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A Novel Approach for Glaucoma Detection Using Cup Disk and Rim Disk Ratio

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ABSTRACT

Glaucoma is a continual ailment which if no longer detected in early phases can lead to permanent blindness. The clinical techniques used by ophthalmologists like HRT and OCT is highly-priced and time-consuming. As a result, there is a have got to advance automatic pc aided process which is able to observe the stage of glaucoma efficiently and in much less time.

Optic disk Ratio and optic cup Ratio are high facets which help in diagnosing glaucoma. As a consequence suitable segmentation of optic disk and optic cup plays a predominant role in detecting the disease. In this paper, an adaptive threshold cantered approach which is unbiased of snapshot fine and invariant to noise is used to section optic disk, optic cup, Neuroretinal rim and cup to disk ratio is calculated to monitor glaucoma. An additional ocular parameter, rim to disk ratio is regarded which in mixture with CDR gives extra reliability in deciding on glaucoma. Furthermore, to that Morphological Operations are utilizing to the method the whole photo to makes the procedure extra amazing. In the end, an SVM classifier has been used to categorize the graphics as glaucomatous or not glaucomatous.

The experimental outcome bought are in comparison with those of ophthalmologist and are located to have extra efficient and high accuracy of 90%. Also, in addition, the proposed system is faster having low computational cost.

As compared to different tricky instruments, digital fondues camera is more cost effective and is more commonly used in general eye examination.

INTRODUCTION

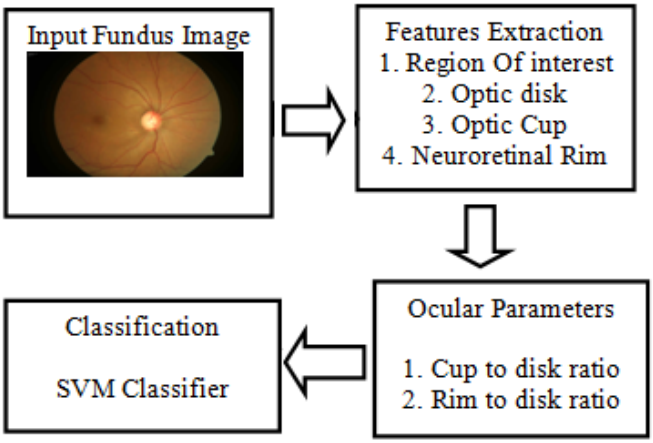
Changes in the structural look of the optic nerve head (ONH) and Retinal Nerve Fiber Layer (RNFL) had been reported to precede the development of visual rea loss in glaucoma.1–3 Detection of ONH and RNFL damage is, accordingly, vital for early prognosis of glaucoma. Latest concentration has additionally been directed to the position of macular

thickness measurements for glaucoma prognosis.

Retinal ganglion cells are also misplaced in the posterior pole in glaucoma, the place these cells could constitute 80% to 85% of the retinal thickness in the macular neighborhood. Optical coherence tomography (OCT) is an optical imaging system that presents high resolution and reproducible graphics of the RNFL that discriminate glaucomatous from healthful topics.6 – eleven even though OCT has been used, for probably the most phase, to evaluate RNFL thickness, latest upgrades in the program even have made feasible the evaluation of ONH topography and macular thickness for glaucoma prognosis and comply with-up.

A prior investigation validated that OCT ONH measurements correlate well with topographic measurements obtained by way of nonlocal scanning another imaging procedure that evaluates the ONH.12 other reports have also shown that OCT macular thickness measurements are drastically thinner in glaucomatous in comparison with healthy eyes.5,thirteen–15 although the capacity of OCT ONH and macular thickness measurements to differentiate glaucomatous from healthful topics has been pronounced to be slash than RNFL thickness parameters, no be taught has but provided a comparison of those three methods within the equal population.

EXISTING METHOD



Optic disk and optic cup are top elements which help in diagnosing glaucoma. Accordingly, proper segmentation of optic disk and optic cup plays a primary position in detecting the sickness. In this paper an adaptive threshold established a system which is unbiased of picture first-class and invariant to noise is used to phase optic disk, optic cup, Neuroretinal rim, and cup to disk ratio is calculated to monitor glaucoma. Another ocular parameter, rim to disk ratio (RDR) is viewed which in combination with CDR gives more reliability in picking out glaucoma.

PROPOSED APPROACH

In current method rather of processing usually a retinal picture, by way of taking the region around optic disk, they stated whether or not the eye is glaucomatous or now not. That is the drawback of discovering the Glaucoma the place it exists external the Optic Disk.

