Diabetic Retinopathy Detection

CSE 438

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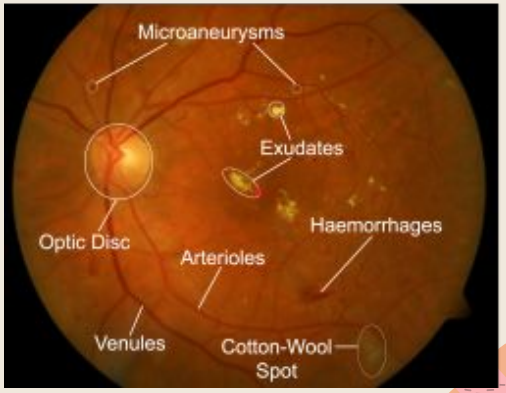
INTRODUCTION

A condition caused by uncontrolled diabetes over time is diabetic retinopathy. This condition causes fluid to seep into the retina by damaging the retina's delicate blood vessels. Untreated, it poses a dire risk of total blindness.
Stages can be identified as, Mild, Moderate, Severe, and Proliferative.



Proposed Method

1. Compares bright background with darker vessels.
2. Creates profile for optic disk and compares to find similarities.
3. Uses K-means clustering to group intense pixels with highest intensities.
4. Uses Deep Convolutional Neural Network DCNN with 14 layers.

Materials And Methods

Materials

01 Hardware

Used python, Keras for DCNN on Google Collab.

02 Datasets

Multiple datasets, from DRIVE, IDRiD Disease dataset. About 700 images splitted into testing

Method

03 Blood Vessel Segmentation

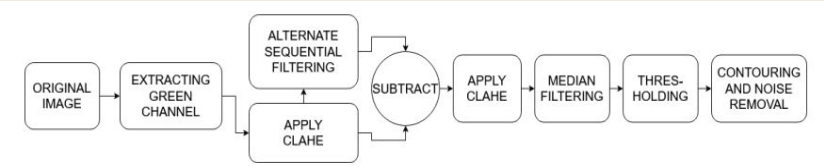
Separating only the blood vessel from the retina and background.

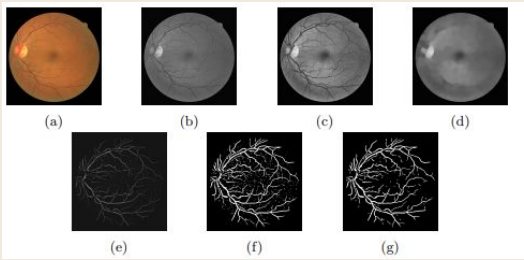
04 Optic Disc Localization

Image processing to identify the optic disc

Details Of Two Methods

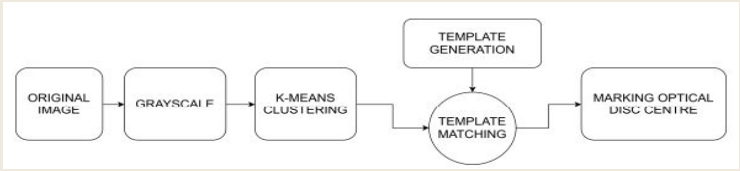
Blood Vessel

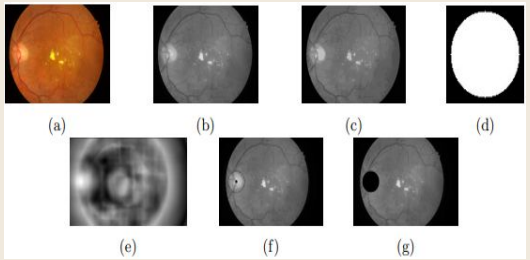




(a) Original Image, (b) Green channel component of (a), (c) CLAHE applied image, (d) Background estimated after Alternate Sequential Filtering, (e) Image (d) subtracted from (c) and CLAHE applied again, (f) Median blur and thresholding, (g) Final segmentation output.

Optic Disc





(a) Original image, (b) Grayscale of (a), (c) Result of k-means clustering, (d) Generated Template, (e) Template Matching result (using NCCOEFF; notice the OD region has highest similarity), (f) Marking OD and its center, (g) Masking OD region.

Conclusion

Descriptive

The proposed blood vessel segmentation method outperforms existing techniques by utilizing efficient morphological operations for background estimation and segmentation.

Statistics

Proposed Method has 95.93% accuracy.
Only took 1 hour to train data on Google Collab.
Test accuracy of DCNN is 75.73% which is still higher than previous architectures.