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Research Paper

MULTICLASS CLASSIFICATION OF MAMMOGRAM IMAGES WITH GLCM FEATURES

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The main objective of this paper is to apply image mining in the domain such as breast mammograms to classify and detect the cancerous cells. Mammogram image can be classified into normal, benign and malignant class and to explore the feasibility of data mining approach. A survey has been made on the applications of intelligent computing techniques for diagnostic sciences in biomedical image classification. The image mining technique deals with the extraction of implicit knowledge and image with data relationship or other patterns not explicitly stored in the images. The main objectives of this method are to apply image mining in the domain such as breast mammograms to classify and detect the cancerous tissues. Mammogram can be classified into normal, benign and malignant class. Total of 24 features including histogram intensity features and GLCM features are extracted from mammogram image. A hybrid approach of features selection is proposed which is approximately reduces the 95% of the features and new decision tree is used for classification.

Keywords: GLCM, Mammogram, Cancer, Multi Class Classification

INTRODUCTION

Breast Cancer is one of the most common diseases, leading to causes of death among women, especially in developed countries. There is no primary prevention since cause is still not understood. So, early detection of the stage of cancer allows treatment which could lead to most high survival rate. Mammography is the most effective imaging modality for breast cancer screening. A novel algorithm based image denoising and enhancement methods on dyadic

wavelet processing are proposed. The denoising phase is based on local iterative noise variance estimations. Moreover the case of micro calcifications, an adaptive tuning of enhancement degree at different wavelet scales, whereas in the case of mass detection, a new segmentation method combining dyadic wavelet information with mathematical morphology (Goll and Zimmerman, 2009). A novel algorithm used to detect suspicious lesions in mammograms; it utilizes the combination of adaptive global thresholding and

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adaptive local thresholding segmentation on a multi resolution representation of the original mammogram. The algorithm has been verified with 170 Mammographic Image Analysis Society. A combination of adaptive global thresholding segmentation and adaptive local thresholding segmentation is used to segment the multi resolution. A histogram based adaptive global thresholding algorithm is used to segment the image to get the coarse segmentation. An approach for choosing the threshold adaptively by looking for the global minimal of the PDF curves of a wavelet transformed image is proposed to implement the global segmentation (Ay, 2011).

The denoising and the contrast enhancement of micro calcifications are specifically addressed to providing a novel methods for separating the foreground and the background in the image to selectively process them. The assessment of the whole system has been performed by evaluating the performance of each block of the system, using suitable metrics and indicators. Moreover, uncertainty propagation is an important issue in the performance evaluation of the system since, at the end; it provides a confidence interval with an assigned coverage probability (Mesgarani *et al.*, 2010). The system we implement includes masses segmentation, features extraction and selection, and masses classification. The whole block presented in this work represents the final step of a CADx system developed is able to assist the radiologist in the early diagnosis of breast cancer. Suitable metrics such as ROC and AUC have been used and the uncertainty propagation through the system is implemented by a Monte Carlo Simulation (Blalock, 2000). a new local spatiotemporal prediction method based on support vector machines. Combining with the local prediction method, the Sequential Minimal Optimization (SMO) training algorithm, and the

