DETECTION OF BREAST CANCER IN MAMMOGRAMS - A SURVEY
S.Abinaya 1, Dr.R.Sivakumar2, Dr.M.Karnan 3, D.Murali Shankar4, Dr.M.Karthikeyan5
1PG Scholar, Computer and Communication, 2Professor/ Research Coordinator, Dept. of IT, 3Prof & Head, Dept. of CSE, 4Prof & Head, Dept. of MCA, 5Prof & Head, Dept. of ECE, Tamilnadu College of Engineering, Coimbatore, India

ABSTRACT: Breast cancer is one the common diseases among the females in the world. The main goal of mammography is to detect of breast cancer earlier by using characteristic masses and microcalcifications. This method proposes an approach for detection and diagnosis of breast cancer in mammogram using artificial bear optimization approach. Initially the mammograms images are acquired from MIAS database and then the digital mammogram images are enhanced by using median filter. Enhanced image is further normalized. The suspicious regions or microcalcification is segmented using bilateral subtraction. Bear optimization algorithm is used to automatically detect the breast border area and nipple board position to identifying region for mammograms digital image. It focuses comparative survey on various enhancement and segmentation techniques used in mammograms for detecting the breast cancer.

Keywords: Microcalcification, MIAS database, bilateral subtraction, bear optimization

1. INTRODUCTION

Breast cancer is one the common diseases among the females in the world. Generally above 25% of woman’s are affected by breast cancer, in that 20%leads to lethal cancers. It is one the leading cause of death due to cancer in women. The team Breast Cancer can be reduced by: giving birth to child before 30, Breast-feeding, Limiting alcohol intake, maintaining a healthy weight, exercising regularly. Breast Cancer that forms in tissues of breast, usually ducts (tubes that carry milk to nipple) and lobules (glands that make milk).

Generally Mammography became a reliable diagnostic tool in 1950s when industrial grade x-ray film introduced. And they are finding the breast cancer problems in two way, they are

- Screening mammography is used as a preventive measure for women who have no symptoms of breast disease.
- Diagnostic mammography involves additional x-rays of the breast to provide different views of the doubted region.

Diagnostic mammography is an x-ray testing the breast cancer in women has a breast cancer complaint. A breast lump is found during testing or has had an abnormality find during screening mammography. Diagnostic mammography is high involves high time-consuming than screening mammography and is high to determine exact size and location of breast abnormalities in their surrounding tissue and lymph nodes. During diagnostic mammography, the breast cancers are imaged in different angles and interpreted.

2. IMAGE ACQUISTION

A United Kingdom research organization has published a digital mammography database. Collecting the database from that MIAS (Mammography Image Analysis Society).Used to capturing the image and collecting the data from MIAS.X-ray film mammogram is converted into digital mammograms. Digital mammogram images are no film or chemical processing. Images easily sent over internet. Laser scanners are helped to digitize conventional film mammograms.
### Table 1: An overview of Preprocessing and enhancement Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indocyanine green (ICG) enhancement [1].</td>
<td>The absorption-corrected fluorescence ratio mammograms high contrast. Mean sensitivity and specificity reached 92% ± 8 and 75% ± 16 standard error.</td>
</tr>
<tr>
<td>Full-field digital mammography (FFDM) [4].</td>
<td>To get improved the performance of the breast unit. Increasing the overall detection rates and earlier detection, and to an increase in interventionism.</td>
</tr>
<tr>
<td>Neural Networks, Gabor feature, Integer Wavelet Transform [6].</td>
<td>Neural network method recognition score of 84.3% was achieved using the proposed approach.</td>
</tr>
<tr>
<td>CAD (Computer Aided Designs) [11].</td>
<td>To implement reduced due to the poor contrast sensitivity of 92% with about 90% of specificity.</td>
</tr>
<tr>
<td>Density Weighted Contrast Enhancement (DWCE) filters [35].</td>
<td>The physician able obtain a good enhancement of suspicious formations in the breast tissue.</td>
</tr>
<tr>
<td>Particle Swarm Optimization (PSO), Contrast Limited Adaptive Histogram Equalization (CLAHE) based on Local Contrast Modification (LCM).</td>
<td>Obtain good quality mammogram images for efficient detection of cancer by tuning the enhancement parameter of LCM-CLAHE of mammogram images using PSO.</td>
</tr>
<tr>
<td>Contrast enhanced method, Wavelet transform [3].</td>
<td>Presented a method to obtain high resolution in 2D structure.</td>
</tr>
<tr>
<td>Hormone Replacement Therapy (HRT), Standard Mammogram Form [25].</td>
<td>Presented a method to obtain increase risk breast cancer, measure of tissue density.</td>
</tr>
<tr>
<td>Transformation invariant landmark detection [24].</td>
<td>A method can be easily implemented used in a large Varity of fluorescence image. To high of quantization.</td>
</tr>
<tr>
<td>Bilateral Mammograms [31].</td>
<td>Proposed a method is efficient at recovering local deformation.</td>
</tr>
<tr>
<td>Tomosynthesis, 3D reconstruction, shift-and-add SAA, back projection [68].</td>
<td>Using this method point-by-point BP is an effective method to reconstruct 3-D tomosynthesis images of the breast with improved rendition of small structures such as microcalcifications.</td>
</tr>
<tr>
<td>Non rigid Transformation, unwrapped [30].</td>
<td>Presented a process to successful in to enhanced mammogram image.</td>
</tr>
<tr>
<td>Rapidly Enhancing region of Intent [2].</td>
<td>Obtain increasing relative contrast, high resolution structure.</td>
</tr>
<tr>
<td>Discrete Wavelet transforms [40].</td>
<td>Used for this transform gives better results by using k mean clustering.</td>
</tr>
<tr>
<td>Computed radiography (CR) system, soft copy reading [50].</td>
<td>This process gets high mean sensitivities result.</td>
</tr>
<tr>
<td>Digital Infrared Imaging (DII) [9].</td>
<td>To presence 98% detection sensitivity in a study of 67 tissues proven cases of breast cancer.</td>
</tr>
</tbody>
</table>