Via since this problem and we enforce new method for detecting glaucoma to procedure the entire photo after which decided where the eye defects. RGB fundus image is used as an enter. The most important regions of detecting Glaucoma are optic Cup, Optic disk, and Rim subject.

By utilizing these three parameters and Processing the entire photograph then we get the Output, the place the attention is effected with Glaucoma and Which stage the attention is suffering from Glaucoma. Additionally, we use Morphological Operations to get the Output extra Accuracy and more effective. This system helps in rapid processing and significant computerized screening of glaucoma.Eachsubjectunderwenta opthalmogic examination including review of medical history, best-corrected visual acuity, slit-lamp bio microscopy, intraocular pressure (IOP) measurement using Goldman application tonometry, gonioscopy, dilated fundoscopic examination using a 78-diopter lens, stereoscopic optic disk photography, and automated perimeter using 24-2 Swedish Interactive Threshold Algorithm. To be included, subjects had to have best corrected visual acuity of 20/40 or better, spherical refraction within 5.0 diopters and cylinder correction within 3.0 diopters, and open angles on gonioscopy.

Eyes with the coexisting retinal disease, uveitis, or no glaucomatous optic neuropathy were excluded from this investigation. One eye of each patient was randomly selected for inclusion in the study. Normal control eyes had intraocular pressures of 21 mm Hg or less with no history of increased IOP and a normal visual field result. The normal visual field was defined as a mean deviation and pattern standard deviation within 95% confidence limits and a Glaucoma Hemifield Test (GHT) within normal limits.

Normal control eyes also had a healthy appearance of the optic disk and RNFL (Retinal Nerve Fiber Layer, cupping, optic disk hemorrhage, or RNFL defects), as evaluated by clinical examination. Eyes were classified as

glaucomatous if they had repeatable (two consecutive) abnormal visual field test results, defined as a PSD outside of the 95% normal confidence limits or a Glaucoma Hemi field Test result outside normal limits, regardless of the appearance of the optic disk. Average MD of the glaucomatous eyes on the visual field test nearest the imaging date was 4.96 dB. According to the Hodapp-Parrish-Anderson16 grading scale of severity of visual field defects, 61 patients (69%) were classified as having early visual field defects, 15 patients (17%) had moderate defects, and 12 patients (14%) had severe visual field defects.

Although the appearance of the optic disk on stereo photographs was not used as an inclusion criterion, the results of stereo photograph assessment were used for comparison with Stratus OCT ONH measurements. Simultaneous stereoscopic optic disk photographs (TRC-SS; Topcon Instrument Corp of America, Paramus, New Jersey, USA) were evaluated by two experienced graders, and each was masked to the subject's identity and to the other test results.

The graders visually estimated the horizontal and vertical cup/disk ratios based on the contour of the cup. The mean value of the two graders was used as a final grading. Subjects underwent ocular imaging with dilated pupils using the commercially available optical coherence tomograph, Stratus OCT (Carl Zeiss Meditec, Dublin, California, USA). All patients had optic nerve head, RNFL thickness, and macular thickness scans obtained during the same visit.

OCT employs the principles of the low-coherence interferometer and is analogous to ultrasound B-mode imaging but uses light instead of sound to acquire high-resolution images of ocular structures. In brief, a low coherence near-infrared (840 nm) light beam is directed onto a partially reflective mirror (beam splitter) that creates two light beams, a reference, and a measurement beam.

