DETECTION OF MALIGNANT TUMOUR IN MAMMOGRAPHY IMAGES USING ADAPTIVE CLUSTERING SEGMENTATION

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ABSTRACT

The group of cancer cells that initiate from the breast cells and it expands from tissue of breast and leads to breast cancer. To identify the breast cancer Mammogram is one of the efficient techniques used now days in earlier using x-ray images of breast and this will reduce the death ratio of breast cancer patients. A new approach is implemented to detect the breast cancer of women by its image and it is discussed in this paper. Initially, pre-processing is applied which converts the original image into gray scale and adaptive clustering segmentation is implemented. Based on segmented image feature is extracted and compared with normal patient image. Normal patient parameters are taken and considered as threshold value and processed patient value is compared to identify the abnormal patient. Hence the accuracy of proposed approach is measured by the factors like Sensitivity, Specificity and Accuracy. Hence it shows that proposed works obtains better detection of cancer when compared to other existing methods.

Indexing terms/Keywords

Pre-processing, adaptive clustering segmentation, threshold comparison, accuracy and breast cancer detection.

I.INTRODUCTION

Image segmentation has been identified as the key problem of medical image analysis and remains a popular and challenging area of research. Image segmentation is increasingly used in many clinical and research applications to analyze medical imaging data sets. Recent developments in image analysis and processing and the increasing interest in medical image segmentation have been covered in many review publications. Many image segmentation algorithms find their foundation in signal processing theory and methods. In a recent editorial, renowned image processing researchers recommended to push science into signal processing by means of comprehensive testing with refutation criteria. There are as many different methods for image segmentation as there are researchers in the field. More in fact, because many researchers have proposed multiple methods.

A wide range of computational vision problems could in principle make good use of segmented images, were such segmentations reliably and efficiently computable. For instance intermediate-level vision problems such as stereo and motion estimation require an appropriate region of support for correspondence operations. Spatially non-uniform regions of support can be identified using segmentation techniques. Higher-level problems such as recognition and image indexing can also make use of segmentation results in matching, to address problems such as figure-ground separation and recognition by parts. Our goal is to develop computational approaches to image segmentation that are broadly useful, much in the way that other low-level techniques such as edge detection are used in a wide range of computer vision tasks.

The development of medical image segmentation and other image analysis techniques have been very rapid and exciting, and there is every reason to believe the field will move forward more rapidly in the near future with the advent of better computing power and the unlimited imagination of researchers in the field. Despite the remarkable results reported in this special issue and other peer journals, there is still scope for further research. There is no shortage of challenges and opportunities for medical image segmentation techniques nowadays.

II. LITERATURE SURVEY

To perform image segmentation and edge detection tasks, there are many methods that incorporate region growing and edge detection techniques. For example, it is applying edge detection techniques to obtain Difference In Strength (DIS) map. Then employ region growing techniques to work on the map as in [2, 10]. In [3], combining both special and intensity information in image segmentation approach based on Multi-resolution edge detection, region selection and intensity threshold methods to detect white matter structure in brain. In [3, 6, 7, 9] adaptive clustering algorithm and K-means clustering algorithm are generalizing to include spatial constraints and to account for local intensity variations in the image. The spatial constraints are included by the use of a Gibbs Random Field model (GRF). The local intensity Variations are accounted for in an iterative procedure.j

In [8], Vincent introduced a fast and flexible algorithm for computing watersheds in digital gray scale images. A combination of K-means clustering and Watershed techniques then region merging and edge detection procedures was used. The clustering method was applied to obtain an image of different intensity regions based on minimum distance to examine each pixel in the image and then to assign it to one of the image clusters. Then a watershed transformation technique worked on the gradient of that image was employed to reduce the over segmentation of the watershed algorithm. But the result is over segmentation image if we use the watershed algorithm with the gradient of raw data image without clustering method above. To get rid over segmentation, merging method based on mean gray values and edge

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strengths (T1, T2) were used. The watershed algorithm can segment image into several homogeneous regions which have the same or similar gray levels. To perform meaningful segmentation of image, regions of different gray levels should be merged if the regions are from the same object. The watershed segmentation generates spatially homogeneous regions which are over segmented.

