Effect of GLCM Texture Features on the Medio-Lateral Oblique (MLO) View of Digital Mammograms for Breast Cancer Detection

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ABSTRACT

Breast cancer is one among the most common cancers in women. The early detection of breast cancer reduces the risk of death. Mammograms are an efficient breast imaging technique for breast cancer screening. Computer aided diagnosis (CAD) systems reduce manual errors and helps radiologists to analyze the mammogram images. The mammogram images are typically in two views, cranial-caudal (CC) and medio lateral oblique (MLO) views. MLO contains pectoral muscles (chest muscles) at the upper right or left corner of the image. In this study, it was removed by using a semi-automated method. All the normal and abnormal images were filtered and enhanced to improve the quality. GLCM (Gray Level Co-occurrence Matrix) texture features were extracted and analyzed by changing the number of features in a feature set. Linear Support Vector Machine (LSVM) was used as classifier. The classification accuracy was improved as the number of features in GLCM feature set increases. Simulation results show an overall classification accuracy of 96.7% with 19 GLCM features using SVM classifiers.

KEYWORDS


DOI: 10.4018/IJBCE.2020070103

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INTRODUCTION

Breast cancer is the second leading cancer in worldwide and most common among the women. In 2018, over 2 million new cases were identified by American Institute for Cancer Research (AICR) (Breast cancer statistics). In 2017, American Cancer Society estimated a 2017-2018 years figure as 252,710 new cases were diagnosed among women and approximately 40410 women and 460 men are died because of breast cancer (Breast Cancer Facts & Figures, 2017-2018). Some years back in Indian woman, cervical cancer was most occurring cancer but now in the recent years, breast cancer is leading (Malvia and Appalaraju, 2017).

An abnormal cell growth in the breast causes breast cancer. Breast cancer occurs in the breast cells of milk glands which is also known as lobules or in the ducts of lobules. Breast cancer shows no major symptoms in early stage. When the tumor is large it may spread till the under-arm lymph node which causes a swelling of lymph node. Common symptoms of breast cancer are swelling in breast, redness, thickening of breast, pain in breast, nipple abnormalities and nipple discharge (Breast Cancer Facts & Figures, 2018). Early detection of breast cancer is very essential step in breast cancer diagnosis and treatment. Out of all screening techniques, X-ray mammography is gold standard technique. Breast mammography uses low energy X-rays for imaging.

Computer Aided Diagnosis (CAD) is a tool used for better analysis of medical images and helps to reduce the manual error. Mammogram images can be analyzed using computerized CAD system which improves the accuracy of the diagnostic method and reduces the workload and unnecessary breast biopsies (Ali et al., 2015). On the other hand, developing a CAD system for breast mass detection is a challenging task because of varying breast density, size, shape etc. CAD system consists of many stages like Data acquisition, Image Preprocessing, Image segmentation, Feature Extraction and Classification. The image obtained consists of noise and artifacts. The preprocessing technique is used to remove the noise and to enhance the raw images obtained. The Medio Lateral Oblique (MLO) view contains pectoral muscle as shown in Figure 1, which contains the lymph nodes indicates the abnormality in the cells. For CAD system, it acts as an artifact because reduces the performance accuracy. Hence it is important to remove the pectoral muscle using image processing techniques. Some important features are extracted from the pectoral removed breast region to classify the images as normal and abnormal.

Proposed study focuses on the semi-automated pectoral muscle removal technique and analysis on the different feature sets of the GLCM texture features. The proposed scheme is as shown in the Figure 2. To classify the MLO views of mammogram images as normal and abnormal an efficient algorithm is developed. The main stages of the algorithm are as follows:

1. Data Collection
2. Removal of Noise and Artifacts
3. Image Enhancement
Monitoring Hospital Patients Using Ambient Displays
Monica Tentori, Daniela Segura and Jesus Favela (2009). Mobile Health Solutions for Biomedical Applications (pp. 143-158).
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Finding Impact of Precedence based Critical Attributes in Kidney Dialysis Data Set using Clustering Technique