AUTOMATED ANALYSIS OF GLAUCOMA DETECTION USING SEGMENTATION AND ANN CLASSIFICATION

N. Kishore Kumar, G. Mallika, D. Divya, K.Durga Prasad, C. Maheswari

[1]Assistant Professor, [2,3,4,5]Student

Department of Electronics and Communication Engineering,

Aditya College of Engineering, Andhra Pradesh, India

ABSTRACT

Glaucoma is a eye disease that causes damage to your eye's optic nerve and can result in vision loss and blindness. However with early detection and treatment, you can often protect your eyes against serious vision loss. Glaucoma is caused due to unawareness in people which can be resulted into permanent blindness. Although the disease is incurable but its symptoms can be minimized therefore early detection of the disease is necessary.Until now there is no low cost method for effective detection of glaucoma. Recent studies used a method called Air-puff Intraocular Pressure(IOP) from 2D retinal images is promising for low cost glaucoma screening .Intraocular pressure(IOP) using tonometer which are performed manually by the clinicians.In this paper we propose method called "CUP TO DISC RATIO " (CDR) method to detect glaucoma. In this method we use advanced discrete wavelet transform(DWT) features obtained from the Daubechies , Symlets and Biorthogonal(Bio 3.3,Bio 3.5,Bio 3.7) wavelet filters.By using this method, we get accuracy around 94.7% and comparision with existing methods of glaucoma detection from 2D retinal fundus images indicates that the proposed approaches has improved Accuracy.

Index Terms–Glaucoma, Fundus images, Discrete wavelet transform, Feature Extraction, Classification.

I.INTRODUCTION

Glaucoma is irreversible chronic eye disease that leads to vision loss. Glaucoma is the second most important source of marginal blindness worldwide and results in the neuro dissolution of the optic nerve. As the recovery of the degenerate optic nerve fibers is not possible medically, glaucoma often goes invisible in its patients until later on stages. The common model estimates that more or less 11.1 million patients worldwide will experience from glaucoma induced mutual blindness in 2020 . Besides, in countries, like India, it is predictable that roughly 11.2 million people over the age of 40 experience from glaucoma . It is supposed that these numbers can be truncated with successful recognition and management options. In light of the problem-solving challenge at hand, current advances in biomedical imaging suggest valuable quantitative imaging alternatives for the recognition and managing of glaucoma. more than a few imaging modalities and their enhancement, including optical consistency tomography and multifocal electro retinograph   , are famous techniques engaged to quantitatively investigate structural and functional abnormality in the eye both to observe inconsistency and to measure the sequence of the disease objectively .

Glaucoma is an eye infection that leads to poor image and finally blindness. detect the disease in time is significant as it cannot be alleviate. It is a second important cause of blindness. It is predict that approximately 80 million people will be costly by 2020. It cannot be cure but by using dissimilar techniques and medical treatment the series of the disease can be slow down. Many people are ignorant of the disease until it reach at advance level. visualization loss from glaucoma is everlasting. This encourage one to discover techniques which distinguish glaucoma previous to it reaches to loss of sight. Optic nerve head segmentation is one of the methods just before notice glaucoma. Nerve head include of optic disc and optic cup. They can be detected by means of segmentation. Then cup to disc ratio is taken. If this ratio exceeds threshold then it is glaucomatous otherwise healthy. In this method, glaucoma can be detected so that action can be done to slow down the enlargement of the infection.

A unique method is used known as cup to disc ratio (CDR) quantity. Cup to disc ratio requires disc and cup frontier detection. This is achieved using segmentation process. different techniques are used for this principle. Disc segmentation can be done by model based methods, deformable model based methods and pixel categorization based methods. Optic cup recognition is more testing job. It is not easy to notice frontier of the cup without strength in sequence. a few of the methods for cup segmentation are- thresholding , levelset based move on the way to ,r-bend scheme, weakening based scheme. in the early hours viewing is very vital so that the patient is out of risk. The ophthalmologists are going to each take fundus images or OCT images for recognition and analysis of the disease. The finding of glaucoma from a fundus take pictures of is much easier than that from an OCT image. In our paper we have concerted mainly on fundus image of the retina. We have detect the cup to-disc ratio (CDR) to recognize the disease at the near the beginning stage and used hairy arrangement to categorize the cruelty of the ailment. The measure of Intra visual pressure is also regularly vital in detecting glaucoma at an early stage. additional methods to detect glaucoma are ruling the ratio of the detachment between optic disc centre and optic nerve head to optic disc diameter .
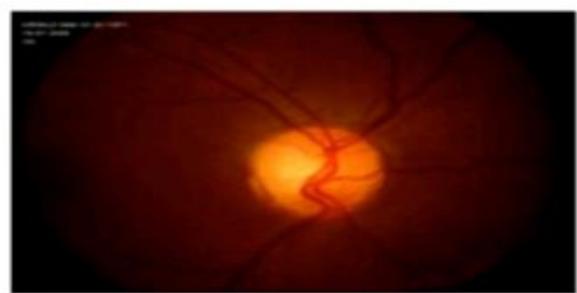
(a) Normal image   (b) Glaucoma image

