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Detection and Processing of Mammograms by using Neural Networks and Wavelets through OFDM

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Abstract: ***Mammography is effective method for early detection of breast tumour. Recently due to machine learning development, it became easy to train with deep neural networks(DNN) by using convolutional neural networks(CNN) and computer aided diagnosis(CAD). The detected part is de-noised by wavelet transforms and it is transmitted through orthogonal frequency division multiplexing(OFDM) in case of treatment in remote area. Since most of the people still live in rural area with lack of awareness about breast cancer. Systems are trained on more number of data to obtain high sensitivity. The region of interest(ROI) is detected and segmented portion is processed for pixel-wise class prediction also with these most suitable techniques.***

Keywords: Mammogram, ROI, Segmentation, Microcalcification, Neural Networks, Wavelet Transforms and OFDM.

I. INTRODUCTION

There is rapid increase in number of cases regarding breast cancer in European as well as in Asian countries among young age groups especially in remote areas, where breast is dense. A dense breast reduce detection sensitivity. The breast cancer has mainly two defects in mammography, 1st is presence of malignant soft tissues or masses and 2nd is presence of microcalcification[1]. In most cases separate methods are used for both cases. So sometimes some parts are being missed by oversight. But here we are going to detect almost both cases by using proposed techniques. Mammography is x-ray image of the breast. Due to artificial intelligence and deep learning[3], now we have large number of data and it reduce human bias. To reduce the death due to breast cancer only can be done by social awareness and proper diagnosis in early stage of detection. Here we are finding ROI first and then segmenting by the help of our techniques. Further it is denoised and enhanced by the help of wavelet transforms. The deep CNN is most proficient for vision even it use simple calculations. The every convolution produces feature map[2], which is downsampled in the pooling layer. It induces translation invariance and local precision. The discriminative image representations and other feature can be provided by DNN by using linear filters, nonlinear activation functions, normalization etc. It consist of convolutional layers[1], activation layers and max pooling layers. In case of remote area OFDM is very useful in fruitful diagnosis and treatment. Further the paper is organized as follows. In next section we will discuss detection of ROI by using multi-threshold value. Section III will be about segmentation and in section IV & V microcalcification & mass detection and conclusion will be explained respectively.

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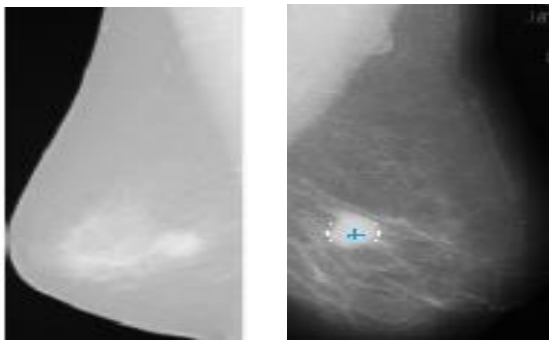
II. DETECTION OF ROI

The massive lesion is similar as glandular tissues in terms of shape, contrast and intensity in mammograms. First of all we locate massive lesion, which occurred in background initially. The detected ROI is used for further processing and it also refined before segmentation.

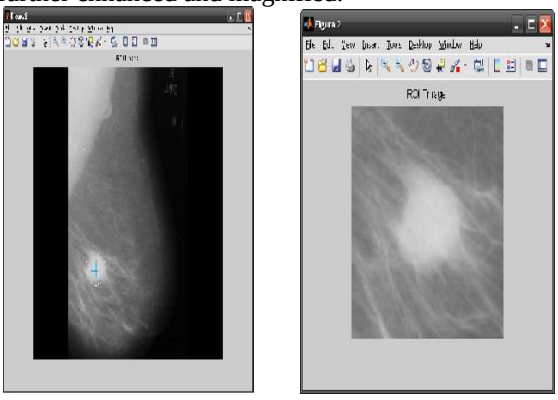


(a) (b)

Fig.1: (a) Massive lesion , (b) Detected ROI

III. SEGMENTATION

The ROI is segmented by using Hough transform and further enhanced and magnified.

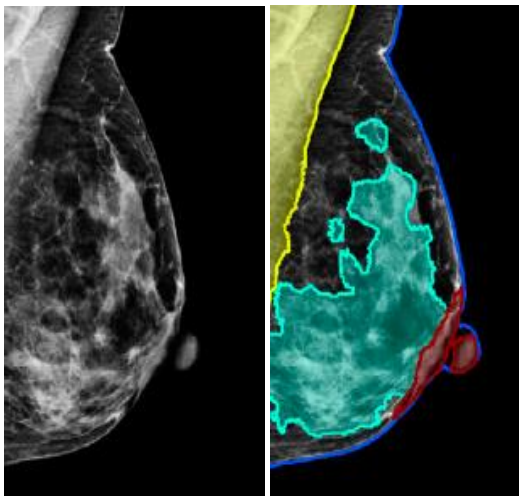


(a) (b)

Fig.2: (a) Marked ,

(b) Segmented and enhanced ROI

After pre-processing, DNN is trained with gradient descend with momentum[2]. Proper values of mean and variances are used for convolution.



(a) (b)

Fig.3:(a) Original image, (b) Labelled image by DNN

The segmented lesions are went for patch extraction[1] in CNN system. The pixel values are scaled with min-max scaling.

