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A SURVEY ON GLAUCOMA DIAGNOSIS USING ARTIFICIAL INTELLIGENCE

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Abstract: Glaucoma is one of the disorders that harms eye vision and gets worse over time. Internal ocular pressure increase is the cause of it. The development of optical coherence tomography (OCT) in retinal diagnostic imaging is the most important. Multiple methods are used to detect glaucoma, including macular edoema, blood vessels, the visual disc, and the optic nerve. The major objective of this essay is to explain to readers why it is unusual to find glaucoma in diabetic retinopathy and how various procedures are utilised to do so. It incorporates a number of technologies and different inputs. It also offers information on the open data sets that are used to develop and evaluate algorithms.

Index Terms **- OCT, macular edoema, diabetic retinopathy, glaucoma, and retinal diagnostic imaging.**

I. Introduction

The phrase "diabetic eye disease" describes a range of sense issues that persons with diabetes can develop by way of a result of their condition. This might cause myopia or serious vision loss. The condition collectively referred to as "glaucoma" affects the optic nerve, which carries signals from the eye to the brain. When left untreated, the ophthalmologic illness known as glaucoma, which is defined by an increase in intraocular pressure (IOP), permanently damages the optic nerve and retinal fibres, leading to myopia or chronic, permanent vision loss. It is a significant secondary cause of blindness. IOP will rise as a result of any imbalance in aqueous generation and drainage. The average intraocular of maximum persons fall around 7.9 to 20.9 mmHg. Blindness is a result of the optic nerve disorder glaucoma. It has to do with the increased fluid pressure inside the eye. Initial signs of glaucoma are frequently negligible or nonexistent.

The position among the iris and the cornea, or iridocorneal angle, is what distinguishes OAG from Closed Angle glaucoma. OAG is present in in excess of ninety percent of glaucoma patients. It typically takes time to develop and is persistent.

Retinal image analysis has made steady progress in terms of its applications in clinical praxis. It is assumed that the system does this by taking retinal pictures by means of a fundus images. The images need to be meticulously categorised in order to retrieve the delicate retinal structures. The remaining retina should get a number of laser blasts spread out over it. Additionally, a robust registration mechanism is required to identify the retina's motion characteristics and modify the laser beam locations accordingly.

A number of methods can be used to find out if glaucoma is present in the human eye. Using the optic disc, macular edoema, and the optic nerve head. Shradha and Sharangouda employed the optic disc and the extrication of blood vessels in their 2015 paper[1] to identify the onset of glaucoma. Here, disc border perception and ROI extraction are used to segment the optic disc. A 2D Fundus image is the paper's input. The CDR extraction is computed using the tracked vessel detection method. Later blood vessels are removed, and the edge detection method finds them and determines the distortion angle. In Jun Cheng's paper [14], Jiang Liu exploited focal edge association to identify glaucoma.

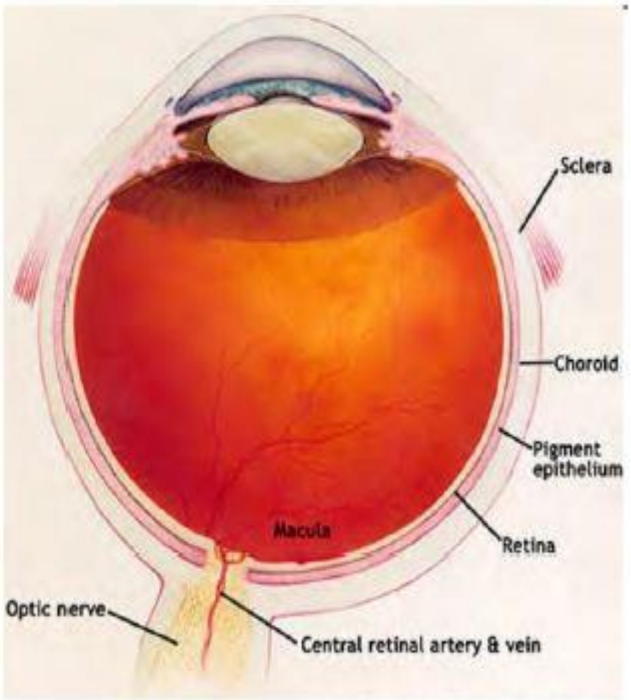


Figure1. Retina Image

This paper[1] extraction runs a histogram after first extracting the green channel. In its ultimate form, this paper's extraction of blood vessels and the optic disc is around 95% accurate.

BLOOD VESSEL AND OPTIC DISC:

The extracted blood vessel image will resemble Fig. 2. The image needs to be smoothed to remove noise and stuttering for accurate segmentation of the vasculature.