An Multi resolution segmentation using histogram technique is proposed in[11], which read the input image and obtains he gray scale image. The obtained gray scale image is used to remove the background objects then the histogram of the image will be obtained. The result of histogram operation will be run through the directional filter bank to reduce the noisy signals. Then segmentation threshold will be fixed and the signals will be grouped into classes. The new threshold value will be calculated for the segmentation purpose. These procedure is done iteratively up to the segmentation becomes infinite.

III.METHODOLOGY

A new methodology for the segmentation of medical images is proposed. Our method uses combination of graph based segmentation technique and k-means clustering inverse radon transform technique with user assistance to set threshold to increase the efficiency of image segmentation. In the first phase our method reads the input image and obtains he gray scale image. The obtained gray scale image is used to remove the background objects then the histogram of the image will be obtained. The resultant picture will be the input to construct the pixel adjacency graph, we construct the graph with set of pixels. We construct 8-neighbor pixel adjacency graph and edges will be assigned to the neighboring pixels. Weight map will be calculated based on the similarity measure of the neighboring pixels and according to the weight values we apply k-means clustering technique to cluster the similar pixels. These set of processes will be executed repeatedly with the user interaction, user interaction is assisted to provide the threshold value. The threshold value is the limit for the similarity threshold value, which will be used to cluster the similar pixels. The result of segmentation will be shown to the user and the system will wait for new threshold value from the user.

3.1 Preprocessing:

At the preprocessing stage we generate the gray scale values of the original image. The generated gray scale values are then passed to the edge detection and we used sobel edge detector for the purpose of edge detection. The output image of the edge detection process is used to increase the intensity values of the original image. We increase the intensity of the detected edges in the original image.
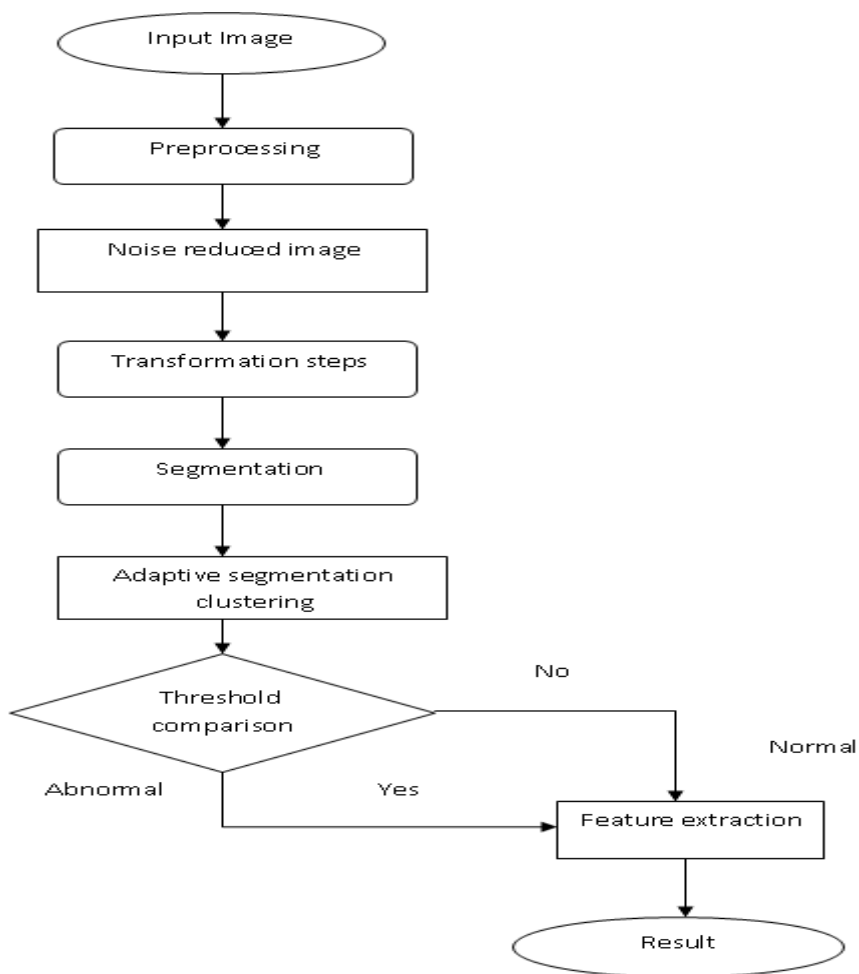

