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IMAGE & SIGNAL PROCESSING

A Method for Microcalcifications Detection in Breast Mammograms

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Abstract Breast cancer is the most cause of death for women above age 40 around the world. In this paper, we propose a method to detect microcalcifications in digital mammography images using two-dimensional Discrete Wavelets Transform and image enhancement techniques for removing noise as well as to get a better contrast. The initial step is applying a preprocessing techniques to improve the edge of the breast and then segmentation process (Region of interest) for eliminating some regions in the image, which are not useful for the mammography interpretation. Then unsharp masking and histogram modification technique has used to enhance the contrast of the image and to clarify some details like microcalcifications. Lastly, Discrete Wavelets Transform applied for detecting the abnormality. The proposed method has evaluated using the Mammographic Image Analysis Society (AS) mammography databases. The proposed method has achieved acceptable results.

Keywords Breast cancer · Computer aided detection · Microcalcifications · Mammograph · Wavelets transform

This article is part of the Topical Collection on *Image & Signal Processing*

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Introduction

A malignant tumor that commence in the cells of the breast is named breast cancer [1]. In modern countries, medical statistics have estimated that one woman in eight will contract a breast cancer. Malignant tumors are more probable to appear in breast tissues of women age up to 40, and they represent 35% of the abnormalities detection in a woman's breasts. Breast cancer is presently accountable for more than 30% of death by cancer in women, which is about 1% of all deaths worldwide. Breast cancers also concern men since it represents 1.5% of all cancer deaths in men [2, 3].

The early detection of breast cancer is remarkable effort because of the treatment of an undeveloped and non-metastasized tumor will not require massive surgical interventions.

Microcalcifications are deposits of calcium in breast tissue [4]. It is small size lesions, typically range in size from 0.05 to 1 mm in diameter. With these dimensions, microcalcifications are comparatively hard to detect [1, 5].

There is a high correlation between the presences of microcalcifications, breast cancer, particularly when a number of microcalcifications collected together is labeled a cluster, and it may be a good sign of cancer. A cluster is well-defined as at least three microcalcifications within a 1-cm2 area. As a result, an correct detection of microcalcifications is necessary to any early detection of the common of breast cancers [6, 7].

In the literature, various numbers of techniques has described to detect and classify the presence of microcalcifications in digital mammograms as benign or malignant.

Computer-based methods for the detection of microcalcifications in digital mammograms have designed [8–11]. These methods based on different image technique in which a signal-suppressed image has subtracted from a

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