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Detection and Identification of Mammographic Microcalcification Clusters in Mammograms

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ABSTRACT:

Micro calcification is a tiny abnormal deposit of calcium salt especially in the breast cancer that in the human female is often an indicator of breast cancer. currently the micro calcification cluster is a important primary sign of breast cancer. The cluster is detected at the early stage and it is identified as the benign or malignant. The existing approaches are tending to concentrate on the morphological micro calcification and/or statistical cluster features. In this paper, the proposed method uses fuzzy techniques to detect the malignant or benign cluster. A graph generation is a set of micro calcifications and represents the multiple scales at topological structure of micro calcification clusters.

INTRODUCTION:

Breast cancer is one of the types of cancer which is seen in humans and is one of the deadliest diseases. Early detection of breast cancer gives the patients a good chance of survival, whereas the late detection can cause death .A breast cancer detected can be classified as benign or malignant. It is one of the most difficult to differentiate between a benign microcalcification from one that is malignant micro calcification. Medical image processing is the process of creating the visual representation of inside part of the body for clinical analysis and medical intervention. Image processing is the process of dividing a digital image into multiple segments. Goal of segmentation is to simplify and /or change the image representation in to something that is more meaningful and easier to analyze. It is based on the measurement taken from the image and might be texture, gray level, color, depth or motion. Mammography is used as a screening tool and diagnostic.

Screening mammogram is performed to attempt to detect breast cancer before symptoms occur. The goal of screening mammography programs is to decrease mortality from breast cancer. Diagnostic mammogram is performed to help detect breast cancer if a woman has symptoms, such as a lump that can be felt in her breast. The goal of mammography is one of the early detection of breast cancer, typically through detection of characteristics masses and /or micro calcifications. Mammography is to detect the around 80% to 90% of breast cancers. The mammography is used with the masses and abnormalities detection at early stage is quite possible. There are several steps of breast image processing, first step is read the input image, next step is preprocessing, segmentation, morphological operation, micro calcification graph generation, feature extraction, classification and finally detect the images are malignant or benign. Morphological is used on gray value image, if viewed as a stack to binary image.

The morphological characteristics of micro calcification could be used to difference between benign or malignant cases. It is difficult and time consuming for radiologists to differentiate between malignant from benign micro calcification. The morphological features and shape are based on mainly extracted from the individual micro calcification and describe the morphological characteristics of individual micro calcification, such as size and shape. The proposed method for modeling and classifying the micro calcification clusters in mammogram is based on the topological properties. A set of topological features are used to extract from the micro calcification graph at the multiple scales, and the Multi Scale topological feature is generated to differentiate between the benign or malignant cases.

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2. PROPOSED METHOD:

In this paper, the proposed method is to classify the stages of malignant or benign of breast cancer .

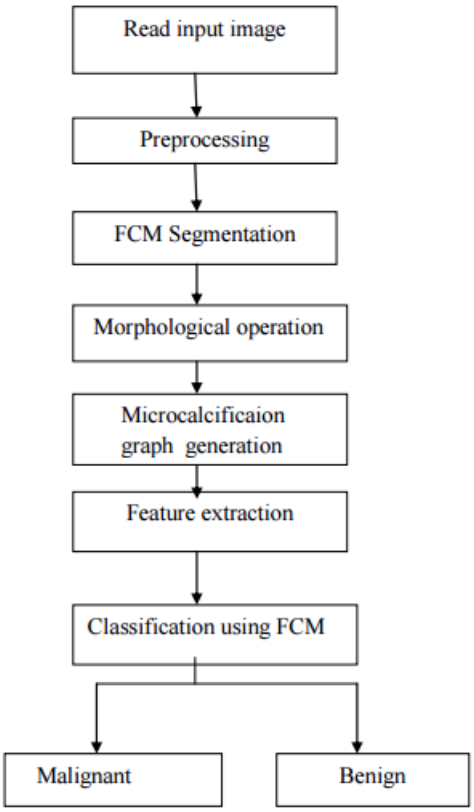

Fig: flow diagram

Preprocessing:

Preprocessing phase is needed to improve the image quality and make the segmentation results more accurate. First we remove the unwanted parts in the background of the mammogram. The objective of this process is to improve the quality of the image, to make it ready for further processing. Removing the irrelevant parts of the image is done by increasing contrast of the mammogram using threshold value.This images is converted into a RGB image to lab .

Segmentation:

Segmentation is the process of confining a digital image into multiple segments. By segmentation technique it is easy to change the representation of an image so it will be easier to analyze and it is easy to locate objects and boundaries in images.

In this technique image can be segmented and the set of segments will cover the entire image.

Morphological Operation:

The techniques of image processing based on the shape. The value of each pixel in the output image is based on a comparison of the corresponding pixel with its neighbors in the input image. By choosing the size and shape of the neighborhood, you can construct a morphological operation that adapts to specific shapes in the input image. Add pixels to the boundaries of object in the image.

