Red Lesion Detection using Dynamic Shape Features for Diabetic Retinopathy Screening

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Abstract **- Diabetic Retinopathy (DR) is the deterioration of human eye its result is increase in the blood glucose level. If the patient has DR, then higher the chance to develop purblind. The robust detection of lesions in digital color fundus images is an important step in the development of automated screening system for diabetic retinopathy. In this work a novel method is introduced for automatic detection of red lesions in the fundus image. A new set of shape features extracted from the detected red lesion called the dynamic shape features that differentiate between the lesions and vessel segments. The detected lesion candidates are classified using dynamic shape features based on the medical values. The simulation analysis indicates that the proposed work is better than the previous works in terms of accuracy, sensitivity, precision and specificity.**

Keywords: Diabetic retinopathy, Fundus, Lesions, Dynamic shape features, Retina.

I. INTRODUCTION

The Diabetic Retinopathy is one of the important public health issue. The glucose level in the blood is increases because of diabetes. It's occur when insufficient insulin production in human body. The proposed method takes as input a color fundus image together with the binary mask of its region of interest(ROI).[3]The ROI is the circular area surrounded by a black background.& its outputs is a probability color map for red lesion detection. This method comprises six steps .First step is spatial calibration is applied to support the different images resolutions. Second, the input image is Preprocessed via smoothing and normalization. Third, the optic disk (OD) is automatically detected, to discard this area from the lesion detection.[3] Fourth, candidate regions corresponding to potential lesions are identified in the preprocessed image based on their intensity and contrast. Fifth, the DSF is together with color features are extracted for each candidate. and Sixth candidates are classified according to their probability of actual red lesions.[3]

II. LITERATURE SURVEY

1) A Novel Approach for Retinal Lesion Detection In Diabetic Retinopathy Images produced by M. Sridevi Maheswari #1, Adarsh Punnolil* in March 2014. In this paper we proposes a novel method for the automated identification of exudates pathologies in retinopathy fundus images based on computational intelligence technique.

2)Red Lesion Detection using Dynamic Shape Features for Diabetic Retinopathy Screening by Lama Seoud, Thomas Hurtut, Jihed Chelbi, Farida Cheriet and J.M. Pierre Langlois in 2015. In this paper, a novel method for automatic detection of both microaneurysms and hemorrhages in color fundus images is described and validated. & add a new set of shape features, called Dynamic Shape Features, that do not require precise segmentation of the regions to be classified

3)Automatic Detection of Red Lesions For Diabetic Retinopathy by Divya R#1,Dr. L. M. Varalakshmi*2 in 2016. In this paper a novel method is introduced for automatic detection of red lesions in the fundus image.

III. SYSTEM ARCHITECTURE

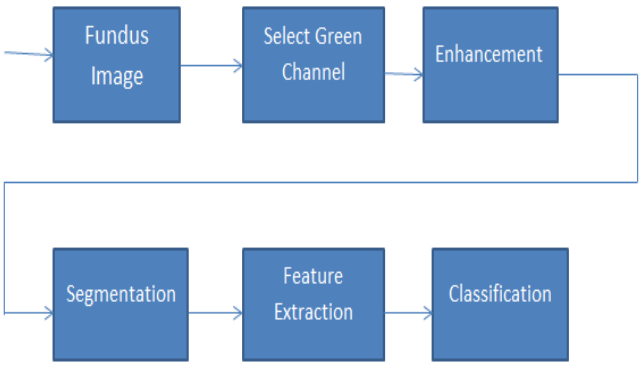

Fig .1. Block diagram

Preprocessing

The pre-processing is done to the acquired image to improve the quality of the image for detection. Generally the image consists of noise and the improper lighting. This preprocessing method involves the removal of noise and smoothing the image for further process.[6]

Segmentation

The red lesion from the fundus image has to be segmented in order to extract the features of the candidate. The segmentation is done using thresholding and morphological operation technique. The morphological operation is used to close the unbounded objects and to bring them into a closed feature for proper detection.[6]

Feature Extraction:

We extract the features of the red lesion when we know the disease condition of the patient. The red lesions are denoted as candidates. We extracted the parameters from the segmented image are called as Dynamic Shape Features (DSF). These features have some parameters such as Area, Eccentricity, Solidity, Major axis length, Perimeter.[6]

Classification:

To differentiate between lesions and non-lesions we can use a ANN classifier. In Classification process we used the Feed forward Artificial Neural Network classifier. By using this classifier accuracy is increases, False rate is decreases and also segmentation accuracy is increase.

