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Automatic Detection of Tumor in Mammogram at the Early Stage

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Abstract

In this paper a technique for image segmentation is proposed using watershed transform. This method uses gradient magnitude as segmentation function to transform input image to watershed format. The Bhattacharya co-efficient has been computed to determine relative closeness of the region, considered in the sample. Histogram techniques have been used for image enhancement. After enhancement Bayesian network model which is based on probabilistic determination and region merging operation have been taken place.. The sample is compared with Mini-Mias data base and data base obtained from the radiologist, made to determine whether the sample is cancerous or noncancerous.

Keywords: Bhattacharya co-efficient, Bayesian network and Gradient magnitude.

I. INTRODUCTION

Image segmentation plays a crucial role in medical imaging by facilitating the delineation of regions of interest. Breast cancer occurs when a malignant (cancerous) tumor originates in the breast. As breast cancer tumors mature they may metastasize (spread) to other parts of the body. Mammographic screening is the main method to identify early breast cancer. Detection and localization of tumor at early stage is the only way to decrease the mortality rate. In this paper an attempt have been made to detect cancerous or non-cancerous for a given sample (image), randomly selected from Mini-Mias and data base obtained from the radiologist, for given image apply segment the image by using watershed transform basically watershed algorithm works as a gray scale image [1]. The colour image and convert it to grayscale. Watershed segmentation is called as a region-based technique. Mark the foreground object (disc size) opening and closing operation of morphology, maximum superimposing with original image. Bhattacharyya distance measure for pattern recognition, Bhattacharyya distance measures the similarity of two discrete or continuous probabilities distribution. Histogram of a particular image (sample) is to be determined. Bayesian network have been implemented, it is graphical model for depicting probabilistic relationship among a set of variables. Region merging operation has been implemented. It is one of the image processing segmentation technique, in this method pixel level is considered, each of them having homogenous region, arranged in a2x2 fashion together satisfy the homogenous property if it is yes they are merging to form a bigger region. Final segmentation output whether the given sample is cancerous or not. The novelty behind in this paper Bio graph viewer have been considered, time taken for watershed algorithm that is computation time have been displayed, time taken for BNT region merging. If the given sample is tumor it is detected and displayed tumor, if the given sample is not tumor it is displaying, tumor is not detected. Basically the malignant tumour usually has speculated, rough and blurry boundary.

II. METHODOLOGY

We are considering the raw images in Mini-Mias data base and clinical data from the radiologist, which is in the JPEG format and then convert to PNG, basically clinical data which is in the DICOM images and convert to BMP (bit map plane) and applying watershed transformation basically watershed transformation is region based segmentation, The gradient magnitude function (sobel operator) which is used basically to detect the edges, mark the Fore ground object (disk size) opening with a closing morphology can remove the dark spot, dilate followed by image reconstruction operation, calculate the regional maxima to obtain good foreground markers. To interpret the result superimpose the fore ground marker image on the original image. Clear the edges of the marker blobs and then shrink them a bit. Remove all the blobs which have less than a certain number of pixels. Compute back ground marker and apply watershed transform [3]. Apply colored watershed label matrix during this procedure. Identify the identical region that is intensity of the pixel

Step1: Read the color image and convert it to gray scale

Step2: Use the gradient magnitude as the segmentation function

Step3:- Mark the foreground objects

Step4: Compute back ground markers

Step5: Compute the watershed transform of the segmentation function

Step6: Visualize the markers and objects boundaries superimposed on original image stop timer.