II. LITERATURE SURVEY

An Optic disc localization algorithm (Geetha Ramani and Dhanapackiam2014) implemented pattern identical practice to put optic disc center. stencil was fashioned by averaging the images in the file. Green plane was processed additional using a number of morphological operation to notice the Optic disc. In

2014, a disc localization algorithm (Akhade et al. 2014) performed principal module analysis (PCA).Cup frontier was take out by fuse two segmentation techniques for the motive that both techniques make another way in the lesser, greater, nasal and temporal region. Best key point at all phase shift was resolute using Bayesian score to choose the frontier of cup from the two segmentation techniques. Local patching i.e. Super pixel segmentation and grid putrefaction techniques (Xu et al. 2014) were practical to segment cup from the take it easy of the fundus image

The preponderance momentous most important module was supplementary processed to eradicate vessels by means of morphological operations. Spherical Hough revolution was functional to distinguish the globular body from the consequential fundus image. Tan et al. (2010) used Gaussian combination Models (GMM) to dig out cup region commencing fundus images.

Resulting cup region has good quality frontier consequences in temporal section, while cup pulling out algorithm in ARGALI performs well in nasal region, thus a hybrid cup extraction was done by fusion of both ARGALI detected boundary and future algorithm detected frontier. Algorithm was hardened on 71 images and 14 % fault decrease was observed. Cup detection algorithm based on vessel kinking was anticipated in Damon et al. (2012).

Algorithm earnings with detecting vessels by classifying a quantity of patches of concentration by by means of facial appearance like mean and standard deviation of a compound image fashioned after computing wavelets of boundaries of green red constituent and incline of green module. Vessel kink detection was accomplished by localizing utmost curvature of the detected vessels. Algorithm assessment was completed on 67 images, and has condensed 43.3 % errors in cup frontier recognition. A spatial heuristics based examination was finished to dig out cup (Wong et al. 2012) after fusing two segmentation techniques i.e. Level set performance functional on green direct to take out brightest pixels from the picture and Color histogram come near which selects pixels in a positive choice in red, green and blue plane by section growing.

III.EXISTING METHOD

The "air-puff test" is a slang term for non-contact tonometry(NCT) .NCT is used during an eye exam to measure the pressure inside your eye .Air-puff test gives your eye doctor an eye pressure reading , known as intraocular pressure(IOP), which helps detect glaucoma . The air-puff test is a non contact tonometry test at puffs a small burst of air into your eye .The air bounces back to the tonometer and gives the machine a reading of your eye's intraocular pressure (IOP).The air puff test is used to measure the pressure inside your eye. For measuring eyes pressure we use non contact tonometer. The non contact tonometer is not in contact with the eye but it gives machine reading of eye's pressure. Tonometer measures the pressure within your eye for the duration of tonometry , eye drops are used to devoid of impression the eye. Then a doctor or technician uses a apparatus called tonometer to determine the inner pressure of eye . A minute quantity of pressure is functional to the eye by a miniature device or by a temperate puff of air.

The range for normal pressure is 12-22 mm of hg("mm hg" refers to millimeters of mercury,a scale used to record eye pressure) .most glaucoma suitcases are diagnosed with pressure greater than 20mm of hg.

However, various populace can have glaucoma at pressure between 12-22 mm of Hg. Eye pressure is distinctive to each person. "Puff tonometry" is a good broadcast test for eye doctors but can from time to time over calculate approximately pressures. This test not as precise as traditional tonometry but it is very receptive in preference up pressure struggle .Many people prefer the air puff test as no contact is made with the eye. The puff of air you will feel is not pain full.However, the IOP quantity provides little accurateness in glaucoma detection and a illustration pasture examination requires extraordinary equipment only present in specialized hospitals. Therefore, they are not fitting for broadcast in the population. It can be done by a trained professional. However, manual evaluation is prejudiced, time unbearable and expensive.

IV. PROPOSED METHOD

In this paper we propose a method called "cup to disc ratio" (CDR). In this we have two stages, In stage1 we have to detect whether glaucoma is present or not then in stage2 if glaucoma is present then we detection which stage it is present.

