A Framework of Review Analysis for Glaucoma Based on Image Processing

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Abstract: Glaucoma is the way of expression relate to a category of eye diseases that slowly effect in loss of vision by invariably damaging the optic nerve, the nerve that convey visual images to the brain. People origin blindness due to glaucoma is 4.5 million globally. There is no cure for glaucoma yet, a rapid detection of it can help to prevent vison loss. Here we analyzed many paper which used different imaging techniques. The proposed framework aims to enable user clear idea, concept and methodology that are studied earlier.

Index Terms **- Glaucoma, Optic Disc, Optic Cup, Cup-to-Disc Ratio.**

I. INTRODUCTION

Glaucoma is the next major root toward blindness globally, next to cataracts. In present day an extremely common physical state challenge the cataracts since the blindness result is unrepaired [1]. Glaucoma fundamentally mark indirectly to the diseases of eye that outcome toward the damage in Optic nerve. As a result, the raised pressure of eye (Intraocular Pressure) cause directly blockage to the eye canal by which the aqueous humor arises. Through tonometer the pressure of eye is measured. If result found in range of 10-21mm of Hg than its normal, otherwise it is suspicious [2].

Optic cup is expanded due to increase in intraocular pressure as present in Figure 1. This affect the Cup-to-Disk Ratio that proceed as a separate feature for the screening of Glaucoma. The usual CDR value consist from 0.3 to 0.5. If the value exceeds 0.5 than the subject is, consider as doubtful case. The ratio for Cup-to-Disk Ratio is taken vertically. In mathematical manner it is denoted as

$$\text{Cup-to-Disc} = \frac{\text{(Diameter of Cup)}}{\text{(Diameter of Disc)}}.$$

There are many feature using which we can identify the condition of eye. Here Optic disk (OD), Optic Cup (OC) and Neuroretinal Rim (NRR) give more importance to identify glaucoma. The OD acts as the initial and end point for the central retinal artery and veins. The color of a usual OD is usually orange-pink but arrive pale in company of pathologies. OC is the central cavity in the OD. It is a cuplike structure and is devoid of nerve fibre [3]. The neuro retinal rim is area between optic disc and optic cup.

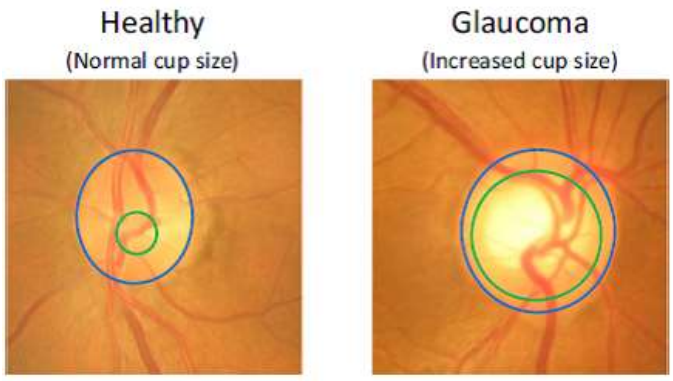

Figure 1: (a) Healthy Optic eye, (b) Eye with increased Cup-to-Disk Ratio

The Neuroretinal rim is subdivided into four main quadrants: Inferior (I), Superior(S), Nasal (N) and Temporal (T). Healthy eye usually have , the inferior (I) rim is thicker than the superior (S) rim, which is thicker than the nasal (N) rim, and the temporal (T) rim

is the thinnest. This condition is known as the ISNT rule. For assessment of glaucoma using the ISNT rule, the NRR area in each of the quadrants has to evaluated.

II. METHODOLOGY

The feature Extraction from fundus image for particular glaucoma detection in human require mainly analysis of optic disk, optic cup, and cup-to-disk ratio. As this feature give clear structure of eyes. There is various image processing method through which we get the condition of human eyes.

A Description on Fundus Image

Fundus image is important as it contain detailed information of the optic disc, optic cup, macula. In glaucoma diagnosis, ophthalmologists are concerned with the optic disc. To drive the advancement in producing better methods for fundus image analysis, large no of research groups has set benchmarks of annotated image databases [4]. This review paper gives us each database with particular brief description for each data ones et, highlighting the main properties.
The paper recognized the most publically available databases of eye in fundus image analysis.

B Basic Process and Analysis

The process for detecting glaucoma using image processing method should contain below basic steps to obey in every different method. Below process show a common framework used in every screening system.

