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Diabetic Detection through Retina (DDR)

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ABSTRACT

Diabetic eye screening is a key part of diabetes care. People with diabetes are at risk of damage from diabetic retinopathy, a condition that can lead to sight loss if it is not treated. It occurs when diabetes affects small blood vessels, damaging the part of the eye called the retina. When the blood vessels in the central area of the retina (the macula) are affected, its known as diabetic retinopathy.

Keywords : Dynamic Shape Features, Retina, Retinopathy Screening, Lesion Detection.

I. INTRODUCTION

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them.

Diabetic Retinopathy (DR) is an abnormality of the eye in which the human retina is affected due to an increasing amount of insulin in the blood. The early detection and diagnosis of DR is vital to save the vision of diabetic patients [1]. The early signs of DR which appear on the surface of the retina are microaneurysms, haemorrhages, and exudates.

Diabetic Retinopathy (DR) is an eye disease associated with long-standing diabetes. Around 40% to 45% of Americans with diabetes have some stage of the disease. Progression to vision impairment can be slowed or averted if DR is detected in time, however this can be difficult as the disease often shows few symptoms until it is too late to provide effective treatment.

Detecting DR is a time-consuming and manual process that requires a trained clinician to examine and evaluate digital color fundus photographs of the retina. By the time human readers submit their reviews, often a day or two later, the delayed results lead to lost follow up, miscommunication, and delayed treatment.

The early stage of this disease is called non-proliferative diabetic retinopathy. In this stage blood vessels swell and sometimes bulge or balloon (aneurysm). The vessels may leak fluid that can build up in the retina and cause swelling. This condition is called macular edema, and it changes the vision of individuals with the disease [2]. The blurriness is sometimes compared to trying to look through water.
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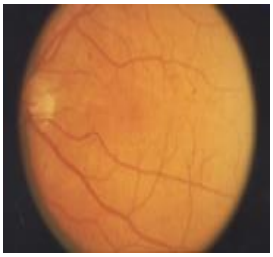
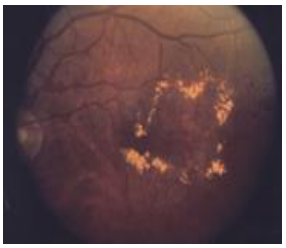
Proliferative diabetic retinopathy an advanced form of diabetic retinopathy occurs when abnormal new blood vessels and scar tissue form on the surface of the retina.



Non-proliferative Eye



Proliferative Eye

II. EXISTING SYSTEM

The red lesions are microaneurysms and haemorrhages; Here the microaneurysms (MN) are detected to diagnose the diabetic retinopathy.

Only the microaneurysms are detected and not haemorrhages (HE).Only the part of image is processed to detect the lesions. Watershed segmentation reduces the actual size of the candidate objects. In this approach, most of the false positive results occur at the vessel segmentation step.

III. PROPOSED SYSTEM

In this method the color fundus image is taken as input together with the binary mask of its region of interest(ROI).

The method comprises six steps

A. Spatial calibration: Spatial calibration refers the process of correlating the pixels of an acquired image to real features in the image. This process can be used to make accurate measurements in real-world units (instead of pixels), and to correct for camera perspective and lens distortion.

B. Image Preprocessing: Lesion may be hardly visible in areas of poor contrast and/or low brightness. The RGB to Grayscale conversion is done to increase the dynamic range of the image[4].

C. Optical Disc Removal: The optic disc is considered one of the main features of a retinal image, where methods are described for its automatic detection. The detection of optic disc is a key pre-processing component in many algorithms designed for the automatic extraction of retinal anatomical structures and lesions [3].

D. Candidate Extraction: Feature extraction starts from an initial set of measured data and builds derived values intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction.

E. Dynamic shape Features: Shape Features involved reducing the amount of resources required to describe a large set of data. When performing analysis of complex data one of the major problems stems from the number of variables involved.

F. Classification: The classification of DR falls into two classes Non-proliferative (Normal blood vessels) and proliferative (Abnormal blood vessel growth).

IV. IMPLEMENTATION

A. Image Acquisition

The image is fetched from gallery that is required for further processing.

B. Preprocessing obtain

Image enhancement technique is used to obtain the required visual quality of image.

a. Grayscale image.
b. Filtered image.
c. Histogram Equalization image.

C. Image Segmentation

Image segmentation is the process of partitioning a digital image into multiple segments[5].

The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

a. Morphological Operation
b. Thresholding Methods

D. Feature Extraction

Feature extraction starts from an initial set of measured data and builds derived values intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction.

E. Classification

The classification process is done over the segmented images. The main novelty here is adoption of Random Forest.

V. CONCLUSION

The results demonstrate the strong performance of the proposed method in detecting both MA's and HE's in

fundus images of the different resolution and quality and from different acquisition system.

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