

AN EARLY DIAGNOSIS OF BREAST CANCER USING FUZZY CLUSTERING AND PNN CLASSIFIER

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ABSTRACT: This paper describes about the breast cancer detection using Fuzzy clustering and PNN classifier. It is essential to analyse the cancer at the beginning stage because the cancer will be curable at earlier stage. So early detection can save their life and mammography is one of the best option used in the detection technique. Mass detection is an active research area for the past few years but till now no accurate method has been devised. In this paper an automated method to segment the breast masses has been proposed based on the Fuzzy C-Means Clustering method and PNN classifier is used widely today in many fields such as medical diagnosis, pattern recognition and it has been used here to classify it accurately. The results show that this method can better assist as a tool in detection of breast cancer. Performance indices such as Accuracy, Precision, Sensitivity and Specificity will be studied. The proposed method will give better accuracy and efficiency with lowest complexity than the existing techniques

Keywords: Mammogram, Fuzzy C-Means Clustering, PNN Classifier, Accuracy, Precision

I.INTRODUCTION

Breast cancer is a disease that is characterized by controlled growth and spread of abnormal cells. When such a growth takes place, the cancer cells form a tumor from which cells will invade the neighboring tissues and organs. Some of these cells may even travel through the blood or other means to attack other organs and tissues in the body[1]. The mammography method consists of two methods such as screening and diagnosis which is used for detection of breast cancer.

Today the breast cancer can be detected by using X-ray, CT scan etc are the equipments were used for the purpose of detection. The diagnosis of breast cancer became million among womans every year and recent technique has been used by the researchers to attain the proper tumor information. Many researchers has been reviewed on this topic and some of them are given below

F.Moayedi et al [2] proposes that the mammography is detected based on the countourlet feature extraction and the SVM classifier has been used. In this a genetic algorithm has applied to increase the accuracy and attained the accuracy of 85%.

S. Singh describes a new approach to the classification of mammographic images according to breast type. The ANN classifier has been used and subsequently trained with the different perturbed input data spaces using 10-fold cross-validation and obtained the recognition rate of 71.4% for the four-class problem[3].

Priyanjana [4] proposes the detection of cancer using the computer diagnosis system. The features are extracted from spectral or spatial domain and various methodologies have been used to measure the several quantitative measurements for roundness, matrix area and produced the accuracy of 89%.

Tanuja.k describes that the ability to recover investigative information from medical images can be enhanced by designing computer processing algorithms in this the segmentation is done by using vector quantization in this code vector are divided into 8 cluster[5].

Salam Shuleenda Devi et al [6] describes erythrocytes separation in microscopic images here the KNN classification has been used to separate the isolated and compounded erythrocytes from the blood smear

The existing methods show that the data collected from each patient during treatment on time period, it was repeated then compared to baseline for the before treatment data of the same patient. In addition to the performance evaluation of the existing method to correctly classify the patients to responders and non responders, a statistical test of significance has been performed between responders and non responders at each treatment time to review.

The primary problem with the algorithm used in existing system it have been observed to overfit for some datasets with noisy classification or regression tasks. Unlike decision trees, the classifications made by existing method are difficult for humans to understand. The data including unqualified variables with different number of levels, are subjective in favor of those attributes with more levels and it is not reliable for this type of data.

In the paper, the proposed system is used to analyze and detect the breast cancer for the early stage detection by using Fuzzy C-means clustering and PNN classification. The rest of this paper is organized as follows. In section II, deals with the breast cancer method. In section III, presents about the proposed system with their processes and then, section IV, discusses about the obtained simulation results and performance evaluation

II.METHODS

The proposed method takes the input as the colored affected image. The affected image is the image taken from X-ray mammogram. The image shows the affected and clustered region of the patient. The detection technique involves various step by step procedures as shown in Fig 1.1. They are image acquisition, preprocessing, segmentation etc.

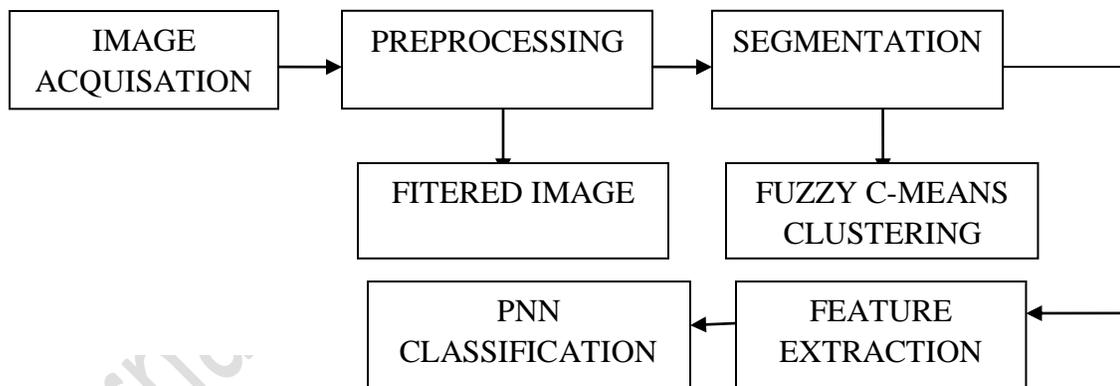


Fig 1.1 Block diagram of proposed method

A.IMAGE ACQUISITION:

