Red Lesion Detection from Enchanced Retinal Images of Diabetic Retinopathy

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Abstract*- Automatic detection of red lesions assumes a basic part in diabetic retinopathy analysis. In this paper proposes a techniques for automatic detection of both microaneurysms and hemorrhages from an enhanced retinal colour images. The principle target of this work is to distinguish red lesions in more exact and correctly. Pictures with low quality are not helpful for conclusion. Here using an image enhancement is mainly based on luminosity and contrast adjustment. HSV and L*a*b colour space are used for the enhancement purpose. Also the proposed work gives the automatic detection of red lesion using the new set of shape features, known as dynamic shape features. Watershed algorithm is used for image segmentation and for the classification purpose KNN classifier is used. Add up to precision of this work is around 91%.*

Keywords*-* micro aneurysms, hemorrhages, diabetic retinopathy, contrast enhancement, luminosity, HSV and L*a*b colour space

I. INTRODUCTION

Diabetic retinopathy is an eye disease generally found in diabetic patients. In this world majority of peoples are suffering from diabetes. High blood sugar levels may cause damage the blood vessels in the retina. Which is the light sensitive part at the back of eye. Sometimes the tiny blood vein may burst and leak blood and other fluids to the retina. This will create a cloudy or blurred vision. It is the most common cause of blindness and vision loss in middle and advanced age groups. Early detection of lesion will prevent the vision loss or blindness. Red lesion includes microaneurysms and hemorrhages which are the symptoms of diabetic retinopathy. Microaneurysms are little round red spot. Which are the principal indication of DR. It is a minor swelling shows up in the retinal vessels as a little, round, red spot situated in the inward atomic layer of the retina. Hemorrhage is the nearness of blood, particularly red platelets, outside of the vein. Which means an escape of blood from a cracked vein.

A few strategies have been created for the automatic recognition of red lesion in colour fundus images. Most of them focus exclusively on the identification of microaneurysms [1-4]. On account of their genuinely uniform round about shape and constrained size range, microaneurysms can be identified utilizing morphological activities, for example, diameter closing and top-hat transformation using a linear structuring element at various orientations The objective here is to recognize MAs from lengthened structures. Another approach is to utilize from the priori shape information and to play out a convolution with a double ring filter [3] or through format coordinating with multiscale Gaussian kernels [2, 4].

Despite the fact that microaneurysms are among the first indications of diabetic retinopathy, Hemorrhages are additionally profoundly significant for DR screening and helpful for reviewing. Hemorrhages come in various sorts, for example, "dot", "blot" and "flame"[5]. Dot Hemorrhages and microaneurysms are difficult to recognize from each other on fundus images, in this way dot Hemorrhages are generally indicated to as microaneurysms. A flame Hemorrhage compares to blood spilling into the nerve fiber layer. Its shape, more stretched, takes after the structure of the nerve fibers. A blot Hemorrhage compares to blood releasing further in the retinal layer. It seems bigger than a dot Hemorrhage, and its outskirts are sporadic, prompting different shapes.

A typical strategy embraced in the literature for joined microaneurysm and hemorrhage identification comprises in distinguishing all dull hued structures in the image, mainly through a thresholding, joined with adjusted preprocessing [5,6], and afterward in expelling the vessels from the subsequent arrangement of candidates. Vessel discovery is performed utilizing either a multilayer perceptron [5] or multiscale morphological closing [6]. Tragically, the major restriction to this approach is that the greater part of the false positives at the vessel division step are really lesions. After their expulsion alongside the identified vessels, these lesions are lost and not recovered in ensuing preprocessing.
Retinal images are widely used for the early detection and diagnosis of many eye diseases. Sometimes this retinal images are not useful for the clinical purpose because of low image quality such as uneven illumination, blurring and low contrast etc. One effective method is to enhance the image for better visibility of retinal image. Here we use a new enhancement

method for color retinal images based on illumination and contrast adjustment [7].

In this paper proposes a new set of dynamic shape features for the detection purposes. These features have the parameters such as Area, Perimeter, Eccentricity, Solidity, circularity Major axis length, and minor axis length. This will helpful for the detection of both microanursysms and hemorrhages. Also an enhanced image is used as an input image. It must leads the accuracy of the work.