DATA BASE

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PREPROCESSOR

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FEATURE EXTRACTION

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CLASSIFICATION
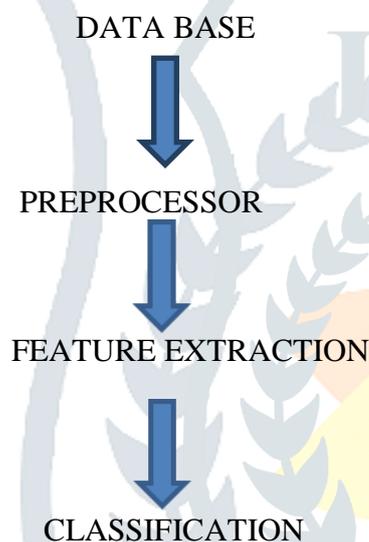
DATA BASE :

In data base, we have collection of 30 retinal fundus images from medical hospital. some of them are normal and some are glaucotomous.In this images we have to select one image and give it to the preprocessor.

PRE PROCESSOR: Preprocessing will get rid of errors caused for the duration of enchanting the images and to decrease brilliance consequence on the representation .while enchanting images the tarnish noise will occurred to diminish this noise we use Spain intensity filter.

FEATURE EXTRACTION: In feature extraction we use highly developed Discrete wavelet transformation (DWT).The DWT captures both the spatial and frequency informations of a signal DWT analyzes the image by decaying it into a common rough calculation via low-pass filtering and addicted to aspect information via high-pass filtering. In feature extraction we are using five filters , namely

 1. Symlet 2. Bio orthogonal 3.Daubechesis

Such disintegration is performed recursively on low-pass rough calculation coefficients obtained at each stage, awaiting the indispensable iterations are reached. Let every image be represented as a $p \times q$

gray-scale matrix . where every constituent of the matrix represents the grayscale concentration of one pixel of the image. Each non boundary pixel has eight adjoining next-door pixel intensities. These eight neighbors can be second-hand to pass through the matrix. The consequential 2-D DWT coefficients are the same irrespective of whether the matrix is traversed right-to-left or left-to-right. Hence, it is satisfactory that we regard as four disintegration information equivalent to 0◦ (horizontal, *Dh*), 45◦ (diagonal, *Dd*), 90◦ (vertical, *Dv*), and 135◦ (diagonal, *Dd*) orientations.

The breakdown configuration for one level is illustrated. The image, $g[n]$ and $h[n]$ are the low-pass and high-pass filters, correspondingly, and *A* is the rough calculation coefficient. In this study,the consequences from level 1 are instigate to acquiesce noteworthy facial appearance. Since the number of fundamentals in these matrices is far above the ground, and since we only need a single number as a delegate characteristic, we in employment averaging methods to conclude such single valued features. The definitions of the three features that were single-minded using the DWT coefficients are in order. Equations (1) and (2) conclude the averages of the equivalent concentration values, whereas (3) is an averaging of the energy of the passion value.

Average Dh1 $=\frac{1}{p \times q} \sum_{x=p} \sum_{y=q} |Dh1(x,y)|$

Average Dv1 $=\frac{1}{p \times q} \sum_{x=p} \sum_{y=q} |Dv1(x,y)|$

Energy $= \frac{1}{p^2 \times q^2} \sum_{x=p} \sum_{y=q} |Dv1(x,y)|^2$

Classification:

Once the facial appearance are area under discussion to both categories of feature standing and feature assortment, we carry out in cooperation the tenfold cross substantiation and the 60:40 slip tests. Both tests are accepted out on the complete 60-sample dataset. In the tenfold cross corroboration process, the dataset is come apart into ten parts. For the duration of the primary iteration, nine parts are used for training and the outstanding part is used for testing. This course of action is accepted out ten times using a poles separately part for testing in each iteration. The consequences obtained from the ten iterations are then averaged to acquire an on the whole accurateness. The 60:40 split test provides the accuracy of the categorization obtained when 60% of the total quantity of samples from the dataset are preferred accidentally. The classifier is experienced against the remaining 40% of the samples that comprise the test set. Table IV provides the results obtained using the tenfold irritable corroboration.

V.CONCLUSION

In this revision illustrates the confidence stuck between features extracted by means of three disconnected wavelet filters that have been subjected to various characteristic ranking and attribute assortment methods. The ranked subsets of preferred features have been fed to a set of organization algorithms to estimate the helpfulness of these features. From the accuracies obtained and contrast, we can bring to a close that the energy obtained from the comprehensive coefficients can be used to make a distinction between normal and glaucomatous images with very elevated accuracy. Proposed method detects

whether patient is strong or is at danger of glaucoma. This imaging technique does not necessitate patient at the time of testing as only retinal image is satisfactory. Cup to Disc ratio calculation method for glaucoma detection is higher to previous methods. This uses super pixel segmentation technique to detect disc and cup. This uses simple linear iterative clustering algorithm. Super pixel segmentation has less complication than pixel based methods. The merely restriction of segmentation is number of super pixels. Increasing this number increases accuracy of correct frontier but time compulsory is more. Hence transaction between accuracy and time is achieved. 54 images are used for valuation. Sensitivity and accuracy achieved are 88.00% and 90.90% correspondingly.

VI.RESULTS

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