Time taken for watershed algorithm, start timer for BNT Baysesian network topology, the graphical structure has to take the form of DAG (Direct acyclic graph) basically direct acyclic graph set of conditional probability table for each node in the graph, conditional probabilities at each node usually stored as a table (conditional probability table or CPT). Where

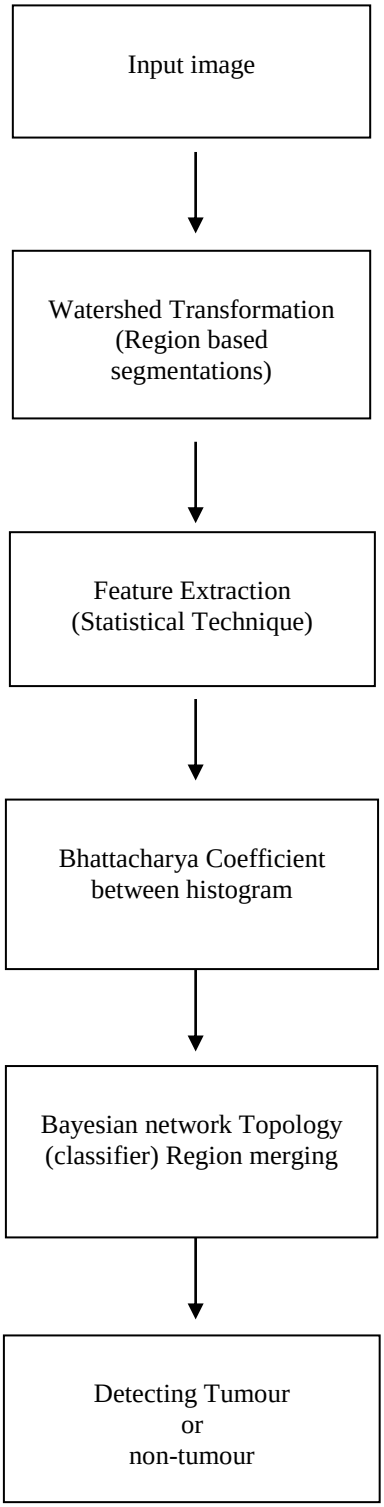
node represent random variable edge indicate conditional dependence relations Initialised connection map, give label to all regions, get the segmented region; Find out neighbor region (dilation process) get the labels.

Make the respective connection value to one. Give delay of 0.5 construct Bayesian network find out total number of nodes, and also define node size, create Bayesian network, visualize the graph structure, region merging using BNT [4]. Calculate histogram for each region. Get the region pixel value from the original image. Calculate histogram, store the value. Calculate Bhattacharya co-efficient between connected regions and create conditional probability table, get all connected component for each segment. Get the histogram of current node calculates bhattacharya co-efficient, store it in variable, stop timer. Load data matrix, that is object, find out common region load classifier, get the object region, get the values, extract the features values, classify features combine output find out matching score more than 0.7 [2]. Initialize empty tumor output ROI (region of interest) is extracted because tumor part usually has high brightness than other part of the mammogram. The intensity of the pixel which comes under the tumor region is different from the other pixels of the breast tissue. Analysis of tumors on mammogram is difficult due to low contrast and poor definition of their boundaries. The region merging method is exactly opposite to the region splitting method. Region merging is also applicable only to images whose number of rows and columns are an integer power of 2. Starting from the pixel level and consider each of them as a homogenous region. At any level of merging if the four and adjacent homogenous regions arranged in a 2x2 fashion together satisfy the homogeneity properties. After segmentation feature extraction using statistical approach, the parameter

Table I. Statistical Features of an Image

Moment	Expression	Measure of Texture
Mean	$m = \sum_{i=0}^{L-1} Z_i p(z_i)$	Measure of Average Intensity
Standard Deviation	$\sigma = \sqrt{\mu_2(z)}$	A measure of Average contrast
Smoothness	$R = 1 - 1/(1+\sigma^2)$	Measures the relative smoothness of the intensity region
Third Moment	$\mu_3 = \sum_{i=0}^{L-1} (Z_i - m)^3 p(z_i)$	Measures the skewness of histogram
Uniformity	$U = \sum_{i=0}^{L-1} p^2(z_i)$	Measures the uniformity In the Histogram
Entropy	$e = -\sum_{i=0}^{L-1} p(z_i) \log_2 p(z_i)$	Measure of randomness

The overall work



III. EXPERIMENTAL RESULTS

The experimental readings are obtained from statistical approach as per statistical features of an image.

