

Breast Cancer Diagnosis System Based on Wavelet Analysis and Neural Networks

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ABSTRACT

The high incidence of breast cancer has increased significantly in the recent years. The most familiar breast tumors types are mass and microcalcifications (Mcs). Mammogram is considered the most reliable method in early detection of breast cancer. Computer-aided diagnosis system can be very helpful for radiologist in detection and diagnosing abnormalities earlier and faster than traditional screening programs. Several techniques can be used to accomplish this task. In this work, the authors present a preprocessing method, based on homomorphic filtering and wavelet, to extract the abnormal Mcs in mammographic images. The authors use four different methods of feature extraction for classification of normal and abnormal patterns in mammogram. Four different feature extraction methods are used here are Wavelet, Gist, Gabor and Tamura. A classification system based on neural network and nearest neighbor classification is used.

Keywords: Homomorphic Filtering, Mammography, Microcalcifications, Nearest Neighborhood Classifier, Neural Networks, Wavelet

INTRODUCTION

Microcalcifications are an early sign of breast cancer which is the most common cancer among women. The mortality and incidence rates are still increasing; whereas, the prognosis has not improved for many years. Only earlier detection can increase the chances of survival for

patients. It is of great importance that the cancer is detected before the onset of metastases. Mammography is the method of choice to find these tumors clinically. In six studies in the United States, Sweden and Holland, it was found that regular screening of women over 40 years for breast cancer can reduce mortality by about 40 percent (R. M. Nishikawa, 2001).

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However, despite significant progress in terms of equipment, all radiologists recognize the difficulty of interpreting mammograms which further increased by the type of breast tissue examined. As such, several studies have been conducted in recent years to develop support systems for diagnosis in mammography construct a second potential reader after the radiologist to reduce errors committed by the doctor. Many research teams are working on automatic detection (Mcs) and opacities of several types, most methods that exist in the literature to segment these two types of lesions involving the Technical Growth Regions, the Watershed or Wavelet. L. Ke et al (L. Ke et al., 2010) show that the comparison approach bilateral mammography is effective to locate any mammography asymmetry between left and right breast to identify those who have a breast. B. Lee et al (B. Lee et al., 2010) detected breast masses using the technique of increasing the area (Level Set). Recent studies developed by A. Noodeh et al (2010) and Mr. Rangayyan et al (2010) show that fractal analysis can be used as an effective tool for identifying cancerous regions in mammographic images. R. N. Panda et al (R. Panda et al., 2009) have developed a system self diagnosis for the detection of mass and (Mcs) by technique OTSU.

The region increasing technique was used by different researchers all noted that pretreatment is required for proper convergence of the contour. A. Sultana et al (A. Sultana et al., 2009) conducted a high-hat transformation white form applied to mammographic image followed by a thresholding. Recent efforts are made by A. Alolfe et al (2009) and N. Hamad et al (2009) based on the transformation wavelet to achieve better detection (Mcs). T. Stojic (T. Stojic et al., 2010) have developed a system that acts on the contrast enhancement of mammograms to detect (Mcs), using two approaches: the first method is based on the multi-fractal theory, and the second based on Mathematical Morphology. Finally, more recently, in the same objective as the work of the Belgrade team, S. Al-Kindi (S. Al-Kindi et al., 2011) have reformulated the problem of contrast enhancement not only

mammograms but also images ultrasonic to create an optimum contrast for better visualize the masses and (Mcs).

APPROACH DESCRIPTION

1. **Problematic:** Mammographic images show a contrast between the two main constituents of the breast fatty tissue and connective-fibrous matrix. In general, it is extremely difficult to define normality of mammographic images: Indeed, the appearance of the mammary gland is extremely variable depending on the patient's age and the period during which the mammogram is done.
2. **Algorithm:** The mammography images segmentation systems illustrated in Figure1.

Extracting Regions of Interest (ROI)

Mammography images are often affected by different types of noise that are due to acquisition parameters, such as the exposure time and the strength of compression of the breast (see Figure 2. a).

A human visual system can easily ignore these artifacts in the interpretation, this is not the case in an automated system and these artifacts may interfere with the interpretation process.

More recently, work on the extraction of the breast area and removal of artifacts in mammography (M. Wirth et al., 2005; L. Belkhdja et al., 2009; J. Nagi et al., 2011) have proven their effectiveness in the development of an automatic diagnostic aid in mammography.

In this paper, we propose a simple method based on the application of two types of filters Morphological opening and closing respectively to remove the light and dark lines (See Figure 2. b). A threshold (T) well chosen can transform these images filtered in binary format (See Figure 2. c), by thresholding, we get several connected components of very different sizes that correspond to the desired structure "breast"

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