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Approach on Glaucoma Diseases Detection Different Techniques

Vibhuti Patel[1], Mayank Vyas[2]
[1]*Assistant Professor, Department of Electronics & Communication Engineering, Parul University, Limda*
[2]*Assistant Professor, Department of Electrical Engineering, Parul University, Limda*

Abstract: ***Glaucoma is a blindness causing eye disease. Rising of intraocular pressure within the eye is the main aetiology. Glaucoma detection is one of the crucial tasks for ophthalmologists. The pressure on eye cells increases with the use of mobile phones, video games in the daily life of human beings. This paper is basically extension of my work on glaucoma detection different techniques approach. We will also understand approaches as Image processing ,fundus image, cross validation , machine learning , CDR on Morphology and Hough Based Technique. Fundus images obtained from fundus camera have been used for the analysis. CDR technique is used on different retinal image for glaucoma detection. Further, analysis of CDR is carried out using different colour channel combinations of the fundus images.***
Keywords: Glaucoma; Funduscopic Image, cross validation, Classification, Feature Selection, Machine learning.

I. INTRODUCTION

Glaucoma is the second leading cause of blindness in the world. Some medical reports from various countries It affects 40% of Blindness in Singapore, more than 3 million peoples living in the United States. Glaucoma is the leading cause of blindness in African – Americans, who should begin glaucoma tests as early as age 35. Before touch the objective we see the fig1.An internal structure of human eye approximately a spherical organ shown in following figure. The protective outer layer of the eye is called the sclera. The other components of the eye are regions such as cornea, lens, iris, and retina.

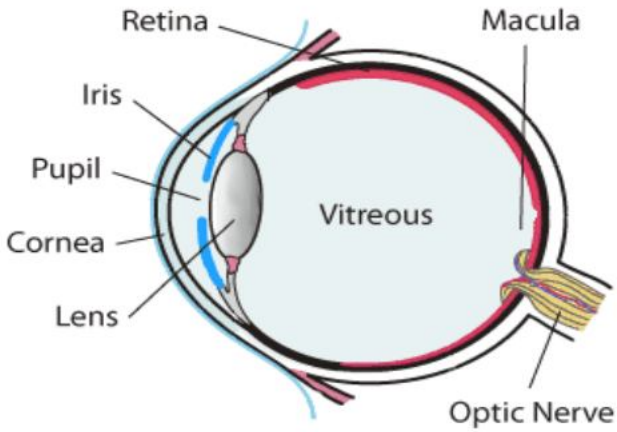

Figure: 1 Human Eye Internal View

Glaucoma Research conducted by WHO has identified more than 285 million people with visual impairments either in the form of blindness or visual impairment. With a significant amount of population falling under visual distress, it is essential to have cost effective, faster techniques to identify such deficiencies and address them at an early phase. The statistics continues to emphasize that retinal abnormalities are common critical issues faced by people across different strata of the society and not specific to any strata / region. Open angle glaucoma: This is the most common type of glaucoma, also called wide-angle glaucoma. It occurs due to partial blockage of drainage canal in which pressure increases slowly as fluid does not drain properly as shown in Figure. Angle-closure glaucoma: It is also called acute glaucoma caused due to sudden and complete blockage of aqueous drainage shown in Figure. The pressure rises rapidly leading to loss of vision quickly. It is developed due to narrow drainage angle, thin and droopy iris.

The iris (coloured part of the eye) is pushed against the trabecular mesh network (drainage channels) within the angle of anterior of the eye, leads to blockage and bulges the iris forward.

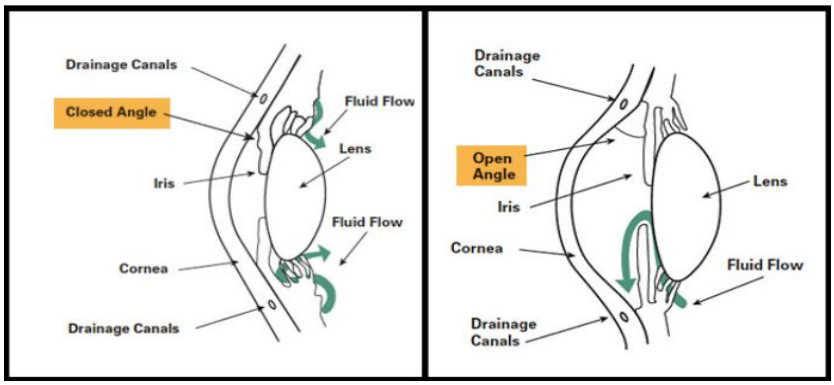

Figure:2 Open and Close Angle of Glaucoma

The internal pressure of the eye (intraocular weight or IOP) is reliant on the harmony among creation and waste of watery liquid in the eye. On the off chance that your eye's waste framework is working appropriately, at that point liquid can deplete uninhibitedly out what's more, avoid a development. Similarly, if your eye's liquid framework is working appropriately, at that point the perfect measure of liquid can be delivered.

II. DIFFERENT DETECTION APPROACHES:

A. *Detection Of Glaucoma Disease Using Image-Processing*

1) Image Dataset To start with, consider a picture from the database; the picture might be binary picture, grayscale, or multidimensional picture. For database creation, an online accessible dataset is utilized for glaucoma ailment, by blending pictures from different datasets and obtain a dataset of 510 pictures, in which 320 pictures are of glaucoma malady and 190 pictures are of sound persons which are shown in Figure.