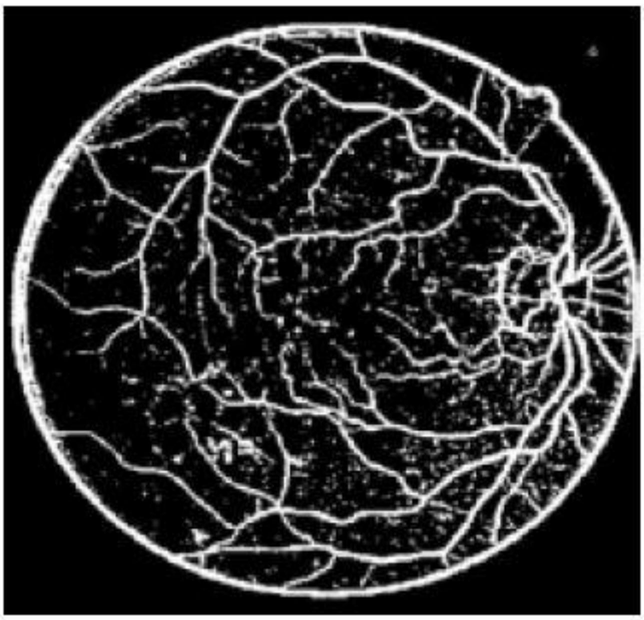


Figure 2. Extracted Image of Blood Vessel

By using CLAHE during the pre-processing stage, the colour picture is converted from RGB to HSI. The Wiener, Averaging, and Median filters are only a few of the filtering methods covered in the paper. Oakar learns that the Median filter, out of these three, is effective at lowering image noise.

The enhanced standard and adaptive histogram equalisation are then applied to the final image. Examining both methods, adaptive histogram is found to be superior to histogram equaliser. The processes of dilation, erosion, closing, and opening are included in the mathematical morphology operator. The image is then processed using Otsu's thresholding technique to identify the target area. These methods aid in eradicating blurry images and produce superior results. Histogram characteristics are discussed in numerous papers; [18] explains their benefits.