### 3. IMAGE PREPROCESSING AND ENHANCEMENT

Image enhancement processes consider the process attenuation, sharpening, image features such as edges, boundaries, contrast to make the processed image. Image enhancement includes gray-level and contrast manipulation, noise reduction, background removal, edge crisping and sharpening, filtering, interpolation and magnification, pseudo coloring, and so on. This section presents the preprocessing and enhancement procedures such as median filtering, normalization and modified tracking algorithm for enhancement of mammograms. The performance of the enhancement technique is evaluated by Signal to Noise Ratio (SNR).

Enhancement involves four steps in the processing. Step one, to find the both sides of breast image and to remove the X-ray label in the digital image. Step two, using the median filter to remove the high frequency. Step three, to avoid the difference contrast and brightness by using the normalization process. Step four, to remove pectoral muscle region using the modified tracking algorithm.
**Table: 2**

An overview of segmentation techniques

<table>
<thead>
<tr>
<th>METHOD</th>
<th>REMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelet transform mean algorithm [40].</td>
<td>Using this transform K-means algorithm gives better results.</td>
</tr>
<tr>
<td>Linear discriminateanalysis (LDA) [70].</td>
<td>Proposed segmenting a image to this approach reduce misdiagnosis rates due to fatigue of doctors, and improve diagnostic accuracy</td>
</tr>
<tr>
<td>Kekre's Fast Codebook Generation algorithm [22].</td>
<td>To Segmenting a mammographic images into homogeneous texture regions and representing disparate tissue watershed segmented. Entropy segmentation using Gray Level Co-occurrence Matrix</td>
</tr>
<tr>
<td>Soft computing techniques [13].</td>
<td>Using this method all the models is able to solve the problem to a reasonable extent.</td>
</tr>
<tr>
<td>Curvelet transform [7].</td>
<td>This transform significantly improves the classification of cancer classes</td>
</tr>
<tr>
<td>Level set segmentation, Shape features [71].</td>
<td>That Fourier descriptor of normalized angle is an effective feature segmented</td>
</tr>
<tr>
<td>Machine learning algorithm – Modified Genetic Algorithm (MGA) tuned Artificial Neural Network [5].</td>
<td>Propose an algorithm increase the detection accuracy, has a recognition score of 97.8%.</td>
</tr>
<tr>
<td>Genetic programming [15].</td>
<td>This method more accurate and intelligible, the generated procedure is applied to an image, More accurate features are extracted and the accuracy of authentication is promoted.</td>
</tr>
<tr>
<td>Fuzzy k-means clustering algorithm [59].</td>
<td>Intensity feature vector improvement in the robustness of mammograms image segmentation.</td>
</tr>
<tr>
<td>Artificial neural networks (ANNs) [60].</td>
<td>Mammography interpretation and diagnostic decision making and features in mammography interpretation. the most effective means for early detection of breast cancer</td>
</tr>
<tr>
<td>Morphological image processing and wavelet transform technique [66].</td>
<td>The result 0.08 false microcalcification, 92.9% of true microcalcification clusters.</td>
</tr>
<tr>
<td>Electric field distribution and Xeroradiography[8].</td>
<td>To using this method to improve xeromammographic image quality.</td>
</tr>
<tr>
<td>Bilateral subtraction, Ant Colony Optimization and Genetic Algorithm [41, 12].</td>
<td>A technique for extraction of suspicious regions using Asymmetric approach. Suspicious regions are identified by subtracting the images</td>
</tr>
<tr>
<td>Ant Colony Optimization(ACO), Bee colony Optimization(BCO), Fuzzy C-Means and Genetic Algorithm[21].</td>
<td>Introduced some novel methods on Bio-inspired adaptive algorithms like ACO, BCO and Genetic algorithm for Selection of features extracted from mammogram image.</td>
</tr>
<tr>
<td>Spatial gray level dependence method (SGLDM), Ant Colony Optimization (ACO), Genetic algorithm (GA) [18, 45].</td>
<td>Hybrid methods for selection are extracted using SGLDM. Feature selection is performed using GA and ACO, which then fed to a three-layer BPN hybrid with ACO for classification.</td>
</tr>
<tr>
<td>Markov Random Field method hybrid with Ant Colony System, Genetic Algorithm and Back propagation Network (MRF–ACSGA-BPN), Conventional textural analysis methods [21].</td>
<td>A technique for segmentation and classification of microcalcifications in mammograms using Ant colony system. Suspicious regions are extracted by segmenting the mammogram image using MRF-ACSGA method.</td>
</tr>
<tr>
<td>(I1, I2, I3) color Space, MAP Estimate, Segmentation, Simulated Annealing (SA) [34].</td>
<td>Observed color image is considered to be the degraded version of the true labels.</td>
</tr>
<tr>
<td>Bio-inspired algorithms</td>
<td>A method for detection of microcalcification based on a bio-inspired adaptive model of contrast detection. Parameter of algorithm is automatically estimated from the image. This method is robust and free of parameter tuning.</td>
</tr>
<tr>
<td>Swam Intelligence [61].</td>
<td>In this method processed as its dynamic nature provides flexibility, robustness to process of rule mining and effectively segmented.</td>
</tr>
<tr>
<td>Fuzzy C-means Clustering algorithm (FCM) [41].</td>
<td>Using the fuzzy C Means algorithm the mammogram image is clustered and segmented effectively</td>
</tr>
</tbody>
</table>
4. SEGMENTATION