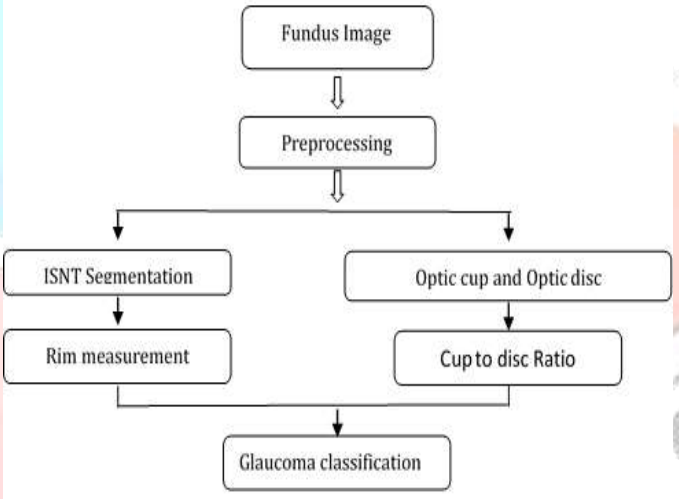

Figure 2: Framework of proposed screening system [5]

Every process contains three basic steps. They are image acquisition, image preprocessing and classification.
The image acquisition can be done by two ways. firstly, by using different dataset of images and another by using medical instrument having good quality of lens. Indirectly which give clear image of fundus.

In case of applying preprocessing steps different author used different feature with various technique. P.Das author choose three important features Optic Disk (OD), Optic Cup (OC) and Neuroretinal Rim(NRR) . The author used, a computer assisted method for the detection of glaucoma based on the ISNT rule is presented. watershed transformation is used for OD and OC are segmentation. The NRR area in the ISNT quadrants is obtained from the OD and OC segmentation. This developed method is tested on four common databases, HRF, DRIONS-DB, Messidor, RIM-ONE and a local hospital database [3].

In [5] author performed Firstly, image segmentation to obtain optic cup, optic disc and rim width. This information will be used as features in glaucoma classification step. (SVM)support vector machine is selected as a classifier. Three sets of input features are tested with SVM classifier. The proposed model features that extracted from both indicators. Adding more input features may help to reduce false negative and false positive cases.

B sumathy highlights a new method to extract feature by adaptive histogram. The goal of the approach is, to traced the boundary of the optic disk by concentrating on each pixel information. The idea behind the paper is to know the boundary for optic disc in a specific manner for normal and abnormal [6].

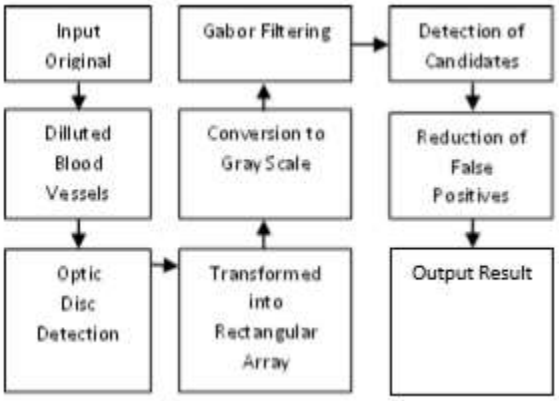

Figure 3: Basic Flow chat for fundus image analysis [7]

H. Li and O. Chutatape give us the algorithm that can extract feature robustly and automatically in fundus images. With some modification on ASM it proposes to detect shape of optic disk. Fovea localization is based to coordinate fundus system. To detect edge detection and region growing it is founded [8].

The fundus images taken for the proposed idea is to collect data from DRIVES, STARE, and HRF database. By applying high pass filtering and tophat reconstruction the algorithm works. The segmented technique provides an accuracy of about 0.931. Also, ISNT parameter is used for the detection of glaucoma. The survey of the results found that the ratio will be in the range 2.166 ± 0.19 for usual people and 1.755 ± 0.08 for abnormal human(Glaucoma effected patients).

Table -1: ISNT ratio (a)normal person(b)glaucoma affected person [9]

Image number	ISNT ratio
1	2.1423
2	2.4064
3	2.4149
4	1.9378
5	2.0355
6	2.0140
7	1.9418
8	2.2399
9	2.1186
10	2.4049

(a)

Image number	ISNT ratio
1	1.8337
2	1.8108
3	1.7794
4	1.8111
5	1.6112
6	1.7146
7	1.8574
8	1.6520
9	1.7061
10	1.7788

(b)

III. CONCLUSION

The framework is proposed to show maximum process done and used in field of enhancing glaucoma. The objective is to understand the review type and enhance the decision ability clear. A platform is also provided with different feature extraction, while the common thing about all review paper have same platform for image processing. In correspond work, we aim to provide a platform in such manner that we can use instant patient fundus image with flexible platform.

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