IV. RESULT ANALYSIS

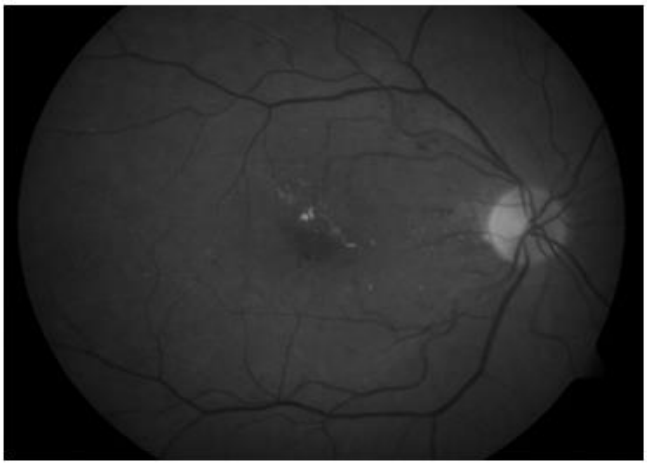

Fig.2 Green Channel Image

First take out the Fundus image it contains Red channel, Green Channel and Blue channel. Out of this select the green channel.

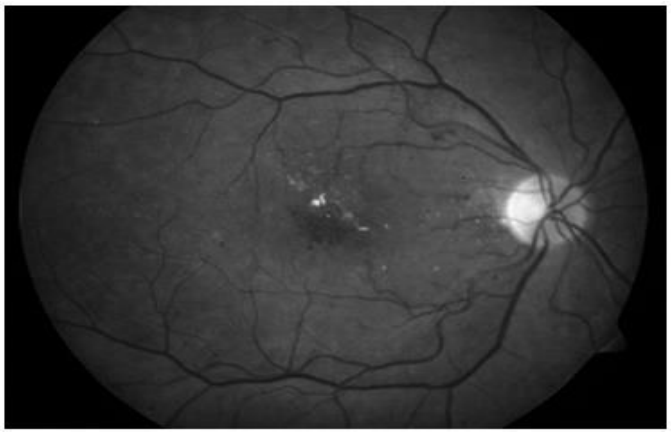

Fig.3.Morphological Opening Result

After selecting the green channel we performed the morphological operations. The purpose is to remove the noise from the image. It also eliminates the shrinks or Thin objects by using a disc shape structuring element. In addition to the morphological opening, the image is subtracted by the previous morphological opening and its intensity are adjusted . The contrast adjustment, maps the values in initial intensity image I to new values in adjusted image J that means 1% of data is saturated at low and high intensities of I .After the series of openings the background of the processed image is not as noisy as the original image and the veins, micro aneurysms and hemorrhages can be seen clearly.

Fig.4 Contrast Adjust Image

After performing the morphological operations we perform the Adaptive Histogram Equalization for the image darkness purpose. After that contrast is adjusted for an image. Contrast adjustment remaps the image intensities values. Also it remaps image data values to the full display range of the data type. Contrast is the difference in luminance or color. & it is determined by the difference in the color and brightness of the object and other objects within the same FOV.

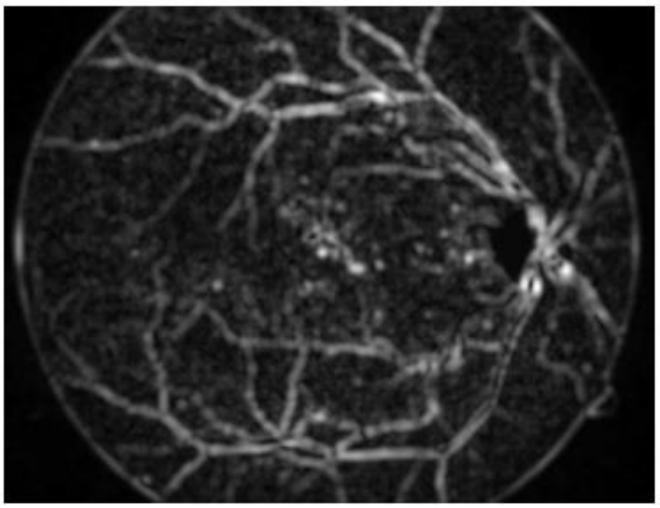

Fig.5 Gabor output

In Gabor filtering we used the 2D Gabor Filter. In this Filtering methods we enhanced veins and exudates.

