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A Detection of Breast Cancer by using Gaussian filtering method and Filter bank method.

(A Short Communication)

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Abstract

Breast Cancer is the most common malignancy in women and is the second most common leading cause of cancer deaths among them. At present, there are no effective ways to prevent and cure breast cancer, because its cause is not yet fully known. Early detection is an effective way to diagnose and manage breast cancer and can give a better chance of full recovery. Several domains and concepts are used in the detection of breast cancer. The main domains used in this detection technique include different types of Filtering method. In this type Gaussian filtering method and Filter bank method was especially adapted to tumors that extend over a relatively large area.

Keywords: Breast Cancer, Gaussian filtering method and Filter bank method.

I. INTRODUCTION

Cancer is the most vicious disease, the cure of which must be the prime target through scientific investigation. The early detection of cancer can be helpful in curing the disease completely. There are several techniques available in the literature for the detection of cancer. Many researchers have contributed their ideas in the detection of cancer. The literatures mainly discuss about the existing cancer detection techniques. Several domains and concepts are used in the detection of cancer. The main domains used in this detection technique include Gaussian filtering method and Filter bank method Mammogram image has been in use for very long time and much research has been carried out by early researchers. They have used different types of filtering methods are Gaussian filtering method and Filter bank method.

II. FILTERING METHOD

A. Gaussian Filtering Method

Dangler et al (1993) presented a method for the detection of cancer in mammograms. The proposed approach used a two stage algorithm for spot detection and shape extraction. In the first stage a weighted difference of Gaussian filter was applied for the noise invariant and size specific detection of spots. A morphological filter reproduces the shape of the spots. The results of both filters were combined with a conditional thickening operation. The topology and the number of the spots were determined with the first filter and the shape by means of the second filter.

Dubey et al (2010) stated that breast cancer is the leading cause of death among women. Currently X-ray mammography is the most widely used method for early detection of breast cancer. Many computer aided techniques are available to assist the radiologist in taking crucial decisions. Many computers that use level set for segmentation of masses in digital mammograms was introduced. This method uses the Gaussian filter for smoothing the image and noise reduction. Level set methods offer a powerful approach for the medical image segmentation since it can handle any of the cavities, concavities, splitting or merging. However, this method requires specifying initial curves and can only provide good results if these curves are placed near symmetrically with respect to the object boundary. The results of experimental study indicated that their scheme can provide useful contour extraction for mass structure.

B. Filter bank method

Gurcan et al (1997) described a method for detection microcalcifications in mammograms. In this method, the mammogram image was first processed by sub band decomposition filter bank. The band pass sub image was divided into overlapping square regions in which skewness and kurtosis as measure of the asymmetry and impulsiveness of the distributed were estimated. The detection method utilized those parameters. A region with high positive skewness and kurtosis was marked as region of interest. Simulation results have shown that the method was successful in detecting regions with microcalcifications detection method utilized in those two parameters.

Raul Mata et al (2000) stated that the detection of clustered of microcalcifications can aid radiologist to detect early breast cancer. Microcalcifications exhibit some important characteristics, like its small size and high luminosity. So, a CAD method can be useful to avoid overlooking them. In this paper a multiresolution analysis

was proposed by decomposing the image through a band-pass filter bank, so that each sub band image become visible only the details at the given scale. Thereafter all the images will be combined in a final one in order to obtain an image that contains all the images details at the scale where of microcalcifications tend to appear. Statistical analysis of the histogram permits to classify the susceptible zones of containing of microcalcifications. Applying those statistical techniques over the whole image and representing the results in a 2-Dmap, clustered of microcalcifications regions appear clearly distinguishable.

Ferrari et al (2001) developed a method for the analysis of asymmetry in mammograms using directional filtering with Gabor wavelets. In their, the breast boundary was detected first and all artifacts outside the breast were removed. Then, the pectoral muscle was detected and removed. The fibro glandular disk was segmented and the resulting image was decomposed using a bank of Gabor filters at 12 orientations and four scales. The Karhunen-Loeve transform was employed to select the principal components of the filter's responses. Rose diagrams were computed form phase images and subsequently analyzed to detect the presence of asymmetry as characterized by variations in oriented textual patterns. The Gabor filter based method gives quantitative measure of the difference in the directional distribution of the fibro glandular tissue.

