An Automatic Detection and Identification of fundus images for Diabetic Retinopathy

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ABSTRACT

Diabetic retinopathy refers to an eye disease which affects a human eye and leads to vision loss. This disease can be diagnosed only at the later stages, so an early detection is necessary. Early detection of DR (Diabetic Retinopathy) is thus must and can be done with the help of Image Processing. The fundus image from the dataset can be taken from the patients' database and using the proper algorithm and pre-processing, the early detection can be made possible.

For this certain parameters can be taken for the symptoms of DR as Exudates, micro-aneurysms, lesions, capillary, the fovea region, etc. With the help of these parameters, especially with the identification of neovascularization, it can also be checked that whether the DR is a proliferative DR or a Non Proliferative DR, and furthermore the severity of the DR can also be measured as Mild NonProliferative DR, i.e. Mild NPDR, Moderate NPDR or a PDR.

For the detection of the Diabetic Retinopathy, the sequence of process need to be followed. For this the image must be gone through the pre-processing followed by the feature extraction. Here using the DCT (Discreet Cosine Transform) technique the feature like the Colour, Shape and Texture can be extracted. This is done on some particular region and then this is to be sent for the classification process done on the SVM (Support Vector Machine). This gives the output whether the person is having the diabetic retinopathy or not, and if it is there, then the severity is also classified.

Keywords: *Exudates, Support Vector Machine, Haemorrhage, Blood Vessels, Fundus, Neovascularization, micro-aneurysms.*

I. INTRODUCTION

Diabetic retinopathy (DR) is a most common retinalcomplication related to diabetes mellitus. It is a major causeof blindness in the middle and advanced age groups.According to the Diabetes Information data, a total of 20.8million people i.e. 7 percent of the developed countriespopulation have diabetes in that only 14.6 million cases are diagnosed. Early detection of the disease viaregularcompulsory screening is particularly important to avoidvision loss. In this process, an early DR diagnostic systemcan assist in a big way since a large population to bescreened and that too repeatedly. Color fundus images aretaken by the ophthalmologists to study retinal diseases likediabetic retinopathy.

When retinal blood vessels will damage, it causes blood toleak on in the retina and it forms features such as microaneurysms, hemorrhages', exudates, cotton wool spots andvenous loops. With breakthrough, the blockages and damageto blood vessels will cause areas of retinal ischemia to develop and in an attempt of revascularization the increase ofnew blood vessels is triggered. The magnification of incipientvessels represent the advanced stages of DR known as theproliferative diabetic retinopathy (PDR), which poses the highrisk of

rigorous vision loss due to a fragile nature of theincipient vessels making them prone to bleed and it cause pre-retinalandthevitreous hemorrhage's. PatientsfeaturingPDRrequireanurgentattentionofspecialist...

II. RELATED WORK

a An Automatic Detection of Proliferative DiabeticRetinopathy

This section describes the proposed automated detection ofproliferative diabetic retinopathy scheme. In this paper the dualclassification of system is present that is the vesselsegmentation followed by analysis of a binary vessel map todetect new vessels.

b Computer-assisted identification of proliferative diabetic retinopathy in colour retinal images

In this paper [2] authors have proposed a hybridized approach which combines the bottom-up vessel analysis approach, and the top-down texture analysis approach for NV analysis. They demonstrate a NVE localization method which characterizes patches of the retinal image, analysing the local texture and local vesselness, and use supervised learning to predict the neovascularity score of each patch in the image. To complement the dense descriptor, we extract features from vessel segments within each patch and add morphometric information like planar curvature, tortuosity and thickness. We present evaluation of the features on 3 datasets, and analyse NVE prediction performance in patches.

c Identification of Different Stages of Diabetic Retinopathy

Within this paper [3], a technique for classification of diabetic retinopathy is presented with the help of fundus images using Support Vector Machine [6]. For identification of diabetic retinopathy, collected fundus images from hospitals undergo several image pre-processing techniques in order to extract desired features. Area of on pixels, mean and area of exudates are the three features extracted and fed into the neural network. SVM based training is applied to analyse the data and find an optimal way to classify images into Normal, NPDR or PDR categories

d A Novel approach for the screening and the classification of Macular Ischemia caused by Diabetic Retinopathy Disease using Retinal Image Datasets

The heart diseases can be diagnosis with the help the structure and properties of the retinal vessels. The A/V classification can be done by analysing the oxygen level in the retinal vessels. The retinal replica can be used to track the specific vessels by using graph trace method. But crossover and vessel bifurcation are the major issues in the computation and identification of the blood vessels. To resolve this problem tracking the adjacent vessel segment of one vessel segment as its own segment, the linking of these vessel segments should be properly identified

e Feature extraction from the fundus images for the diagnosis of diabetic retinopathy

In this methodology, the authors collect colour fundus images input from the fundus camera are initially kept to a standard size and higher pixel size for maintaining the original aspect ratio. Because of fundus

images are always saturated in the red channel and low contrast in the blue channel we choose the green channel for all our operations. The green channel image operation is performed by two different sizes of a structuring element or filter that is dilation (Max filter) and erosion (Min filter).

III. COMPARISION OF IMPLEMENTED TECHNIQUES

Table 1 Comparison of Implemented Techniques

Sr. No	Title	Method Used	Advantages	Disadvantages
1	An Automatic Detection of Proliferative DiabeticRetinopathy	Vessel segmentation	Proliferative stage DR can be checked	Complexity increases
2	Computer-assisted identification of proliferative diabetic retinopathy in color retinal images.	Patch Characterization by texture.	Image level categorization	Too large dataset is required
3	Identification of different Stages of Diabetic Retinopathy	SVM using Sequential optimization algorithm	Levels can be categorized by this method	Limited optical disk size .
4	Investigation of Severity of Diabetic Retinopathy By Detecting Exudates with respect to Macula	preprocessed images with JSEG algorithm	Less time consuming method	Focuses only on MI
5	Feature extraction from the fundus images for the diagnosis of diabetic retinopathy	Blood vessel extraction	Easy diagnosis of DR	Time consuming

IV. PROPOSED WORK

In order to check the possibility of the DR and its stages the system has been proposed and following are the steps.

Step 1: Input the image from the dataset.

Step 2: pre-processing and filtering

Step 3: Feature extraction viz. Color, Shape and Texture.
Step 4: Region of interest and applying the LBP.
Step 5: Classification done by the SVM (Support Vector Machine).
Step 6: Get the output of the desired image.

IV. CONCLUSION

According to my literature survey, here we can conclude that the detection of diabetic retinopathy is very important and thus an efficient framework for diagnosis for feature extraction of DR has been developed. A system where classification of the fundus images can be made which helps in measuring the severity of the diabetic retinopathy by applying different processes on the image of a human eye.

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