GLAUCOMA DETECTION USING FUNDUS IMAGE PROCESSING

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ABSTRACT

In this paper we use a computational technique for detection of glaucoma. Dividing discs into segments is a unique technique and gives the value of the size of the cup and the size of the disc. This is the most used technique for detection of glaucoma for its portability, size and costs. Obtained a sensitivity of 100% indicating that, there is no false negative. This will reduce the workload of clinicians by more than 50%. Accuracy is greater as compared to other methods.

Keywords: Glaucoma, Fundus Imaging, Eye

I. INTRODUCTION

Glaucoma is the cause of blindness which is not reversible since it affects the eye’s optic nerve. In most of the cases symptoms of vision loss is not seen until advanced stages. The elevated stress in the eye, which is caused by either overproduction of aqueous humour or by the blockage of the drainage system of this liquid causes optic nerve to degrade its functions. Fundus image and important parts of the eye. The retinal fundus image is used to ascertain the width. It is non-invasive techniques most used by ophthalmologists. Its major advantage is that images can be taken easily for either healthy and nonhealthy retinas, it is also portable and not difficult to use for any health professional, specially in screening campaigns. The thickness of the RNFL is calculated by measuring the proportion among the size of the optic nerve (named disc) and the size of the excavation inside the optic nerve produced by the increasing eye’s pressure (named cup). This parameter is known as the Cup-to-Disc ratio (CDR).

![Image](a) ![Image](b)

Figure 1: Healthy (1) and Unhealthy (2) retinal images:

Glaucoma is further classified as open-angle glaucoma, closed-angle glaucoma and normal-pressure glaucoma. Normal IOP is in the range of 10-21 mmhg. In most glaucoma patients, the IOP increases (>21mmhg) up to 60mmhg. The tonometer ascertains accurate IOP. This method is used to get the value of intraocular pressure for the treatment of glaucoma

II. LITERATURE SURVEY

According to Mohammadi [1] and Jeyaraman [2], it is estimated that in developed countries, at least half of glaucoma patients feel no signals of the disease, which is expected to be worse in developing countries. In a study of glaucoma prevalence from worldwide published data, found that by 2020, over 11.1 million people will lose their eyesight. It also reported the increasing economic cost of treatment of glaucoma in advanced stages. Anusorn et al [3] proposes a method for disc segmentation using edges detection. Dhumane and Patil [4] use
superpixel segmentation to detect both disc and cup by means of a clustering algorithm, with a sensitivity of 88% and accuracy of 90.9%. Ayub et al [5] propose the cup and disc segmentation using RGB and HSV color models and K-mean clustering. The method has 92% of accuracy, but they do not take into account the vascular system that goes throughout the disc which interferes with the precision of detecting the correct pixels that belong to the disc. Nikam and Patil [6] implement CDR.

### III. PROPOSED SYSTEM

Various diagnosis methods are preferred for glaucoma diagnosis. Texture features are very accurate for glaucoma image detection. Higher order spectra (hos) combined with texture features helps to improve the classification accuracy. The fundus images also detects diabetic retinopathy. Damage to optic nerve fiber is detected using the morphological features of fundus images. Features which are morphological such as CDR, the ratio of area of blood vessels in inferior-superior side to the nasal-temporal side, and ratio of distance between the optic disc center and optic nerve head to diameter of the optic disc are used to detect glaucoma. Once the disc and the cup have been properly segmented, we can proceed to measure the Cup-to-Disc Ratio. We implemented two methods whose precision is compared with the specialist’s diagnostic. The first method places a reference point at the center of the disc and measures both the distance from this point to the border of the segmented cup (denoted by Rc), and the distance from the center to the border of distance from the center to the border of the disc (denoted by Rd).

### IV. BLOCK DIAGRAM

![Block Diagram](image)

1. **Input Image**
2. **Preprocessing RGB, Gray Extraction**
3. **Segmentation (Disk and Cup)**
4. **Compare the Ratio (Disk and Cup)**
5. **Output**

### V. MODULE EXPLANATION

**Input Image**

In the MATLAB, image is first resized according to the parameters then it is converted into gray scale image from RGB and next step includes disc and cup division.
Image Preprocessing

Preprocessing is done on images. It is generally carried out using grey images because the processing cost is much more soaring colored images. For making this possible several techniques are used to remove all the unwanted information from the image and after the processing is done pixels are added to the image

Segmentation

It involves division of a image into different parts. The motive is to make it more simple to understand for further processing

Disc Segmentation

The retinal image is processed to detect the disc boundary for image segmentation using RGB color conversion.

Cup Segmentation

The boundary of the cup is detected by application of color and edge analysis technique.

VI. CUP AND DISK RATIO MEASUREMENTS

After the cup boundary and disc segmentations CDR has been detected. According to the CDR calculations it gives the final result. The presence is identified if the value is higher than 0.56 and the value lower than 0.5 assures the absence of glaucoma.

![Figure 2: Flowchart of the method](image)

VII. SCREENING AND DIAGNOSIS

![Figure 3: (a)actual image, (b) sub-image around OD, (c) CDR result](image)

VIII. CONCLUSION

The presence of the cup in the disc is a strong indicator of glaucoma, The division of disc was done by thresholding, the division of vessel was done using edge detection. Future work concerns to obtain a bigger dataset of fundus images to make a deeper test of the algorithm. The division of vessels should be done much more accurately as it doesn't reduces noise. Future improvements can be made by using convolutional neural networks to increase accuracy.
IX. REFERENCES


