approach						
Jinshan Tan	bilateral symmetry	84.2% true positive				19 MIAS data base	

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