Chapter 13

Mammogram Classification Using Nonsubsampled Contourlet Transform and Gray-Level Co-Occurrence Matrix

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ABSTRACT

This chapter explores diagnosis of the breast tissues as normal, benign, or malignant in digital mammography, using computer-aided diagnosis (CAD). System for the early diagnosis of breast cancer can be used to assist radiologists in mammographic mass detection and classification. This chapter presents an evaluation about performance of extracted features, using gray-level co-occurrence matrix applied to all detailed coefficients. The nonsubsampled contourlet transform (NSCT) of the region of interest (ROI) of a mammogram were used to be decomposed in several levels. Detecting masses is more difficult than detecting microcalcifications due to the similarity between masses and background tissue such as F) fatty, G) fatty-glandular, and D) dense-glandular. To evaluate the system of classification in which
INTRODUCTION

In spite of evolution of new technologies for progressing quality of the mammographic images, the interpretation process and the images analysis are still difficult tasks. The same difficulty is true for the radiologist. This is due to the abundant texture and/or noise. It is expected to develop the analysis system and automatic interpretation of the mammographic images as a tool of the aid to make decision for detecting and classifying cancer. Currently, breast cancer is the most frequently found cancer for women worldwide and such incidences are increasing at a large scale. Therefore, search for analyzing images of the breast to aid diagnostic system (HD. Cheng et al., 2006) attracts the attention of many researchers. There are, at present, a number of techniques used for the medical images for breast cancer diagnosis which are: Ultrasound (imaging ultrasound), MRI (Magnetic resonance imaging) and mammography. Many of the studies have agreed the idea that the early stage of detection of the breast cancer may improve prognosis and improve survival rate for breast cancer patients (Smart CR et al., 1995; B.Cady et al., 2001).

Mammography technique remains the essential part of detecting breast. It is the most efficient in monitoring and early detection of breast cancer (L. Tabár et al.,1985; RE. Bird et al., 1992). All radiologists suffer from the difficulty in interpreting mammograms which further increased with type of examined breast tissue. Mammographic images show a contrast between the two main components of the breast fatty tissue and Connective-Fibrous Matrix. In general, it is very difficult to define normality of mammographic images: Indeed, the appearance of the mammary gland is extremely variable depending on the patient age and the period in which the mammogram is done. That’s why many researchers have proposed the algorithms for mass.

An approach for Mammogram classification (S. Beura et al., 2015) was presented using two dimensional Discrete Wavelet Transform and Gray-Level Co-occurrence Matrix for detecting breast cancer. The work in (Yu. Zhang et al., 2010) came up with new segmentation method for identifying mass regions in mammograms. For each ROI, an enhancement function was applied and proceeded with filters. Then, energy features based on the co-occurrence matrix of pixels were computed. The paper (P. Rahmati et al., 2009) presented a region-based active contour approach to segmentation of masses in digital mammograms. The work in (M.M. Eltoukhy et al., 2010) presented an approach for breast cancer diagnosis in digital mammogram using Curvelet Transform. After suggested mammogram images in Curvelet basis, a special set of the biggest coefficients is extracted as feature vector. A Computer-aided diagnosis (CAD) for characterization of Mammographic Masses was presented in (Jiazheng Shi et al., 2009). It is based on Level Set Segmentation with New Image Features. The Patient Information is based on the level set method, and includes two new types of image features related to the presence of microcalcifications with the mass and patient age. A linear discriminant analysis (LDA) classifier with stepwise feature selection was used to merge the extracted features into a classification score.

The literature survey reveals the existing classification schemes for digital mammogram images. However, most of them are not able to provide a good accuracy. In this chapter, we have proposed an effective algorithm for detecting and extracting texture features, using Nonsubsampled Contourlet Trans-