Table II. Results obtained for wear

Image sample	Avg. Gray level	Avg. contrast	Measure of smoothness	3rd Moment	uniformity	Entropy
mdb 035	36.221	70.377	0.0708	9.7769	0.3178	3.9486
mdb 045	48.817	73.284	0.0763	7.4611	0.216	4.7884
mdb 055	47.013	76.606	0.0828	8.7825	0.3815	3.7776
mdb 065	31.75	63.692	0.0587	8.4945	0.2214	4.4139
mdb 085	45.816	69.788	0.0697	6.601	0.3153	4.2982

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IV. RESULT AND CONCLUSION

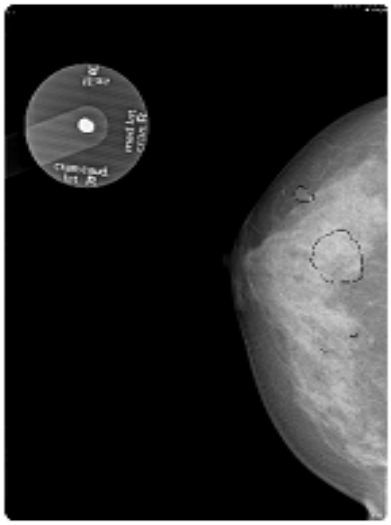

Fig.1 Input Image

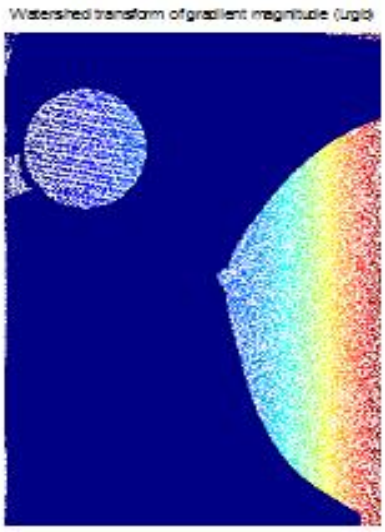

Fig.2 Watershed transform of gradient Image

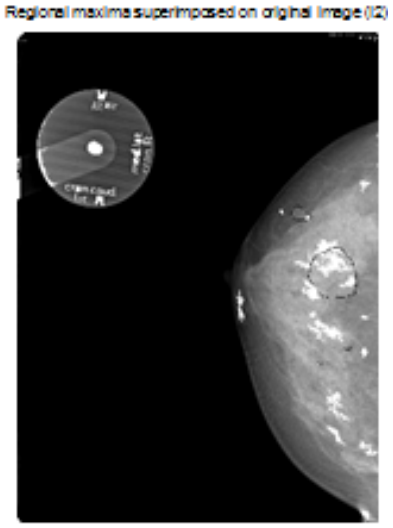

Fig.3 Regional maxima superimposed on original image

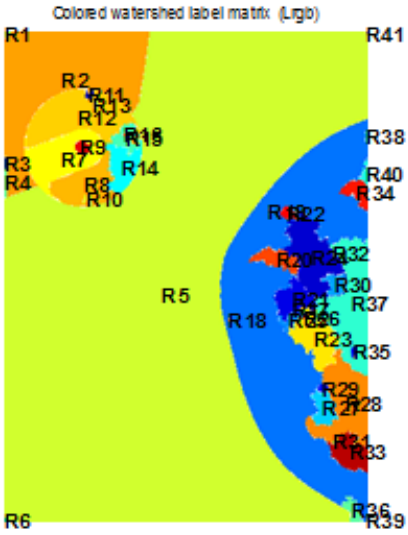

Fig.4 Colored watershed label matrix image

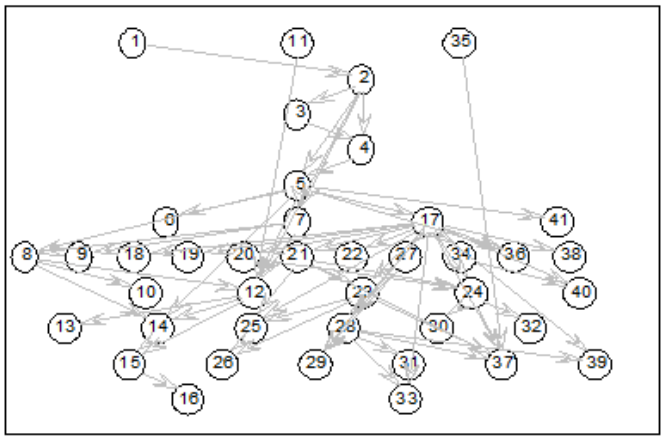

Fig.5 Represent the various nodes and its path

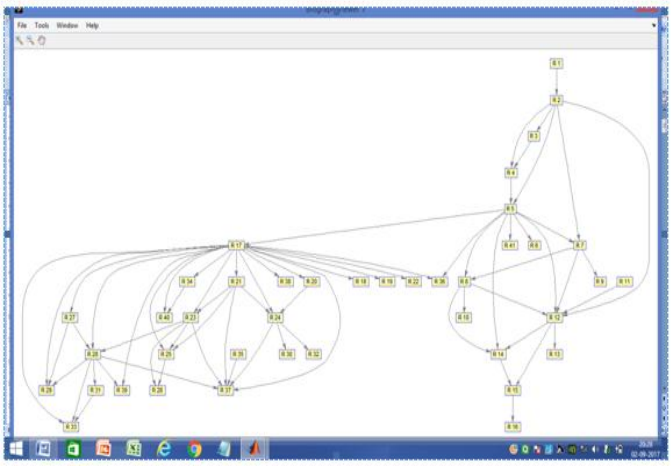