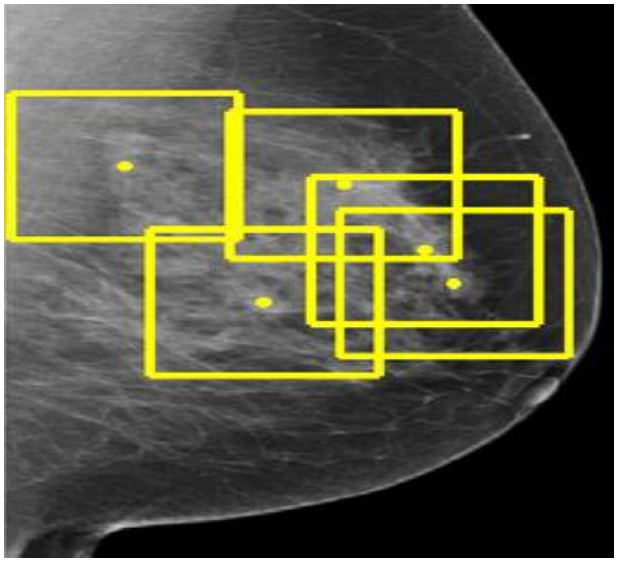


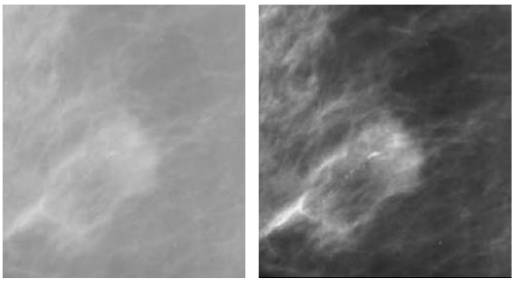
Fig.4: Extracted patch for CNN

IV. MICROCALCIFICATION AND MASS DETECTION

In wavelet framework, there is linear and non-linear enhancement operators[4]. But linear operators provide unsharp masking.

To avoid this non-linear enhancement is used, in which non-linear function is increased to avoid artefacts. The low contrast is enhanced first in compare to high contrast to minimize saturation effects. The edge should not blur.

The wavelet transform modulus maximum(WTMM)[5] method is used to detect edges of mass during segmentation. More accuracy is obtained by contour extraction. The smoothing function is used to obtain gradient in x and y direction.



(a) (b)

Fig.5: Microcalcification (a) Original , (b) Maximum visualize image

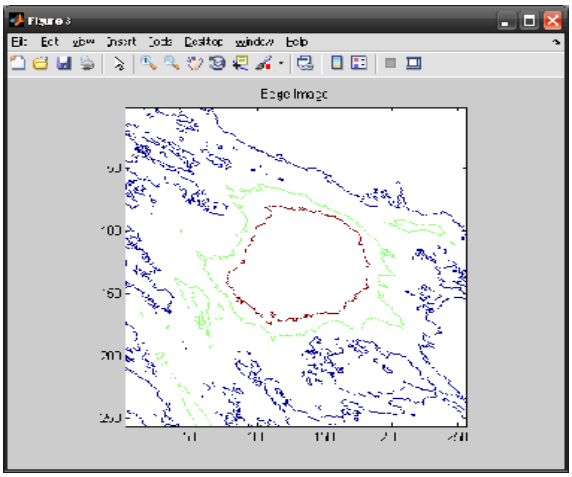


Fig.6: Edge Detection

There is so many segments in the contour, so irrelevant should be deleted. The edge points are linked and radial lines are used.

V. CONCLUSION

In this paper result is obtained by using deep learning with CNN and wavelets. The pre-processing and other analysis can be done by obtaining information through OFDM in case of remote area diagnosis. The ROI is obtained and segmented to detect massive lesion. The CNN is trained by using patch-wise approach. Since it is CAD , so there is still chance of improvement in this field.

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REFERENCES

1. Thijs kooi, Geert Litjens, “Large scale deep learning for computer aided detection of mammographic lesions”, Elsevier, Medical image analysis 35(2017),ISSN 1361-8415, pp.303-312.
2. Dubrovina, P.Kisilev, B.Ginsburg, “Computational mammography using deep neural networks”, Computer methods in biomechanics and biomedical engineering, Taylor & Francis Group,2016,pp.1-5.
3. Gens R., Domingos, P.M. 2014, Deep Symmetry Neworks.2537-2545

4. Bar Y, Diamant I.Wolf L, Geenspan H., "Chest Pathology Detection by using Deep Learning with Non-medical Training", IEEE International Symposium on Biomedical Imaging(ISBI), 2015, New York.
5. Long J, Shelhamer E, "Fully Convolutional Networks for Semantic Segmentation", IEEE Coputer society conference, Boston, 2015, PP.3431-3440.

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Dr. Pradeep Kumar has completed his Ph.D in ECE. He had done M.E in Applied Electronics and B.E in ECE from Anna University, Chennai. He has published more than 27 papers in various international journals and conferences. His research area is Bio-Medical Signal and Image Processing. He has more than 8 years of teaching experience. Presently he is working as associate professor in CMR Institute of Technology(UGC-Autonomous), Hyderabad.