

Extensive Image Enhancement Techniques for Efficient Micro Classification in Detection of Mammography Masses



Chatakunta Praveen kumar, Yogesh Kumar Sharma, K Rajendra Prasad

Abstract: Digital mammography used for detecting and suspecting the tumors from mammogram images and it is most demanding research in current era. It infers the field of image processing [14] so that key tasks of image processing are useful for radiologists in the medical diagnosis of mammogram images. Image processing play a key role in the diagnosis of either tumors or small masses from mammography images, in which pre-processing or enhancing techniques are required for smooth micro classification analysis. In this paper, proposed technique is presented for improving the quality of mammogram images as well as better classification of mammogram images that helpful for presenting the effective diagnosis for detecting the tumors in digital mammography. In the experimental study, an efficiency of proposed technique is demonstrated with respect to several performance parameters from benchmarked mammogram images.

Keywords: digital mammography, calcifications, enhancement techniques, pre-processing.

I. INTRODUCTION

The techniques of image process are used in the fields of computerized photography [1], space image processing [2], medical image processing [3], biological image processing [4], character recognition [5], remote sensing [6], and other industrial applications [6], [7] for products design and inspection. Traditional computer-aided design (CAD) [8] is a popular technique which can be used in diagnostic centres for the purpose of diseases identification. Breast cancer is one of major problem in women for the middle age groups due to some reasons. Identifying breast cancer in initial stage is important for radiologist and useful for human for extend their life span. In this context CAD is one of the good and highly demanding application for identifying tumors in initial level. In this paper majorly focusing on three issues namely pre-processing, segmentation, classification in mammograms. So far there is no best way to prevent this type of cancer in initial stage for extending human life span who are suffer from the breast cancer. Mammography is successful procedure used in initial level breast cancer detection. Image of x-ray is known as the mammography [13].

Identification of abnormalities is an emerging requirement for detecting the mammography diseases for women, in which various stages are needs to be identified. Earlier detection of tumours or masses is necessary in mammography images because those cases are curable and also prevent the severities of mammography. Two key cases are to be addressed in mammography for making effective decisions for confirming the earlier stages of mammography detection. , these are masses and micro-calcifications. Key steps of mammogram breast cancer detection are shown in Fig. 1. In digital mammography, the scanned images of mammograms are digitised for further analysis of suspected regions for determining the severity cases of masses calcifications, like malignant tumor and benign tumor. Various image enhancement techniques [9] are applied such as, contrast stretching, histogram equalization, mean and median filter. These techniques improve the quality of mammogram images so that it would be useful for getting the most accurate classification of masses regions and non-masses regions. Region of interest (ROI) [10], [12] is most commonly used segmentation technique and multi-ROI is proposed idea and it can be applicable for parallel segmentation at multiple areas, so that it saves an amount of computational time than simple ROI, in which initial images size of 1024x1024 are reduced to 256x256 size of choosen region of mammogram images. The features are selected from the part of ROI in the process of feature extraction. Two types of tumors are classified i.e. malignant tumor and benign tumor for finding the problem during mammography investigation in the experimental study.

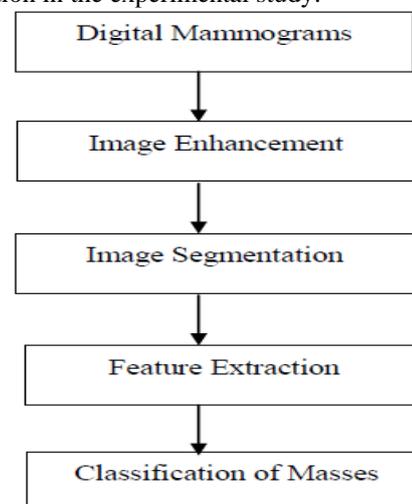


Fig. 1: Key Steps of Mammogram Breast Cancer Detection

Manuscript published on 30 September 2019.