Micro calcification Graph Generation:

In this step, we are using a multiple scale. It is generated to the spatial connectivity relationship between micro calcification within the clusters. The individual micro calcification is based on corresponding to the each nodes to represents an edge between two nodes are created if the two corresponding micro calcification are connected.

Feature Extraction:

Over a range of scales micro calcification graph is a set of graph theoretical features can be extracted to express the topological properties of micro calcification clusters. These features will constitute the feature space for the classification of malignant and benign clusters. Before extracting the topological features of micro calcification clusters, we first provide the following definitions for general graphs. Further definitions for graphs can be found in [32]. Here, we use G(V,E) to represent a graph, where V is the vertex set and E is the edge set, and use |V | (the cardinality of V) and |E| (the cardinality of E) to denote the number of vertices and the number of edges in G, respectively. Gconn denotes the sub graph of G that corresponds to the largest connected component.

Definition 1:

The adjacency matrix
A(i, j) of a graph G(V,E) is a |V | × |V | matrix,
defined as A(i, j) = 1, if (i, j) ∈ E 0, otherwise

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Where (i,j)εE indicates(i,j)is an edges, there is an edges between vertex j and G

Definition 2:

The degree matrix D(i, j) of a graph G(V,E)is a |V | × |V | diagonal matrix containing the degree of vertex I at entry (i,j), defined as D(i, j) = d(i) , if i = j 0, otherwise

d(i)=Σjεvaij is the number of edges incident to vertex i and

Σiεvd(i)=2|E|.

F. FCM:

Fuzzy c-means is a method of clustering which allows a piece of data to be a member of two or more clusters. The FCM algorithm consists of the following steps:

• Step 1: Let us suppose that M-dimensional N data points represented by xi(i = 1, 2, . . . ,N), are to be clustered.

• Step 2: Assume the number of clusters to be made, that is, C, where 2 ≤ C ≤ N.

• Step 3: Choose an appropriate level of cluster fuzziness f >1.

• Step 4: Initialize the N × C ×M sized membership matrix U, at random, such that Uijm∈ [0, 1] and Σ c j=1 Uijm=1.0, for each i and a fixed value of m and Determine the cluster centers CCjm, for jth cluster and its mth dimension by using the expression given below

$$CC_{jm} = \frac{\sum_{i=1}^{N} U_{ijm}^{f} X_{im}}{\sum_{i=1}^{N} U_{ijm}^{f}} \quad \text{.....(1)}$$

• Step 5: Calculate the Euclidean distance between ith data point and jth cluster center with respect to, say mth dimension like the following: Dijm =||(xim − CCjm)||……. (2)

RESULT AND DISCUSSION:

Fig: GUI for Micro classification Detection

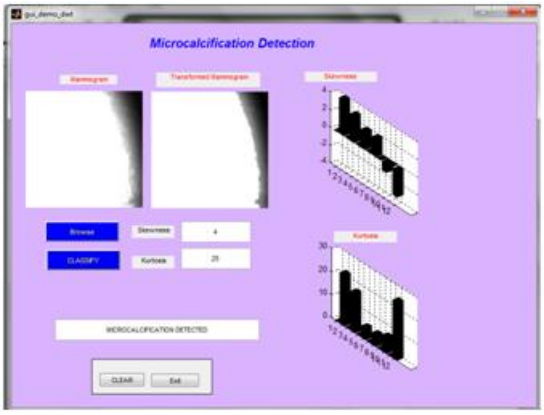

Fig: Input and Outputs

Fig: Input image for GUI

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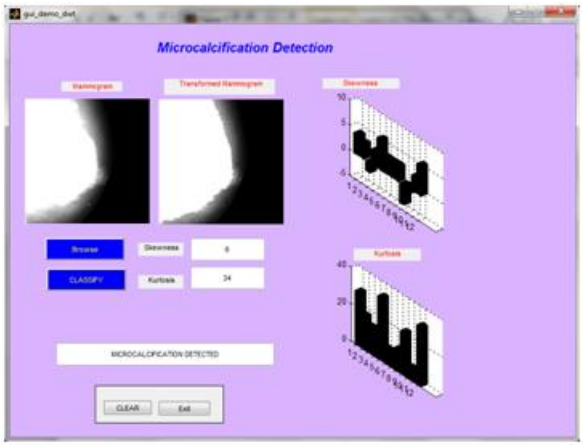

Fig: input and output images and graphs of micro classification

CONCLUSION:

The paper presented FCM method for determining the stage of breast cancer malignant or benign based on the size of the cancer on the mammogram image basis. In previous publication is extracted at a single scale, micro calcification cluster is a representation of covering Multi scale characteristics was developed in this paper. The resulting eight graph feature sets were aggregated and constituted the Multi Scale topological feature vector, which has been used to classify the micro calcification clusters into malignant or benign.

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