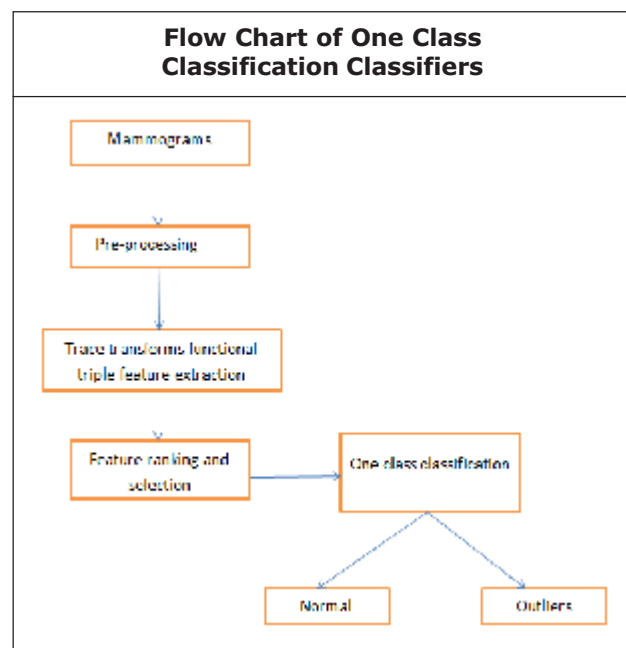
wavelet kernel function, a local SMO Wavelet SVM (WSVM) prediction model is developed to enhance the efficiency and universal approximation capability of the prediction model. The proposed model can significantly reduce the complexity of the model and capture the local information of the signals more effectively in the engineering applications (Maymandi, 2003). Analyzes mammograms in three major steps; First, a global segmentation method is applied to find region of interest. This step uses the texture features, decision trees and a multi resolutions Markov random field model. The second step works for the output of the previous algorithm, a combination of three different local segmentation methods is used, and then some relevant feature is extracted. First the global algorithms find regions of interest in the whole image, and then, some local methods verify this suspicious location. It became evident during development that an algorithm by itself would not solve all the arising problems; so, a proper combination of different techniques seems to be rational (Okaniwa *et al.*, 2005). A novel algorithm to detect suspicious lesions in mammograms. These algorithms utilize the combination of adaptive global thresholding Segmentation and adaptive local thresholding segmentation on a multi resolution representation of the original mammogram. The experimental results show that the detection method has a sensitivity of 91.3% at 0.71 false positives per image. Were proposed and achieved good detection results. For MISC and ASYM lessons and other lesions that are mainly characterized by gray level features, such as brightness and gray value, gray level feature based detection algorithms can obtain more comprehensive results and are effective in mammographic mass detections, particularly the adaptive threshold detection algorithms is programmed (Goll and Zimmerman, 2007).

The classifier is part of a Computer Aided Diagnosis (CADx) scheme that is aimed to assisting radiologists in making more accurate diagnoses of breast cancer on mammograms. The methods to be considered were; Support Vector Machine (SVM), Kernel Fisher Discriminated (KFD), Relevance Vector Machine (RVM), and committee machines of which most have been developed recently in statistical learning theory. These classifiers were tested using a database of clinical mammograms, which included a wide spectrum of difficult to classify cases. Results obtained from the two different sets of experiments demonstrated that the kernel based method yield the best performance and outperforming that of FFNN, AdaBoost; these methods also computationally advantageous both in training and in testing (Goll and Zimmerman, 2009). A system based on fuzzy-neural and feature extraction techniques for detecting and diagnosing micro calcifications' patterns in digital mammograms. A fuzzy technique in conjunction with three features was used to detect a micro calcification pattern and a neural network to classify it into benign/malignant. The system was developed on windows platform, modified some traditional features and found that a combination of our three modified features, such as entropy, standard deviation, and number of pixels, is the best combination of features to distinguish a benign micro calcification pattern from one that is malignant (Goll and Zimmerman, 2007).

ONE CLASS CLASSIFICATION

In real-time pattern recognition applications, learning cannot be expected to take place with a few example objects. Decision boundaries could be placed almost anywhere in the feature space.

To make a real distinction between objects from different classes, measurements from all the classes involved must be available in sufficient numbers. The smaller the sample size, the bigger the problem. This can be the case in sample data involving abnormal mammograms, because it becomes more and more difficult to find sample data. Overtraining a classifier for sparsely distributed datasets with very limited samples can result in finding patterns or structures in data where there is no pattern. When a function is over trained on some data, it depends on both the flexibility of the function and how well the error is minimized.