The image acquisition is the first process in the proposed method it is nothing but the physical sense or capturing the interior structure of an object from the database used in the present method

B.PREPROCESSING

A test image is an affected image of the patient is given as input image. The input test image was preprocessed and the preprocessed operations are such as the noise removal and the contrast enhancement. The first step in preprocessing is the image converted to gray scale image. The next image is subjected to noise removal followed by

the contrast enhanced image. The Gabor filter is used to detect the edge of the affected region it can be done though if the image is not yet smoothed

C.SEGMENTATION

Segmentation is the most important part in image processing. Partitioning entire image into several parts it will be more easier for further process. The preprocessed image will be given to segmentation and in this Fuzzy C-means clustering algorithm has been used .The goal of a clustering analysis is to divide a given set of data or objects into a cluster, which represents subsets or a group[7]. The partition should have two properties they are homogeneity inside clusters the data, which belongs to one cluster, should be as similar as possible and heterogeneity between the clusters the data, which belongs to different clusters, should be as different as possible.

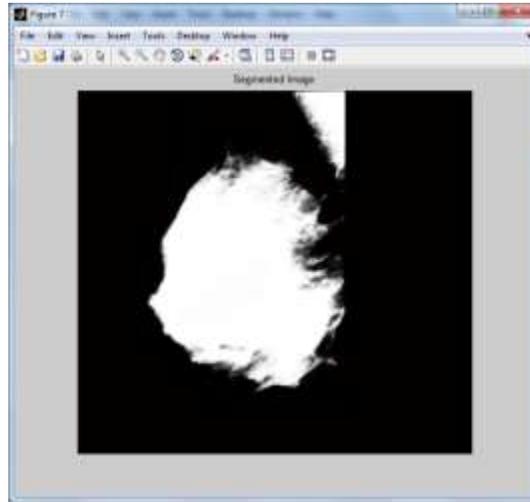


Fig 1.2 Segmentation

D.FEATURE EXTRACTION:

In the proposed work, the features are extracted from the segmented image. The texture and shape features and PHOG features are extracted using the proposed Feature Extraction technique. The texture based features are computed from the statistical distribution of observed combinations of intensities at specified positions such as contrast, correlation, energy and mean features.

i)CONTRAST:

It is nothing but the difference between the color and the object

ii)CORRELATION:

It is an optical method to track the 3D accurate measurement change in the image

iii) ENERGY:

It is nothing but the extraction of the information from the image

iv) MEAN:

It is the average value of array

Similarly, the shape based features is image retrieval consists of measuring the similarity between shapes represented by their features such as area, perimeter, solidity.

i)AREA:

It is nothing but the shape information of the object

ii)SOLIDITY:

It is the ratio of image area and its convex-hull area which is area of convex polygon

iii)PERIMETER:

The perimeter is calculated using the number of pixels around the boundary of pixel in an image

PHOG descriptors are used to extract local shape information to obtain more discriminative features such as variation it is a statistical measure that measure the average value of dataset, standard deviation it is the square root of the variance [8].The texture based features, shape based features and PHOG features has been extracted and it tabled in table 1.1 and table 1.2 ,1.3 for four different images

Table1.1 Texture based feature

Texture feature	Image1	Image 2	Image 3	Image 4
Contrast	0.0033	0.003	0.002	0.068
Correlation	0.9904	0.9932	0.994	0.983
Energy	0.65	0.504	0.514	0.587
Mean	0.22	0.43	0.408	0.282

Table 1.2 Shape based features

Shape Features	Image 1	Image 2	Image 3	Image 4
Area	845	1.074e+05	1.7860e+03	872.36
Solidity	0.88	0.955	0.962	0.627
Perimeter	2.15	2.43	2.205e+03	223
Major Axis Length	434.5	741.51	607.4	658

Table 1.3 PHOG based features

PHOG Features	Image 1	Image 2	Image 3	Image 4
Standard Deviation	0.0084	0.0100	0.0065	0.0044
Variance	6.9724e-05	59.9921e-05	4.248e-05	1.944e-05

E.CLASSIFICATION

In the defect recognition classification of an image plays the important role. There are several classifiers available for the image classification. But the neural network based classification has advantages over the other method. Neural networks are analytical models loosely based on the action of biological neurons. Neural network classifier also subdivided into different types classifiers[]. A probabilistic neural network (PNN) it is nothing but a feed forward neural network, it is widely used for classification purpose and pattern detection problems. This algorithm is the parent probability distribution function (PDF) of each class is approximated by a Parzen window and a non-parametric function.