Segmentation of the breast region and non-breast region is a necessary prerequisite for further bilateral subtraction. This existing section presents the border detection method using genetic algorithm. The breast border can be obtained by segmenting the breast region in the image. Some authors have developed methods to identify the breast region on the basis of a global histogram analysis. However, a method based on global thresholding alone is critically dependent on the selection of the threshold values.

4.1. BILATERAL ASYMMETRY

Asymmetrical breasts can be reliable indicators for future based on breast cancer in women; these factors have been considered in a woman's risk profile. Asymmetries are concerned with those that are changing, enlarging or new. And that can be that are palpable an associated with other determine, such as microcalcifications or architectural distortion.

5. SUMMARY & CONCLUSION

Early detection of breast cancer is necessary to only localized cancer is to be treatable and curable. Mammography is one of the tools and is the gold standard for the early detection of breast cancer. However, finding microcalcifications region on mammograms are benign. The most important mammographic signs of malignancy are masses and microcalcifications. During diagnostic mammography, the breast cancers are imaged in different angles and interpreted. Thus, diagnostic mammography is more expensive than screening mammography. Initially mammogram images are acquired from MIAS database. Then the image is preprocessed to enhancing the image by using the weighed mean filter and the process is further normalized by the image processing techniques. Then region in pectoral muscle of the breast is removed by using the modified tracking algorithm. In feature work then segmentation of mammogram image is performed to detect the breast border by using the Artificial Bear optimization approaches.

6. REFERENCES

[8] Fatoaros PP and Reo G U “On optimizing the xeromammographic image”.


[18] KarnaM, Thangavel K, Ezhilarasup,”Ant Colony Optimization and a New Particle Swarm Optimization algorithm for Classification of Microcalcifications in Mammograms”.


[50] Takeshi Kamitani, Hidetake Yabuuchi, Hiroyasu Soeda, Yoshio Matsuo, Takashi Okafuji, Shuji Sakai, Taro Setoguchi1, Masamitsu Hatakenaka1, Nobuhide Ishii3 & Hiroshi Honda1, (February 2010), “Detection of breast cancer by soft-copy reading of digital mammograms: Comparison between a rule image- processing parameter and high-contrast parameters”.


[68] Ying Chen and James T. Dobbins (19 September 2007), “Importance of point-by-point back projection correction for isocentric motion in digital breast tomosynthesis: Relevance to morphology of structures such as microcalcifications”.