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III. PROPOSED MULTI-REGION OF INTEREST (MULTI-ROI) AND EXPERIMENTAL RESULTS

In an image of mammogram, region of interest (ROI) selects the part of an image in reduced size which helps for faster detection of either tissues or masses in suspected mammogram image. The basic technique of ROI is described with three key steps, they are, collection of mammogram images, image enhancement, and mammogram image segmentation. Mammogram images are generally obtained with size of 1024x1024 pixels and it contains the most of the part with unwanted regions, the ROI gives the optimal results with reduction of mammogram image size of 256x256. Fig. 7 shows the steps of ROI.

In mammogram classifier model, we use more number of mammogram images, in such cases, ROI takes longer time for selection of region of interests from mammogram images. Thus, this paper describes the proposed model, namely, multi-ROI for multiple mammogram images, and it reduces the computational time for selection of parts of multiple images. The basic functionality cannot differ in both ROI and multi-ROI, but we achieve optimal computation time in multi-ROI.

Fig. 8. shows the results of multi-ROI for sample mammogram images. Textual properties [11] of segmented objects play a vital role for detection of breast cancer or classification of abnormalities of mammogram images.

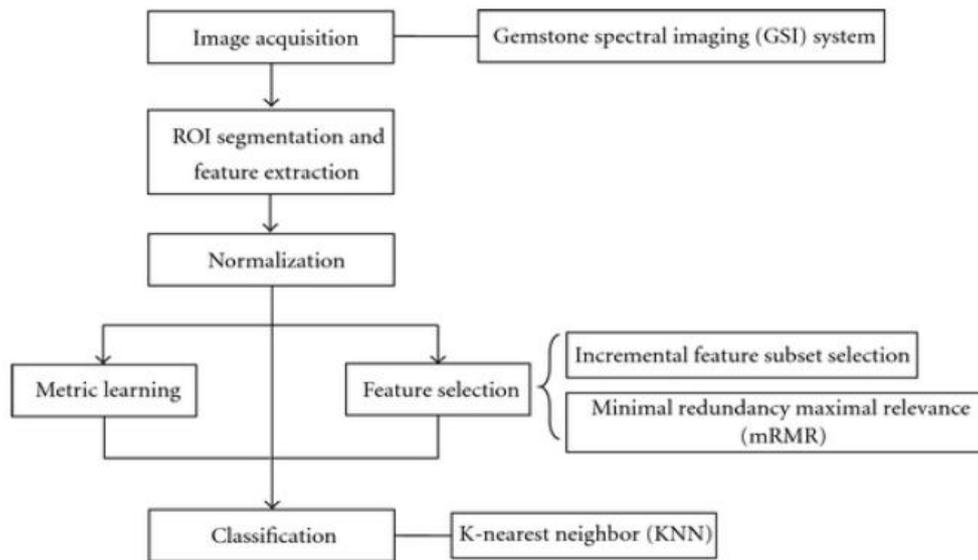
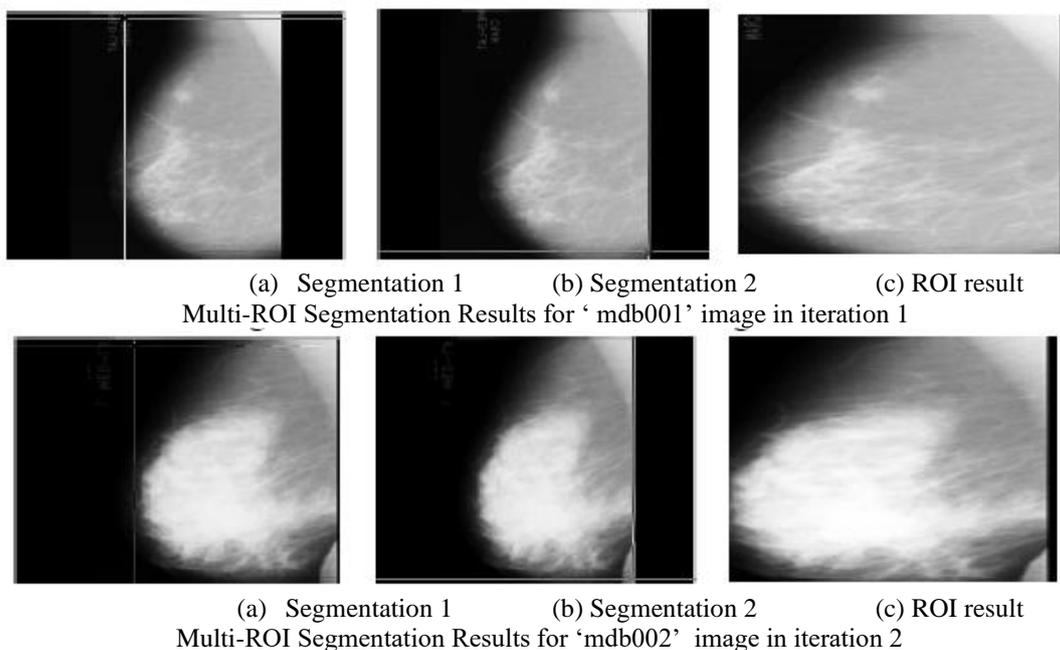
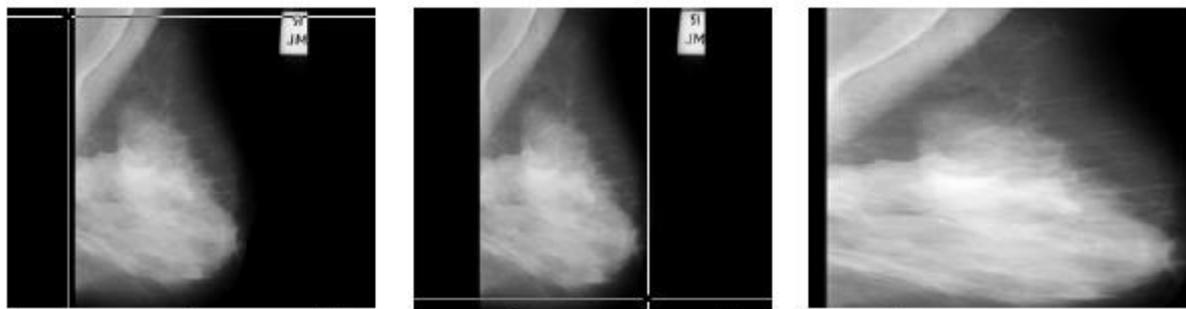
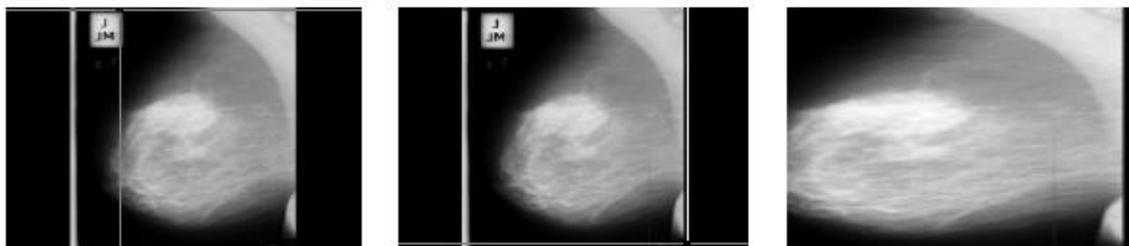


Fig. 7 Steps of ROI





(a) Segmentation 1 (b) Segmentation 2 (c) ROI result
Multi-ROI Segmentation Results for 'mdb003' image in iteration 3



(a) Segmentation 1 (b) Segmentation 2 (c) ROI result
Multi-ROI Segmentation Results for 'mdb004' image in iteration 4



(a) Segmentation 1 (b) Segmentation 2 (c) ROI result
Multi-ROI Segmentation Results for 'mdb005' image in iteration 5

Fig. 8 Steps of ROI Segmentation Results

IV. CONCLUSION

This paper describes the methodology for improving the strategy for mammogram masses identification through the techniques of image enhancement and proposed multi-ROI. The proposed multi-ROI is superior than basic ROI with respect to computational complexity. It performs the selection of interested parts of mammogram images for findings of severity cases of breast cancer detection and its possibilities. Thus, proposed ideas are well suited for early detection of mammogram breast cancer detection.

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