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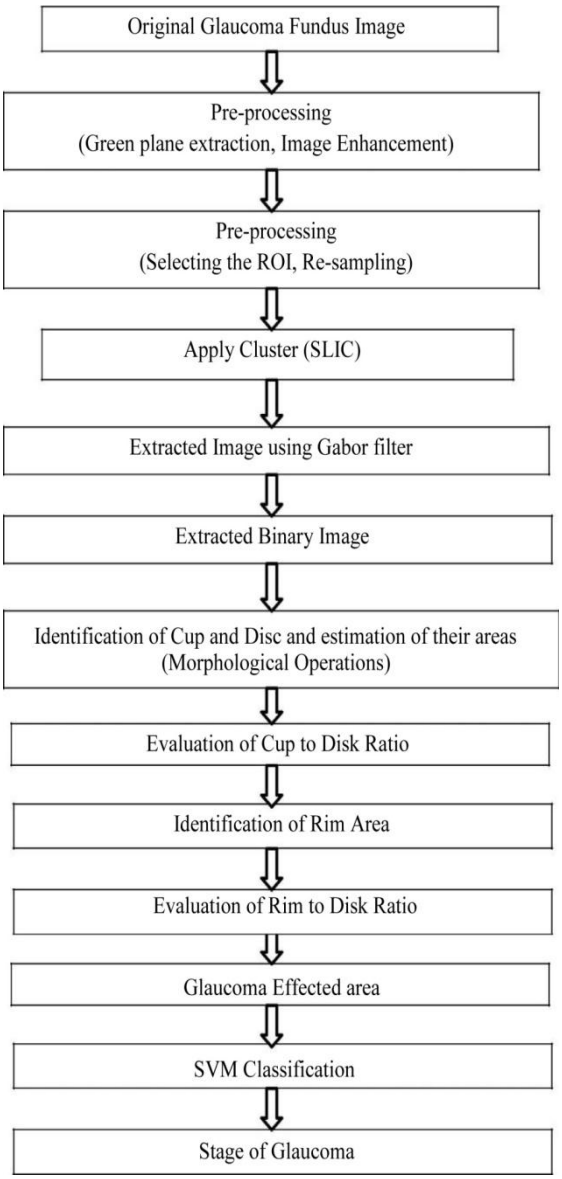

fig 1: a proposed algorithm

Results

fig 1: original image

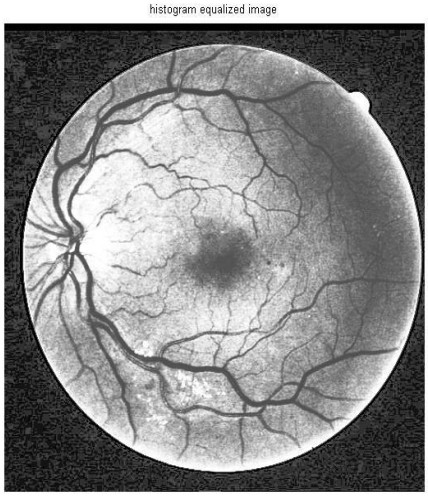

fig 2: histogram output image

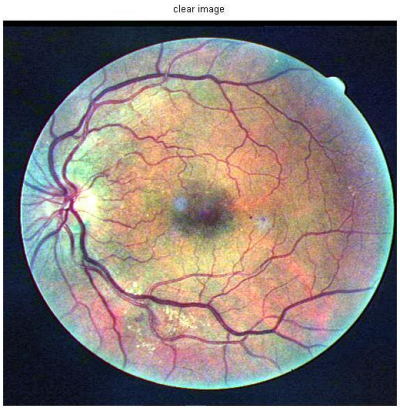

fig 3: enhanced output image

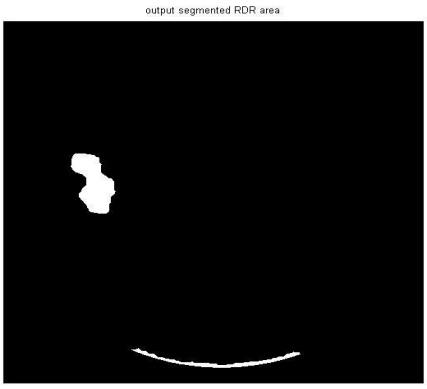

fig 4: our proposed output image for perfect segmentation disease image

CONCLUSION

The evaluation of stratus oct program-provided parameters confirmed that par papillary RNFL measures and ONH topographic parameters had the perfect vigour to discriminate glaucomatous from healthy eyes. Areas beneath the ROC curves and sensitivities at reasonable and excessive specificities were identical for the high-quality parameters from each of these two approaches to evaluation.

We additionally observed that a blend of selected RNFL and ONH parameters in a linear discriminate operate resulted in additional improvement of the diagnostic accuracy of OCT. The ROC curve areas for the Stratus OCT RNFL measurements have been similar to those obtained with the prior models of this technological know-how.

The areas beneath the ROC curves for the prior OCT models were reported to range from zero.79 to zero.94, depending on the parameter and characteristics of the population. In reviews evaluating the diagnostic potential of a couple of OCT parameters, the RNFL thickness in the inferior region regularly had the first-class performance to discriminate healthful eyes from eyes with early to reasonable glaucoma with sensitivities between sixty seven% and seventy nine% for specificities 90%.9,11,26 In our be taught, the parameter inferior thickness also had the highest field under the ROC curve, with sensitivity of 65% for specificity at 95%. The parameter ordinary thickness also had a equivalent efficiency.

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