REVIEW ON STUDY OF COMPUTER AIDED DETECTION IN MAMMOGRAPHIC IMAGES

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Abstract:In health care, digital image processing is important now adays, as there is a direct use of digital images to diagnose the diseases, in medical image processing some of the operations are performed like preprocessing of image, feature extraction, image segmentation and mass classification. Breast cancer is one of the leading causes for the deaths in women. To diagnose and cure the cancer early detection of the cancerous tumors is the only way. Mammography is one of the techniques to detect and diagnose the breast cancer. It is helpful for the radiologist. In this paper we will be providing brief study about the computer aided diagnosis. Because of the noise it is difficult to interpret the mammograms. Sometimes radiologist will to find the tumor. This paper focuses on survey of work done various researchers which will be helpful for the radiologist for taking decisions.

Keywords: mammography, breast cancer, image segmentation, mass classification

1. Introduction:

In medical image processing we perform different operations which will enhance the image or find the tumor from abnormal images. Breast cancer is one of the leading cancers which affect the health of women. After skin cancer this cancer is majorly found in women and due to which death rate is increasing among them. According to the American cancer society facts and figure in 2019 around 268,600 cases of invasive type breast cancer will be diagnosed among women. [1]. The survey says nearly 41,760 women and 500 men in 2019 will be expected to die because of breast cancer.

Breast cancer is found to occur often in women. Detection of breast cancer can be done using clinical methods and tests but the rate of accuracy is not that much high. To obtain the abnormal region in the mammogram is quite difficult because of the noise and the contrast of the image. From the preceding two decades breast cancer is found to be the major issue in the medical research. the main problems are due to the fuzzy nature of the tumor and the contrast of the image, mainly we have to work on the enhancement of the image first then we can go for extracting efficient features and then segmentation is performed to obtain the Region of interest (ROI). ROI can be given to the classifiers to obtain the type of tumor. CAD system is helpful to decrease the work of radiologist [2]. Figure 1 shows the input image (mdb028 MIAS) and the ROI.

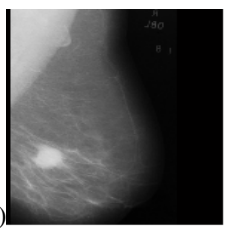
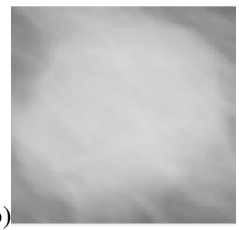
(a)  (b) 

Fig1. (a) Input image (mdb028) (b) Region of Interest (mdb028)

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Various methods are used for identifying the tumor in computer aided diagnosis including threshold-based segmentation, region-based segmentation and some clustering-based techniques also. in case of thresholding work carried out with two ways either global and local, in case of global thresholding we will be focusing on global data like the histogram [3], It has been observed that when the masses are brighter than the other nearby tissue then we use the global thresholding and in case of local thresholding we try to check the local threshold values of the pixel. This technique is widely used in the identification of mass in mammogram [4-6]. This paper gives brief review about computer aided diagnosis in mammogram.

2. Literature Survey :

Breast cancer is one of the cancers which is regularly occurring in women and it has been found that due to this mortality among women is increasing. it is generally developed in the cells of the breast. it forms in the lobules of the breast or n ducts; it can also be happened in the fatty tissues. Radiologist mostly misses the tumors in the breast cancer due to the contrast and noise in the mammogram image also it is due to the manual error. in image processing related to the medical there are certain areas are there where researchers work like image enhancement, image segmentation and image classification.In breast cancer generally micro-calcification and masses are mostly the indications in mammogram. The main steps in these are identification of masses and classification.

The masses in mammogram are having various shapes and due to the contrast and fuzzy nature of the contour it is difficult to identify the mass or tumor. It is found that sometime radiologist may go for doublereading of mammogram but in that case, it is more costly to go for double reading leading to a greater number of radiologists [7]. Through classification of image type of tumor is getting identified and we can take certain primary measures based on the early detection of tumors this will be helpful to avoid needless biopsy [8].

Image preprocessing is one of the basic steps in image processing. The main aim of this method is to improve the quality of the image and to remove the unwanted portion in the image. In breast cancer mammogram image is containing some of the labels which can be removed with the help of preprocessing step, because of the nature of the mammogram it is difficult to handle the mammogram image. Through image segmentation we can find out the tumor, image segmentation can partition the image into different sub-region. Every region will be helpful for us to identify the required data [9]. To identify the region of interest it is important to distinguish from the surrounding area, to do this we can utilize the parameters such as intensity of pixel and boundary of the tumor. Usually a high intensity and circular based objects are more likely to be ill-defined masses [10]. One of the other methods is clustering based technique which classify the different pixels grouped under similar properties [11]. M. Suliga et.al [12] has given extension to the k-means algorithm. Even we can work with respect to the contours of the mammogram. Various authors have worked on the level set and snake method. [13-15].

breast cancer screening is one of the best procedures to identify the cancer tumor at an early stage, generally it is not possible for radiologist for analyzing the hundreds of images every day, this work required lot of time and it is important to have the concentration of the radiologist also. Because of the same reason CAD systems are becoming more popular as there is more reliability is there. in mammograms it is found that due to the artifacts and labels present, it makes the background non-uniform region [21], itaffects accuracy of segmentation and proper contour cannot be detected. because of this the performance of algorithm is degraded. so, we try to remove these artifacts and labels from the background.