Fig 1: overall block diagram of the proposed system

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Noise reduction:

We have generated the histogram value of the image, we used 64 bit histogram for our purpose. The resultant value is used for the segmentation process. The pixel adjacency graph is constructed with the set of pixels from the image. We construct 8-neighbor pixel adjacency graph and edges will be assigned to the neighboring pixels. Set of pixels are assigned as nodes and links are assigned with the neighbor pixels of the image. We maintained separate graph for each set of pixels.

Weight map construction:

An edge weight is computed with the grey level contrast of the pixel. Given a pixel adjacency graph $G = (V;E;W)$, we consider the following edges weights mapping:

$$n \in \mathbb{N}, \forall e_{i,j} \in E, \quad w_{i,j}^n = \left(\frac{|p_i - p_j|}{d(i,j)} + 1 \right)^n$$

Where i and j are two nodes of the graph, pi and pj are the grey level values of neighbor pixels of the image and d(i; j) is the Euclidean distance between the two neighbor pixels. wi;j plays the role of a dissimilarity measure between neighbors pixels and can be seen as a local estimate of the image's gradient modulus. wi;j is a strictly positive increasing function of |pi-pj|. A small edge weight means that pixels i and j have similar values, whereas wi;j takes large values when pixels i and j have significant different values.

3.2   Adaptive segmentation clustering:

The similar pixels are identified and clustered to a group. The threshold value provided by the user is used to identify the similar pixels. The distance of neighboring pixels which are below the threshold is identified as similar pixel and will be assigned to a class.

Segmentation:

Based on the result of k-means clustering process the image is segmented and reconstructed to provide the resultant image. The resultant image is displayed to the user and will be allowed to provide new threshold. Based on new threshold entered the clustering process and segmentation process will be repeated to provide new result. This methodology will be repeated until the user gets satisfied.

IV. RESULT AND DISCUSSION

This is the input gray image to analysis breast cancer while using this input segmentation should analysis various generous this shows huge disorders that show in below output.

Fig: 2 input gray image

From the input gray image it would section into several shearlet transform from each stage some slight difference might finding for the breast cancer these section layers from the gray image is exposed lower.

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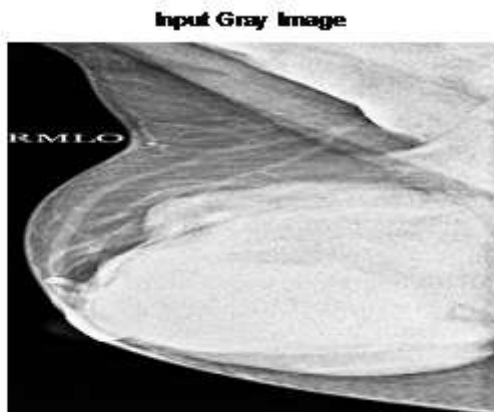
Input Gray Image

Fig: 3 shearlet transform

Above shearlet transform consequence image can sub divided into huge amount of deviation may control these categories has been correlated somewhere in various analysis