It is frequently used in classification problems. If the input is present, the first layer computes the distance from the input vector to the training input vectors. This produces a vector where its elements point out that the training input is closer to input. The second layer of PNN sums the contribution for each class of inputs then net output as a vector of probabilities get produced. At last, a complete transfer function on the output of the second layer picks the maximum of these probabilities, and produces a 1 it is nothing but positive identification for the particular class and a 0 will be negative identification for non-targeted classes.

III. SIMULATION RESULTS

A test image is an affected image of the patient is given as input image and then the image is preprocessed. The filtered image is segmented using clustering then subjected to the features extraction. The shapes based features, texture based features and PHOG features are extracted from features extraction. Finally these features are classified using the PNN classifier and the results are shown in Fig 1.2 and 1.3

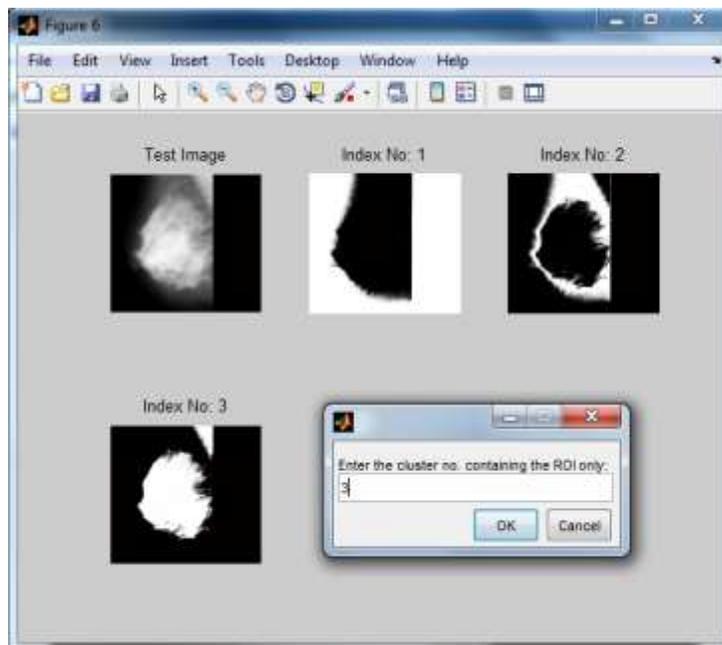


Fig 1.3 Fuzzy c-means clustering

The above window shows the clustering process to segment the image and the affected image index number get entered then segmented image alone will get displayed the whitened image is the segmented image.

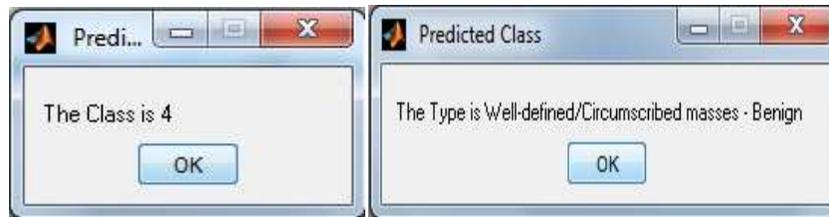


Fig 1.4 PNN classification

The above window shows the PNN classification process to classify the image and the affected image class and it belongs to which type will get displayed

IV. PERFORMANCE EVALUATION OF THE PROPOSED SYSTEM

Breast cancer detection and classification by using Fuzzy clustering and PNN classifier is proposed and the performance of the above methods has to be evaluated with different parameters namely, the accuracy, precision, sensitivity and specificity of the overall performance are calculated.

Table 1.3 Performance evaluation of proposed system

Parameter	PNN
Accuracy	99%
Sensitivity	90%
Specificity	96%
Precision	97 %

The above table shows the performance evaluation of the proposed method. The performance evaluation can be calculated using a group of patient is taken based on their condition and the patients get analyzed then the true positive and false negative will be evaluated.

V.CONCLUSION

In this paper a new approach to find out the presence of cancer mass in mammograms. The images are acquired from the database and preprocessing operations like Gabor filter are applied. The preprocessed output image is then segmented using the Fuzzy C-Means algorithm which is fast and yields good results. Finally classification is used to classify the segmented breast cancer image. By using this approach, successfully detect the breast cancer masses in mammograms. The results indicate that this system can facilitate the physician in the identification of breast cancer in the early stage of diagnosis process itself.

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