Architecture of Classification Classifiers

SVM (Support Vector Machine)

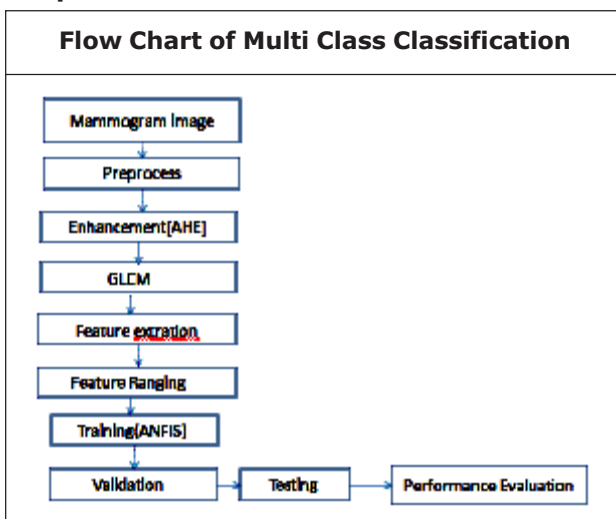
It uses data from two classes to determine a maximum margin hyper plane between the two classes. In the most simple case a hyper sphere is computed which contains all target objects. To minimize the chance of accepting outliers, the

volumes of this hyper sphere is minimized. The model can be rewritten in a form comparable to the Support Vector Classifier (SVC) and it will therefore be called the Support Vector Data Description (SVDD). It offers the ability to map the data to a new, high dimensional feature space without many extra computational costs. By this mapping more flexible descriptions are obtained. It will be shown how the outlier sensitivity can be controlled in a flexible way.

Nearest Mean Classifier

The minimum – distance classifier summarizes each class with a prototype and then uses a nearest approach for classification. Three drawbacks of the original minimum distance classifier are it’s in ability to work with symbolic attributes and learn more than a single prototype for each class. The proposed method solutions to these problems include defining the mean for symbol attributes.

Proposed Method



Pre-processing

The mammogram image for this study is taken from Mammography Image Analysis Society As mammograms are difficult to interpret, pre-processing is necessary to improve the quality

of image and make the feature extraction phase as an easier and reliable one. Adaptive Histogram Equalization (AHE) improves on this by transforming each pixel with a transformation function derived from a neighbour region. This method was first developed for using the aircraft cockpit displays. In its simplest forms of each pixel is transformed based on the histogram of a square surrounding the pixel.

Neuro Fuzzy Algorithm

The nonlinear systems, related control issues will be briefly reviewed. Neural networks and fuzzy classifiers techniques model will be describe as general structure for approximating the nonlinear functions and dynamic processes. Based on the comparison of two methods, Neuro fuzzy model will be proposed as a promising technology for the control and adaptive control of nonlinear processes.

EXPERIMENTAL RESULTS

Existing Model

The feature extraction functions depend solely on the user. The only constraint is that the functional process has to prove rotational invariance, which is the case with all the functional method has done in existing method. The performance of this system can be further to enhanced by framing new functional that is more adaptable to mammograms and by tuning the GMMs according to the functional method has developed.

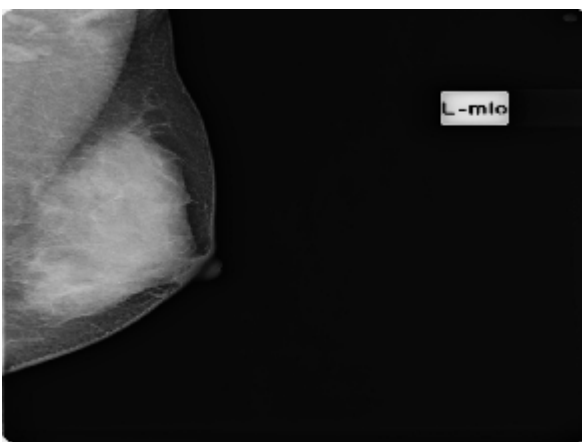
The extracted features from trace functional coupled with the GMM classifier yielded the highest accuracy of 92.48% compared to the other classifiers. The use of trace transforms in data mining and data identification has already proven to identify and distinguish objects with high accuracy.

Normal Input Image



The normal input image represents to transforming a mapped image which is 2-D image and set of parameters (ϕ , ρ) that characterize an each line domain.