Fig: 4 section image of shearlet

Belong the various mentioned shearlet transform about that noisy image MSE(mean squared error) and size might mentioned the determined value can excecuted below the image.
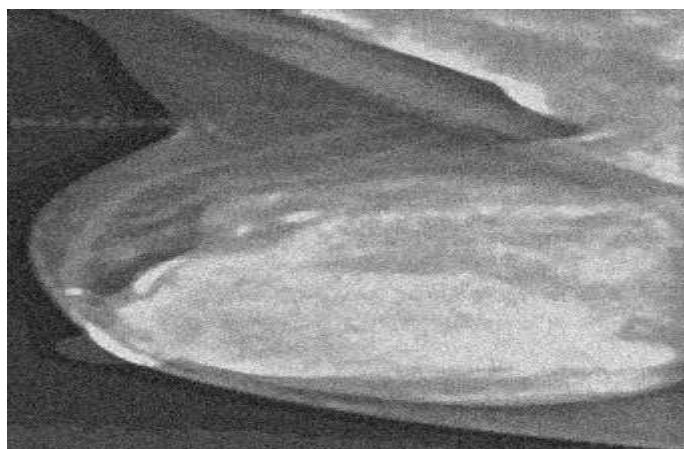
NOISY IMAGE, MSE = 399.9924 SIZE = 512 x 512

Fig: 5 Noisy image

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Based on their noisy result analysis restored image and mean squared error cam give into the matrix value to restored image finding deep disorders in the give breast cancer investigation.

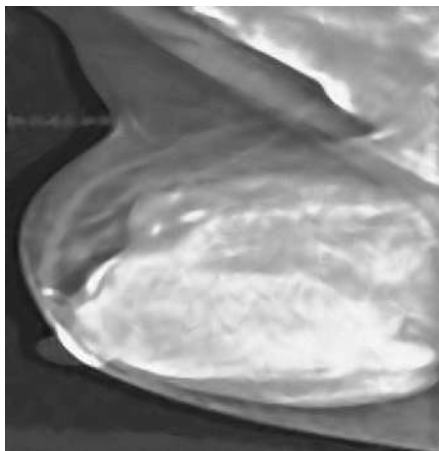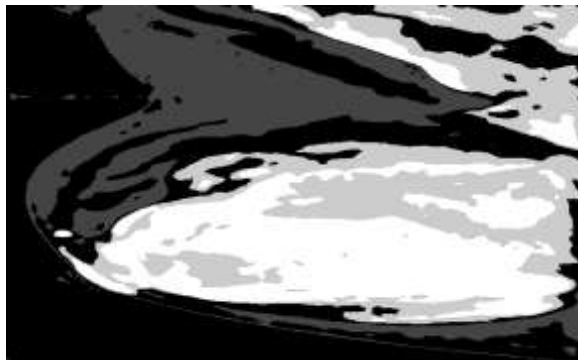RESTORED IMAGE, MSE = 19.8299 SIZE = 512 x 512

Fig: 6 restored image

Adaptive clustering result

Adaptive clustering output can digonising the countless number of cancer cell in the yield function of the breast disease

Fig: 7 adaptive clustering image

These are the image using adaptive clustering result on input image using the contribution exploration about the processing using soft computing techniques

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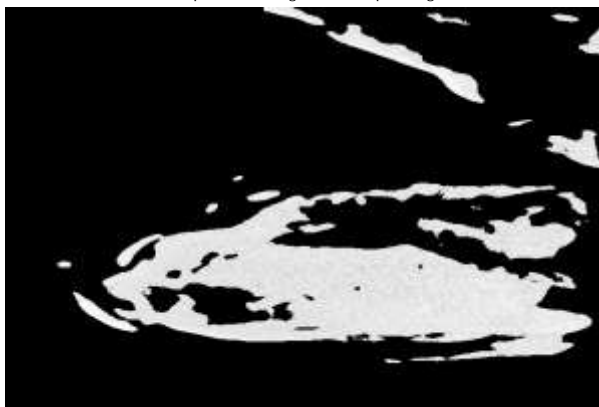
Fig: 8 adaptive clustering images on input image