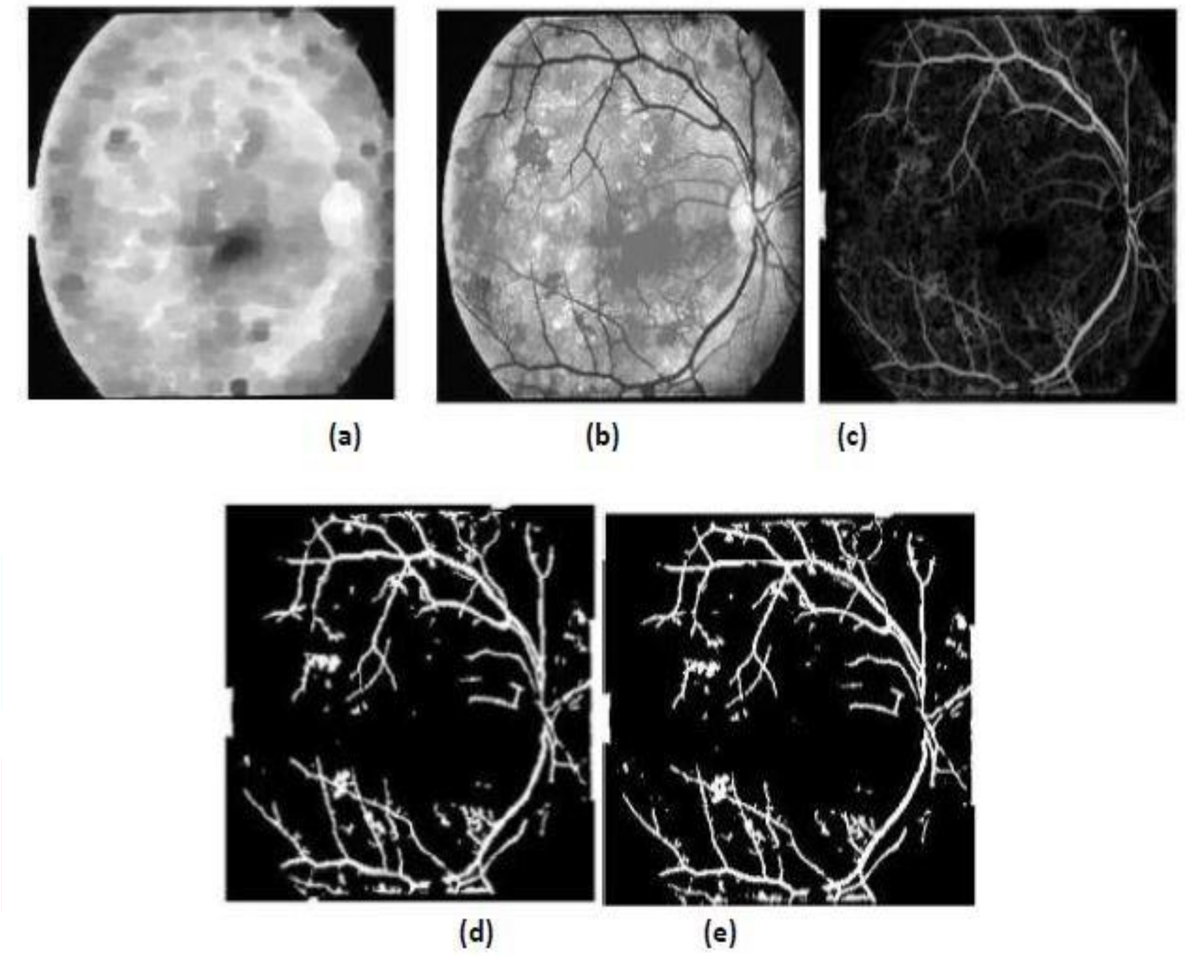
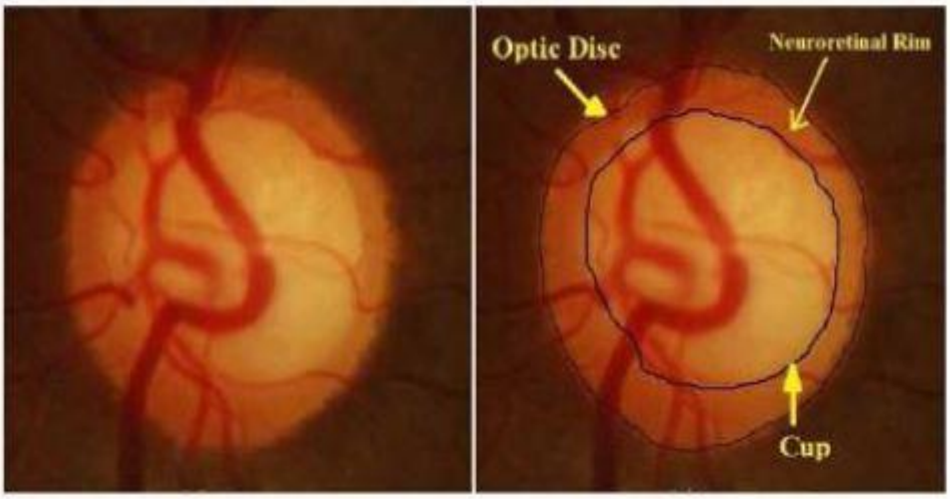


Fig (3): (a) Closing (b) Filling (c) Difference (d) Thresholding (e) Detected Blood Vessels

OPTIC CUP AND OPTIC DISC:

This study reveal based on the sorting of the optic disc founded on super pixels and the optic cup for identifying the existence of glaucoma. They used the gradient approach. Use super pixels to compute centre surround statistics for discs and cups, then histogram equalisation to combine the results. It acquires knowledge about the cup by calculating location data for segmenting the cup. Super Pixel makes use of the SLIC algorithm. It determines a evaluation consistency total for increased disc segmentation correctness. The centre surround statistics are computed after the Support Vector Machine (SVM) classifier has categorised the optical disc.

Sheeba et al used artificial neural networks in a paper that was released in 2014 to identify the existence of glaucoma[4]. Here, the criteria for glaucoma stage identification have been taught to a neural network.



Fig(4): Structure of optic disc and optic cup

In order to interpret the images and train neural networks, weights and biases are used. The grade is dogged through back propagation, which involves reversing computations across the network. The neural network helps to provide a wide range of features and a GUI for the development and modelling of neural networks. Using GUI, neural networks may be created, trained, and simulated. The back propagation technique provides better glaucoma presence precision.

CONCLUSION

As stated earlier, we have gathered data sets, conducted analysis, and in many cases, analysed the distinctions between clinical diagnosis and algorithmic specifics in this survey study. In light of everything stated above, we would advise the doctor regarding any further diseases as well as the type of glaucoma that manifests in human eyes. Additionally, it gives them the information and counsel they need on the most recent advancements in medical technology. It constantly guides him. Machine learning can automate the equipment, reducing the requirement for labourers. We can also access historical data through it, which we can then study for the past, present, and future. The huge volume of data can be leveraged to address the storage problem via cloud computing. We have researched the problem by looking into it and taking into account the articles that have been written about it. We will now provide our own, most direct solution to the problem at hand.

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