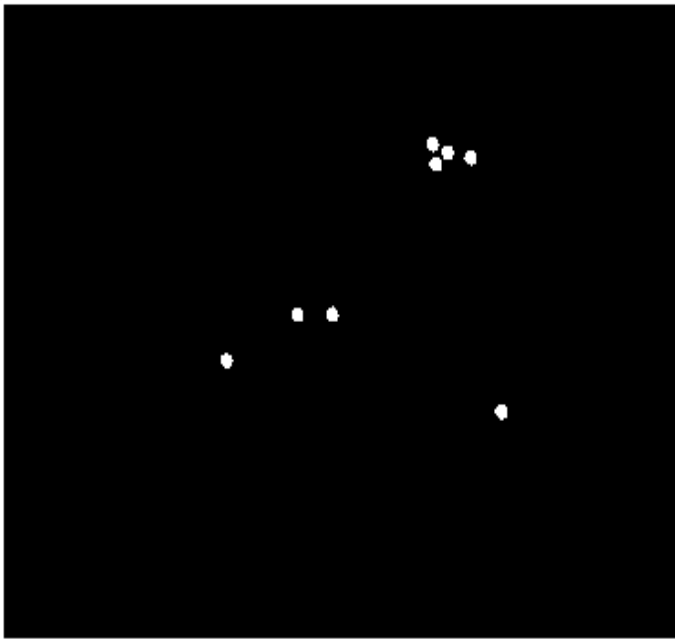

Fig.6 Atrefacts Removed

In Gabor output image both veins and exudates are presents but we only want to the exudates and removed all the veins. so we can make the index for the blobs and perform this activity .The blob area those less than 200 are present and remaining large blob area are removed. So finally we get this output image. In this output image only exudates are present.

Classification using ANN Classifier:

The perceptron can be trained by adjusting the weights of the inputs with Supervised Learning. In this learning technique, the patterns to be recognized are known in advance, and a training set of input values are already classified with the desired output. Each training set is then presented for the perceptron in turn. In this every input can set the output from the perceptron & it is compared to the desired output. If the output is correct, no weights are altered. If the output is wrong, then we have to distinguish which of the patterns gives result to and adjust the weights on the currently active inputs towards the desired result.

Building on this algorithm of the simple Perceptron, the MLP model not only gives a perceptron structure for representing more than two classes, it also defines a learning rule for this kind of network. The MLP is divided into three layers: the input layer, the hidden layer and the output layer, & each layer in this order gives the input to the next.

In Classification process we used the Feed Forward Artificial Neural Network classifier. By using this classifier accuracy is increases, False rate is decreases and also segmentation accuracy is increase.

Algorithm for ANN Classifier:

One of the most popular NN algorithms is back propagation algorithm. BP algorithm could be broken down to four main steps. After choosing the weights of the network randomly, the back propagation algorithm is used to compute the necessary corrections. The algorithm can be decomposed in *the following four steps:*

i)Feed-forward computation
ii) Back propagation to the output layer
iii)Back-propagation to the hidden layer
iv)Weight updates

This algorithm has been stopped when the value of the error function has become sufficiently small. This is very rough and basic formula for BP algorithm. The last step, weight updates is performing through out the algorithm.