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region growing segmentation methods can be performed to segment the image and find the ROI.
Chen and Zwiggelaar [22] have used region growing method for removing the pectoral region and then manually a seed point is selected on the border in between the pectoral and breast region used a region-growing technique to remove the pectoral muscle, then manually placed a seed point on the border between the pectoral and breast regions. Subsequently, the seed was grown based on the likeness with the region's mean intensity.

The CAD process to work on mammogram image for segmentation of micro calcification is also difficult due to the low contrast and difficulty in differentiating between the surrounding area this will make it hard to detect the tumor effectively. Brief characteristic of micro calcifications is described in [23]. to detect the micro calcification properly contrast of the image mustincrease also remove noise. Jayasree Chakraborty et.al.[24] have focused on the region grow method which is controlled by the multilevel thresholding. this method gives better results in detecting suspicious region in mammogram. in one of the studies dubey et.al have worked on two different approach based on level set and marker-controlled watershed which is better option to perform segmentation of the image. for this process they have used set of 17 mammograms. as per the output boundary image we received by is observed that the output we get is better as compared to other methods [25]. As compared to both methods, marker-controlled method is good one. along with the segmentation of the image it is also important to classify the image in to proper type such as malignant or benign. Segmentation methods are of three different types such as contour based, region based and cluster-based segmentation of image. One of the segmentation methods is based on the water shed segmentation it is based on the watershed transform. it is useful to find the border between the two objects [26].

In our proposed work will be developing an approach for automatic mass detection in mammogram using multilevel thresholding. For segmentation purpose we will be focusing on region grow method to reduce the false positive rate. As we will be having iterations so with every iteration a new region is obtained with more accuracy.

3. Methodology

:Computer aided diagnosis system will give us better alternative to diagnose the cancer. it helps the radiologist for second opinion about diagnosis. The work carried out by Ciatto et al. [16] has given observation that the results obtained by double reading are equivalent to the single reading of mammogram. In medical image processing to find the tumor we must perform certain operations Fig.2 shows the general operations to be performed.

In medical image processing specially for cancer , various processes are performed on the images. In breast cancer identification of mass is difficult due to the noise or contrast of the image so we perform presprocessing on it. We can use median filter to remove or decrese the spot noise and salt and paper noise[17]. Simillarly we can use various other filters also namely, average, or mean filter, adaptive median filter, average filter, and wiener filter. Detection of mass is one of the measure tasks performed with the help of segmentation for the same different type of segmentation algorithms have been used based on threshold based or region-based technique also clustering methods can be used [18-20].

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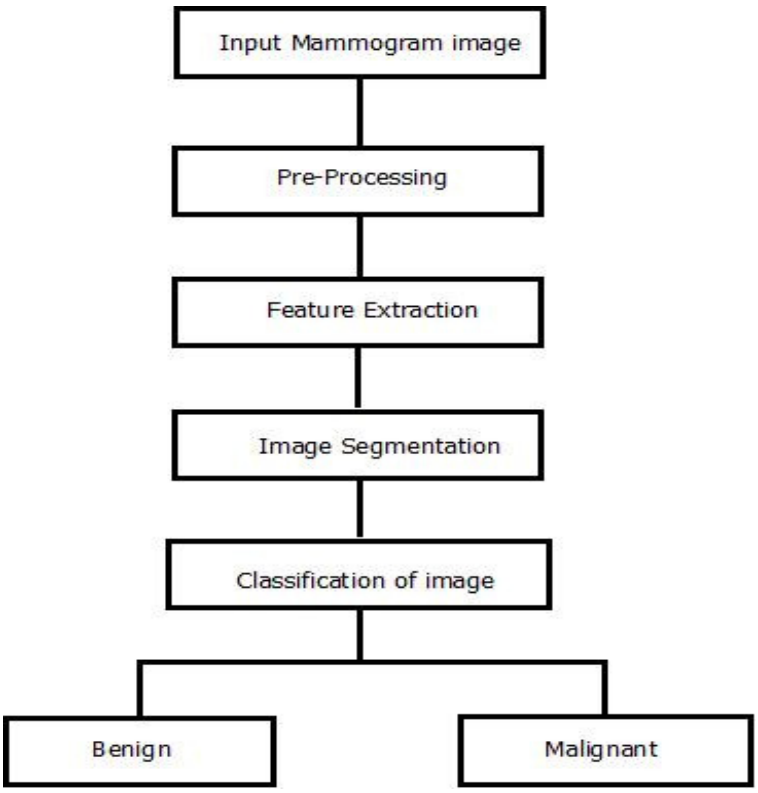

Fig.2 General procedure for mass detection in mammogram.

3.1 DATABASE: To perform the evaluation of the algorithms we use some standard databases for mammograms such as Mammogram image analysis society (MIAS) dataset generally known as mini MIAS dataset. It has 322 images consisting of various type such as circumscribed, calcification, speculated, asymmetric and size of all the images is 1024-pixel x 1024-pixel. Another database which is mostly used by the researchers is Digital database for screening mammography (DDSM) this database contains more then 2000 images of different types with the ground truth availability. It is the combine effort of Massachusetts General Hospital, Sandia National Laboratories and the University of South Florida Computer Science and Engineering Department.

4. CONCLUDING REMARK

Breast cancer is commonly found in the women, it has been observed that early detection and diagnosis of breastcancer is the better way to reduce the death rate among women. Mammography is one of the measures to go fordiagnosis mammogram image to find the tumor. Radiologist may miss some tumor part in the breast due to human error or due to the contrast of an image. In that case double reading of the mammogram is done but it iscostly. To reduce this cost, we go for computer aided diagnosis. After going through the study, it is found that proper segmentation approach is needed to find the proper ROI. Study shows that various CAD systems and different algorithms effectively useful for the tumoridentification.

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