Hong-Dun Lin et al (2003) stated that early detection and diagnosis breast cancer markedly increases survival rate. Digital mammography is believed to help breast image experts to detect breast cancer early. Accurate diagnosis also depends on the quality of the image presented to the experts. The study addresses the quality improvement of the image. A statistically based sub band filtering method was applied to enhance the mass and calcification shown in the digital mammograms by inhibiting noise. The method was based on sub band transformation due to its decomposition characteristic and includes two steps: noise inhibition and boundary enhancement. Contrast ratios and frequency responses are measured to evaluate the enhancement performance and distortion affect, respectively, to validate the effectiveness of the proposed and conventional methods, a phantom mammogram image that consists of similar mammographic microcalcifications, breast gland and well-circumscribed mass was designed for simulation experiment. Moreover, the real mammograms with microcalcifications were also applied on representing the efficient enhancement ability by the proposed method. The results in the study demonstrated that the proposed method improved the quality of the image more than other enhancement methods, according to these to criteria. The comparison results have shown that not only the image quality is improved but also within less image distortion.

Sampat and Bovik (2003) presented an approach to detect tumor mass in digitized mammograms. The approach consisted of two steps. In the first step, a filter algorithm was used to enhance the features. In the second step, a filter was used to detect the spatial location with the enhanced features.

Kuan-Yuei Li and Yu-Kun Hung (2006) stated that clustered microcalcifications in digitized mammograms have been widely recognized as an early sign of breast cancer in women. This work was devoted to developing a Computer-Aided Diagnosis (CAD) system for the detection of microcalcifications. Accordingly, their approach was divided into two stages. At first, all suspicious microcalcifications are preserved by thresholding a filtered mammogram via a wavelet filter according to the MPV (Mean Pixel Value) of that image. Subsequently, Markov random field parameters based on the Derin-Elliott model are extracted from the neighborhood of every suspicious microcalcifications as the primary texture features. The primary features combined with three auxiliary texture quantities serve as inputs to classifiers for the recognition of true microcalcifications so as to decrease the false positive rate. Both Bayes classifier and Back-propagation neural network were used for computer experiments. The data used to test this method were 20 mammograms contain 25 areas of clustered microcalcifications marked by radiologist. From their experiments, they concluded that, with a proper choice of classifier, the texture feature based on Markov random field parameters combined with properly designed auxiliary features extracted from the texture context of the microcalcifications can work outstandingly in the recognition of microcalcifications in digital mammograms.

Prajna et al (2008) extended a method based on Gabor filters and phase portrait analysis to detect initial sites of tumor. The fractal dimension of each ROI was estimated using the circular average power spectrum technique. Analysis with a set of four features, including fractal dimension and three texture features known as entropy, sum entropy and inverse difference moment had been carried out. Region based methods are used in this research. Region based detection takes in to account the spatial information in contrast to pixel based methods. The features are directly correlated to important diagnostic information like the shape and margin of extracted regions.

Balakumaran and Vennila (2011) stated that mammography is the most efficient method for breast cancer early detection. Clusters of microcalcifications are the sign of breast cancer and their early detection is the key to improve breast cancer prognosis. Microcalcifications appear in mammogram as tiny granular points, which are difficult to observe by radiologists due to their small size. An efficient method for automatic and accurate detection of clustered microcalcifications in digitized mammograms is the use of computer Aided Diagnosis (CAD) systems. This paper has presented a novel approach based on multiscale products of Eigen values of Hessian matrix. The detection of microcalcifications is achieved by decomposing the mammograms by filter bank based on Hessian matrix in to different frequency sub-bands, suppressing the low

frequency sub band, and finally reconstructing the sub bands containing only significant high frequency features. The significant features are obtained by multiscale products. Preliminary results have indicated that the proposed scheme was better in suppressing the background and detecting the microcalcifications clusters than any other detection methods.

Mario Mustra et al (2012) stated that microcalcifications are an important early sign of breast cancer development. Because of that computer aided detection systems (CAD) from detection of microcalcifications can be very useful and helpful for breast cancer control. In order to perform detection and classification of microcalcifications it is necessary to remove background for accurate detection and they have proposed a method contrast enhancement of microcalcifications. The proposed method improves microcalcifications contrast solely, while background is being suppressed. For background suppression they have used combination of wavelet filtering and gray scale morphology. The results of the proposed method are significant improvement in background suppression and contrast enhancement of microcalcifications.

III. CONCLUSIONS

In the first stage a weighted difference of Gaussian filter was applied for the noise invariant and size specific detection of spots. A morphological filter reproduces the shape of the spots. The results of both filters were combined with a conditional thickening operation. The topology and the number of the spots were determined with the first filter and the shape by means of the second filter. This method uses the Gaussian filter for smoothing the image and noise reduction. The method was based on sub band transformation due to its decomposition characteristic and includes two steps: noise inhibition and boundary enhancement. Contrast ratios and frequency responses are measured to evaluate the enhancement performance and distortion affect, respectively, to validate the effectiveness of the proposed and conventional methods, a phantom mammogram image that consists of similar mammographic microcalcifications, breast gland and well-circumscribed mass was designed for simulation experiment. For background suppression they have used combination of wavelet filtering and gray scale morphology. The results of the proposed method are significant improvement in background suppression and contrast enhancement of microcalcifications.

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