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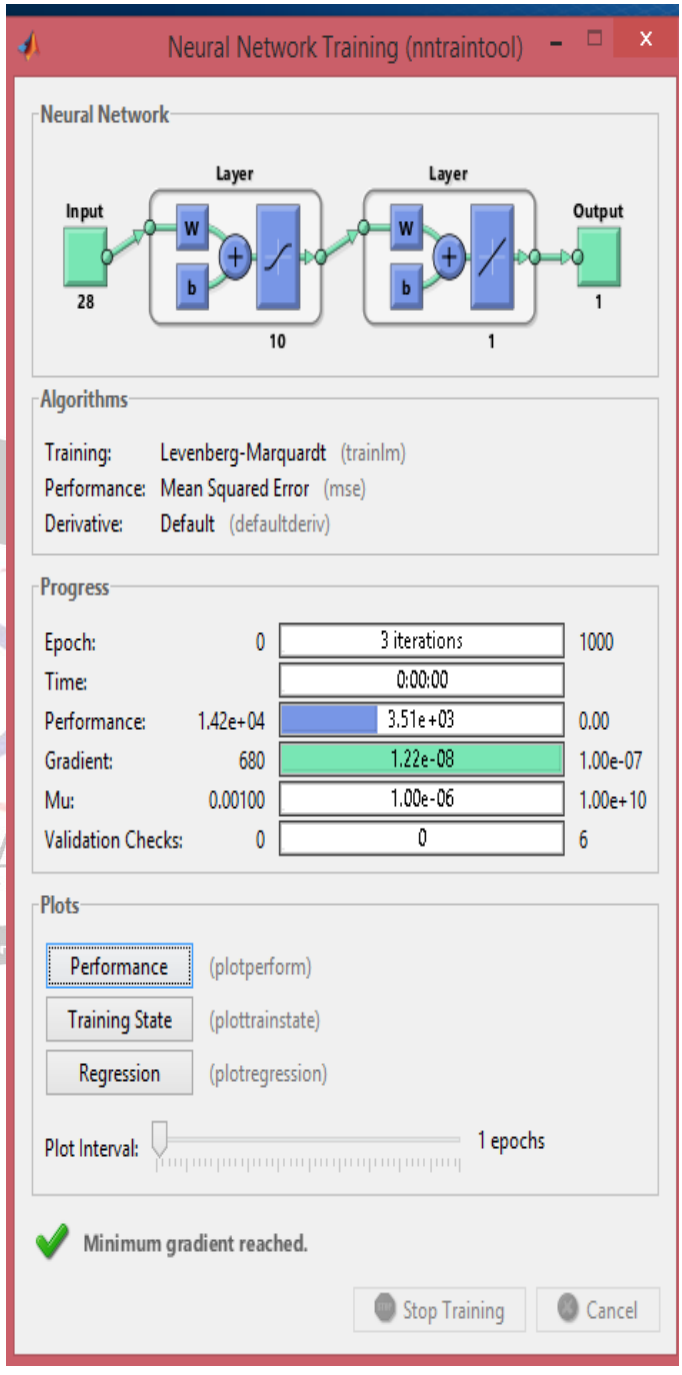

Fig.7 neural networks training tools

Applications of ANN Classifier:

Data Compression

Security

Object Recognition

Character Recognition

Accuracy of Images:

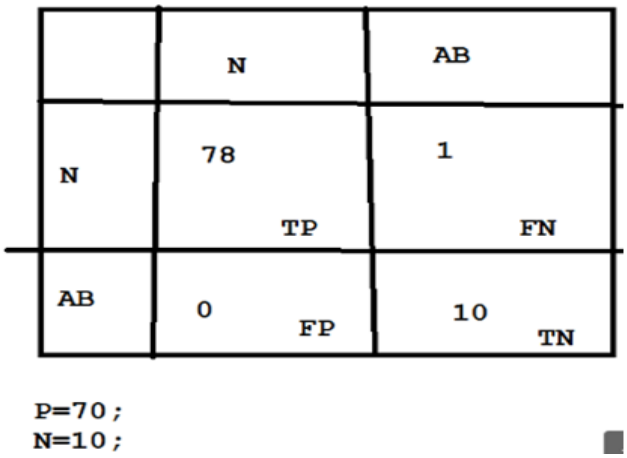

Fig. 8 accuracy of images

V. CONCLUSION

This method is based on a new set of shape features. The DSF's, is presented and evaluated on different databases. The results of this proposed method in detecting both Mas and HEs in fundus images of different resolution and quality. DSF'S have good features to discriminate between the lesions and vessel segments. Improvement in accuracies is made by the ANN Classifier.

The detection of red lesion using this technique to identify the patient with diabetic retinopathy for the medical science. The artificial Neural network is used the results are accuracy and efficient. The parameters are evaluated with the aid of medical values from already created database.

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