II. PROPOSED SYSTEM

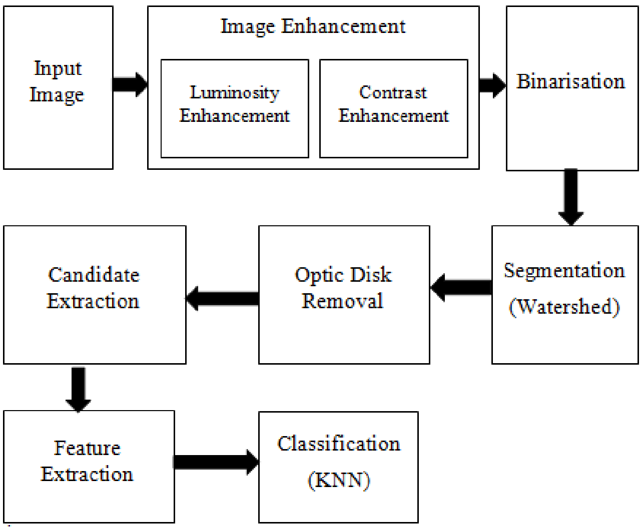

Fig.1: Block diagram of the proposed system

The basic block diagram for the proposed work as shown in fig.1. Right off the bat the retinal images is improved by luminosity and contrast adjustment [7]. At that point image binarisation is finished. Taken after by watershed tasks is performed for image segmentation additionally the optic disk expulsion is finished. Since optic plate is the piece of an eye. At times it will be identified as a lesion so in this manner it will evacuate. Hopeful area is the portioned picture after the evacuation of optic plate. Extracted shape features will be separated from this area. Mostly 8 shapes are removed, for example, area, perimeter, circularity, solidity, eccentricity, vessel density, major axis length and minor axis length. This separated highlights are utilized for the characterization of microanursysms and hemorrhages.

The Binarization Method changes over the dark scale picture (0 up to 256 dim levels) in to high contrast picture (0 or 1). The amazing binarized picture can give more precision in character acknowledgment as analyzed unique picture since commotion is available in the orginal picture. The Watershed Transform is a remarkable procedure for sectioning computerized pictures that uses a sort of locale developing strategy in light of a picture inclination. The Watershed Transform adequately consolidates components from both the intermittence and closeness based techniques. Since its unique advancement with dark scale pictures, the Watershed Transform has been stretched out to a computationally effective shape and connected to shading pictures.

The features of the candidate region are extracted in order to know the patients have any symptoms of diabetic retinopathy or a normal patient. The parameters extracted from the segmented image are called as Dynamic Shape Features (DSF). These features have the parameters such as Area, Perimeter, Eccentricity, Solidity, Major axis length, Minor axis length and vessel density etc.

- Area: It is the aggregate number if pixel esteem '1' in the twofold picture
- Ecentricity: It is figured utilizing √((Q^2-P^2)/Q^2). Q is the length and P is the width. It can be found by district tests along the bounding box.
- Solidity: The measure of pixel in a raised structure is strength and it is communicated as Area/Convex zone.
- Major Axis Length: The prolongation of the bouncing box towards its hub. L= 1-P/Q
- Retinal Vessel Density: The overabundance vessel growth location assumes a huge part in the best possible recognition of Diabetic Retinopathy. For the patient experiencing Proliferate Diabetic Retinopathy, overabundance veins begin developing.

Vessel density (VD) = Total number of pixels in the vessel extracted image/Total number of pixels in the original fundus image.

= Number of non-zero pixels in vessel extracted binary image/Total number of non-zero pixels in true binary fundus image

In design acknowledgment, the k- nearest neighbor's calculation (k-NN) is a non-parametric strategy utilized for grouping and regression. In the two cases, the info comprises of the k nearest preparing cases in the component space. the yield is a class participation. A question is ordered by a larger part vote of its neighbors, with the protest being appointed to the class most normal among its k closest neighbors (k is a positive number, commonly little). On the off chance that k = 1, at that point the question is basically allotted to the class of that solitary closest neighbor.

Table 1 is used to classify a normal person and diseased person [9]. After getting the enhanced retinal image first calculate the vessel density. This vessel density value determines the classes for normal or diabetic retinopathy patients.

Table 1: grouping of disease and normal person

Pixel density of vessels	Classes
25.78	DR
9.21	NORMAL
13.21	DR
25.98	DR
33.16	DR
10.2	NORMAL
12.9	NORMAL

If we get a classes of diseased or normal person then find out the symptoms of diabetic retinopathy. Mainly diabetic retinopathy have symptoms microanursysms and hemorrhage. These are detected with the help of Table 2 [10].

Table 2: features extracted value

Image Samples	Area	Eccentricity	Solidity	Major axis length	Perimeter	Symptom
Image 1	9	0	1	3.4641	8	Microanursyms
Image 2	1077	0.7292	0.7671	48.8788	211.834	Hemorrhage
Image 3	12	0.8706	0.8571	6.3307	12.8284	Hemorrhage
Image 4	4	0	1	2.3094	4	Microanursyms
Image 5	21	0.4896	1	5.6877	14.2426	Hemorrhage

III. CONCLUSION

The proposed work is an efficient method for the detection of red lesion. Many of the work done by using dynamic shape features. Here also using this features for the detection purpose. The main part of this work is the enhancement of retinal image. This enhancement is mainly done by luminosity and contrast adjustment. This enhancement will reduce the confusions about candidate region selection process. In this work take a 130 images data set which is trained for the lesion detection purpose. Then after the testing part we have three classes Normal, Microaneurism, and Haemorrhage. We have used a standard database. From the database we know images which are normal or images which have microaneurism alone and also those affected with haemorrhage. The total accuracy of the proposed work is about 90% is obtained.

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