Diabetic Ratinopathy Detection Using Eye Images

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1   Abstract

Diabetic Retinopathy(DR)[4] is the leading cause of blindness in the working-age population of the developed world. It is estimated to affect over 93 million people. So need for a comprehensive and automated method of DR screening has long been recognized. SO in this work I would like to create an automated detection system for the disease which can benefit the population by early and easy detection of disease.

2   Problem Statement

Given a image of left and right eye of the patient, the main aim of the project is to classify the eye status among one of the following classes 0 - No DR, 1 - Mild, 2 - Moderate, 3 - Severe, 4 - Proliferative DR. So my task is to create an automated analysis system capable of assigning a score based on the above scale.

3   Motivation

Diabetic Retinopathy(DR) is retinopathy caused by complications of diabetes, which can eventually lead to blindness.According to 'WHO' estimation 347 million of world population is having the disease diabetes and about 40-45% of them have some stage of the disease, DR. 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.
Currently, detecting DR is manual process done by trained clinician by examining digital fundus images which is usually results in miscommunication and delayed results which eventually results in delayed treatment.
So my aim to provide a a automated, suitable and sophisticated approach using image processing and pattern recognition so that DR can be detected at early levels easily and damage to retina can be minimized.

4 Dataset

I use a dataset created by Eyepacs,picture Acrchive communication system[2] for a challenge based on a problem on Kaggle[1]. The dataset is labeled dataset with both left and right eye images rated with expert opinion on images. I plan to use a small subset of the categories in the dataset if necessary due to time constraint and size of data-set.

5 Methodology

Imaging Preprocessing

The images in data-set contains a lot of noise initially so I will first apply some imaging techniques to pre-process the image and contrast enhance them. This technique adjusts the local variation in contrast by increasing the contrast in lower contrast area and lowering the contrast in high contrast area.

Texture Analysis and Feature extraction

In this step different features like red layer of perimeter(RLP),green layer of perimeter(GLP) etc. for the eye image are extracted for classification in further steps. Basically in this step I will extract blood vessels using image processing techniques from the given images so that I can use them in in classification step.

Classification

Neural networks has shown good results for computer vision problem so for the classification I will use artificial neural network(ANN)[3, 2] with the proposed algorithms along with back propagation. But as the process is expensive and time consuming I may use other techniques too those uses lesser computation.

References

[1] kaggle Challenge *Diabetic Retinopathy Detection.* `https://www.kaggle.com/c/diabetic-retinopathy-detection`

[2] Wong Li Yun , U. Rajendra Acharya, Y.V. Venkatesh, Caroline Chee, Lim Choo Min, E.Y.K. Ng *Identification of different stages of diabetic retinopathy using retinal optical images.* July 2007

[3] Jagadis h Naya k, P Subba nna Bhat, Rajen dra Achar ya U,C. M. Lim, Manjunath Kagathi `Automated Identification of Diabetic Retinopathy Stages Using Digital Fundus Images` November 2007

[4] Diabetic Retinopathy `http://en.wikipedia.org/wiki/Diabetic_retinopathy`