Local standard deviations of image shows and identify the depth research for the information to localization and bulk amount of blood clotting in particular section in our bodies.
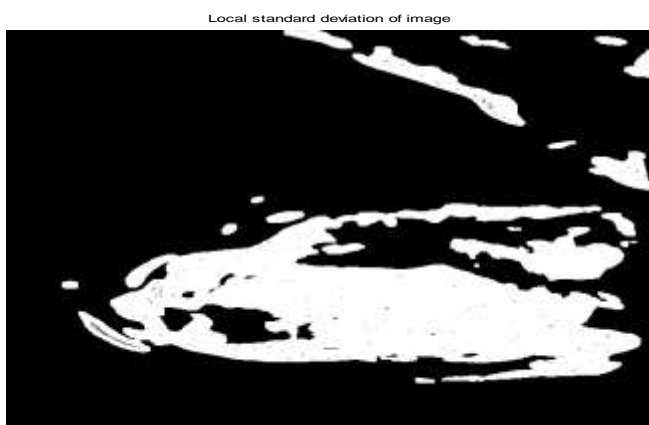
Local standard deviation of image

Fig: 9 local standard deviation images

These are the result analyzed among level- 1 DWT (discrete wavelets transform) and level- 2 DWT, it help to determine the numerous information to research would been take place in the breast cancer thus these are the output result for discrete wavelets were shown below the explanation.
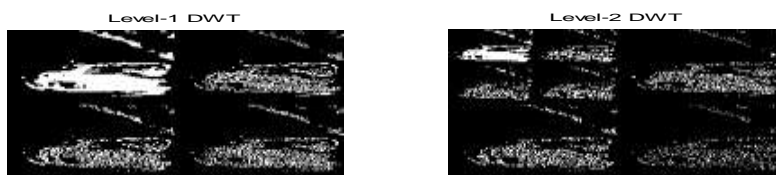
Level-1 DWT   Level-2 DWT

Fig: 10 levels discrete wavelets transform

Finally these are the final output segmentation among the all result based on the breast tumors research and information besides from the serious injuries, were the abnormal condition decision can display beneath

final segmentation output

Fig: 11 final segmentation output

I S S N **2 3 2 1 - 8 0 7 X**
V o l u m e 1 2 N u m b e r 2 6
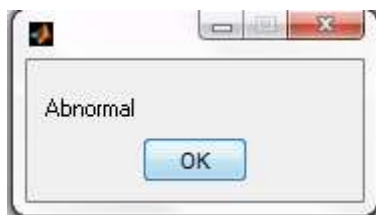J o u r n a l o f A d v a n c e s i n c h e m i s t r y

Fig: 12 abnormal image

These are the final abnormal stage of the breast cancer that shon below the final segmentation results, Algorithm and calculation between adaptive clustering processing and initiated centroid value and after demising details while given.

Calculation Details:

Initial MSE = 399.992424

MSE after Denoising = 19.829875

Relative Error (norm) After Denoising = 0.005345

RECONTRUCTION_ERROR = 0.0053

PSNR: 35.1576 dB

Adaptive Clustering Processing:

Initiated centroid value = 42.833333

Initiated centroid value = 85.666667

Initiated centroid value = 128.500000

Initiated centroid value = 171.333333

Initiated centroid value = 214.166667

Elapsed time is 1.894297 seconds.

mean_dwt =189.8052

std_dev =358.7490

Feature =272.0530

Lung Cancer Stage: Abnormal

Sensitivity = 82.9019

Specificity =82.2553

Accuracy =95.7861

V. CONCLUSION

The proposed procedure early detection and diagnosis of Breast cancer in women increases the conduct possibilities and cure of the disease. These are modification based on their breast cancer analysis detection of tumors cells from the mammogram database and the intensity of affected cells are identified using 1-D DWT. The Region of Interest of the cells is measured using texture analysis. For 1- D discrete wavelets deviation shows abnormal condition based on their individuality and distasteful. The classification is done to identify normal / abnormal in the future detection possibilities is 2-D DWT levels in the after day segmentations

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