Existing Output Image



Disadvantages

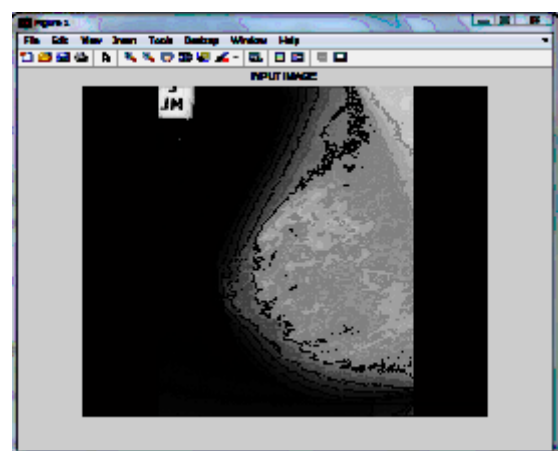
1. The accuracy value is obtained only on 92.48%.
2. One – Class classification method is used for an only one cycle function. It takes long time function.
3. Trace Transform functional method is additionally used for a resize the input image.

Proposed Method

GLCM

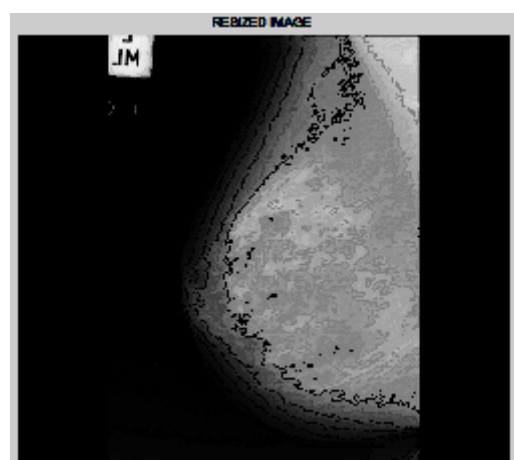
A co-occurrence matrix, also referred to as a co occurrence distribution, defined over an image to be the distribution of co-occurring values at a given offset. The interpolation process allows the significant improvement in efficiency without compromising the quality of the result.

Input Image

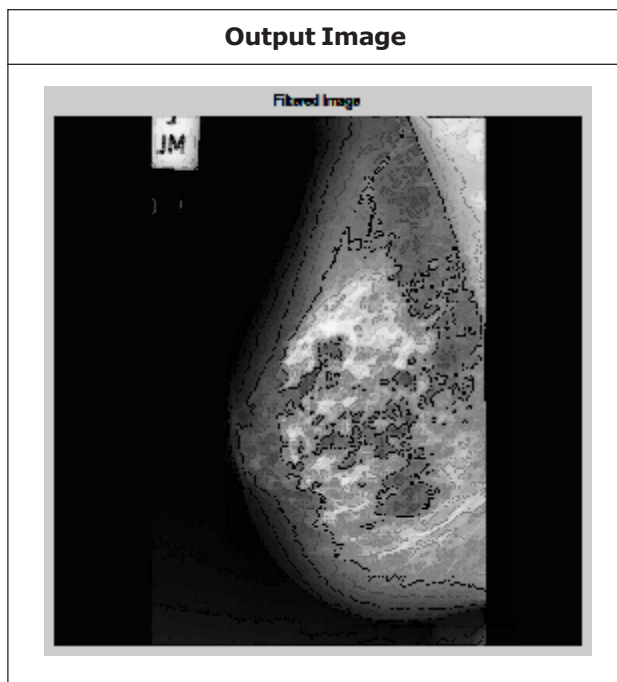


This image represents the input image of the proposed method, in this process the image cannot contains the pure enhancement and contains image blurring.

Resized Image



In this method the image has been modified and resized. In order to this modification the image has been easily enhanced and easily removes the noise.



The above image shows that final output image in order to this image shows been enhanced and filtered, the Neuro fuzzy algorithm and the subtractive clustering algorithm works to remove the noise of the image signal.

CONCLUSION

A novel method for multi class classification method based mammographic image analysis process has proposed. An application of trace transforms to the problem of mammographic analysis is very rare. Trace transform function method has proposed and it's framing a new functional method. The extracted features or users are based on image consideration. The Neuro fuzzy logic techniques help to overlapping the image easily, and its helps for a multi classification method. The methods like one

presented in this paper could assist the medical staff and improve the accuracy of detection. The method can reduce the computation cost of mammogram image analysis and can be applied to other image analysis applications. The extracted features from trace functional coupled with the GLCM classifier yielded the highest accuracy of 95% compared to the other classifiers.

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