Fig.6 represents Bio graph viewer

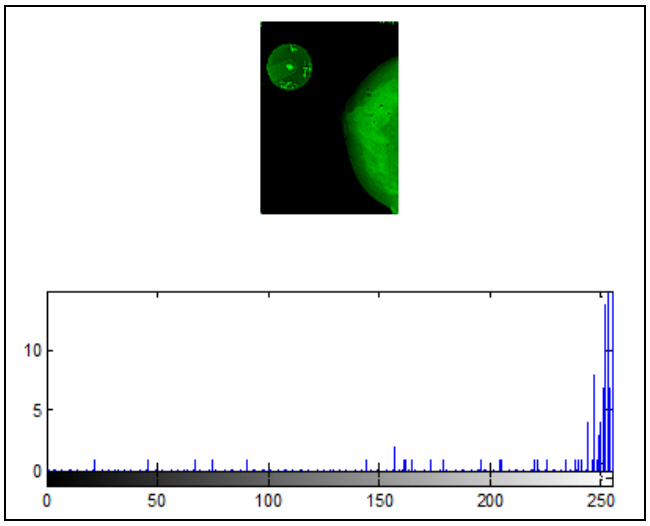

Fig.7 Represents histogram of a particular image.

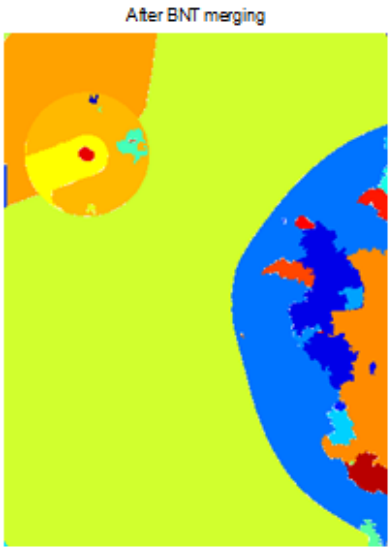

Fig.8 represents After BNT merging

Fig.9 Represents Detected tumour

Time taken for watershed algorithm = 25.698935 sec

Time taken for BNT region merging = 36.956127 sec.

Concluding remarks: For early diagnosis is a fundamental requirement in order to achieve a reduction in mortality rates. Screening procedure has contributed to a substantial reduction in mortality rates through early detection of the disease. Many techniques have been established for the detection of calcifications. The main novelty behind this paper is computation time taken for watershed algorithm and time taken for BNT region merging automatically it detects the cancerous region through various procedure, which are mentioned in the above flow chart.

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