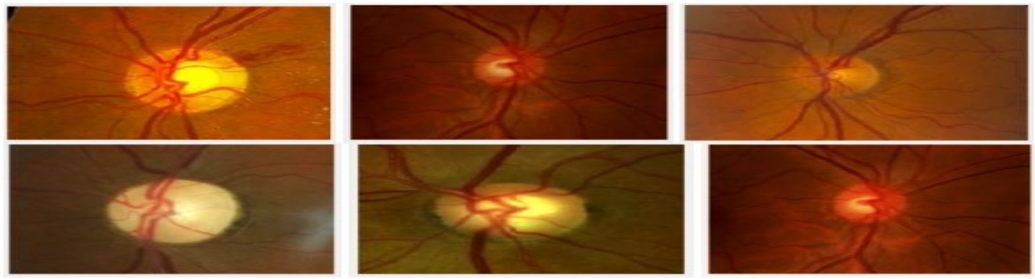

Figure:3 Input Images

2) Segmentation The division errand done by utilizing a worldwide thresholding system and ROI is chosen from different outcomes got in the wake of changing as far as possible from worldwide thresholding. To perform this task, initially divide the image into a fixed size. Then select a random threshold value to separate the background of the image. Then again select the threshold T for both the part and take a mean value as a new threshold. After repeating this step multiple times a constant value of T is obtained.

3) Extract Region of Interest After performing thresholding, obtain a region of interest, which will be separated from the background. This region of interest contains the portion of the cup and disc in the human eye.D. Cup Disk Ratio The cup-to-disk ratio (normally reported CDR) is an estimation used in ophthalmology and optometry to overview the development of glaucoma. This cup plate extent place a noteworthy activity in the area of glaucoma disease in case this comes this extent is incredibly high, by then, it exhibits that there is a chance of glaucoma illness all the while in the occasion that cup circle extent is low, by then it shows that there is a no chance of glaucoma contamination.

4) Extract Features and prepare for Training Cup to disk ratio extracted and radius to disk ratio are calculated and stored in a datasheet to send for training. Consider 150 images that are randomly selected to extract the features and this can be prepared by the datasheet and further can be given for training and testing the dataset.

B. Detecting Using Cross Validation

Here suggests the way of giving the possibility of glaucoma using classification data mining technique based on couple of algorithms. This paper introduces the probability of having glaucoma by using classification prediction technique. Data Samples were randomly collected for patients of different age, B.P measure, and Diabetes level, Myopia, IOP and Family History.

Figure-4 shows the main process on which different stages are selected and run on Rapid miner Tool. Different attributes like age, BP, diabetes family history, IOP, myopia as input dataset file is imported on Rapid Miner and by the use of various stages and Cross validation algorithm, connected to each other accordingly. This Figure represents the cross validation algorithm with decision tree. Figure-5 shows the Prediction of Glaucoma on the basis of dataset taken as input using cross validation to calculate best prune.

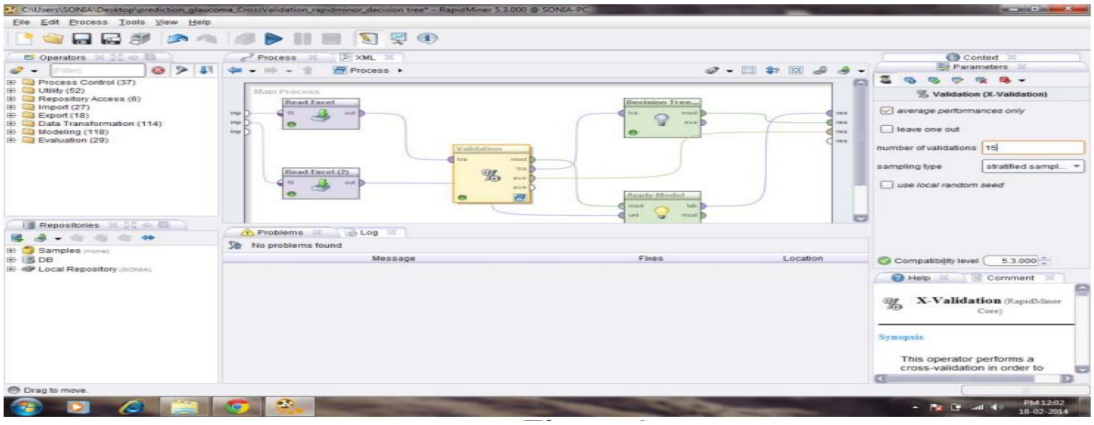

Figure:4 Initial view

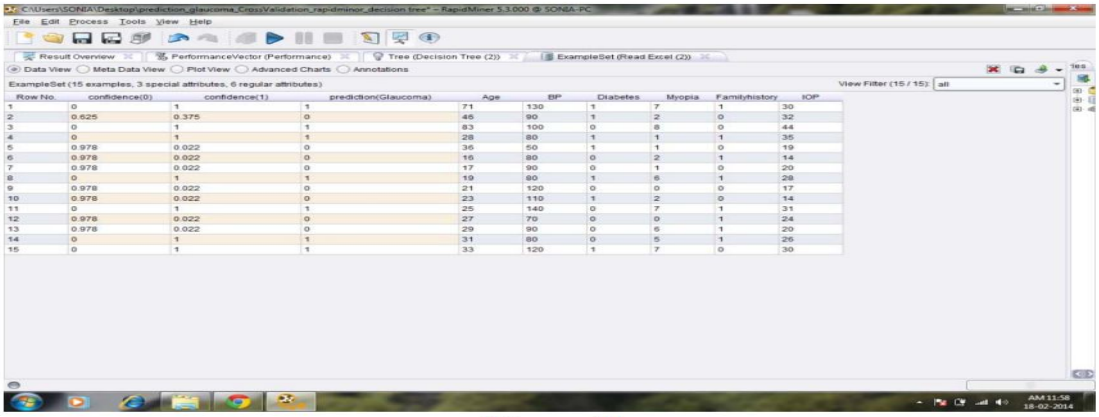

Figure:5 Datasheet

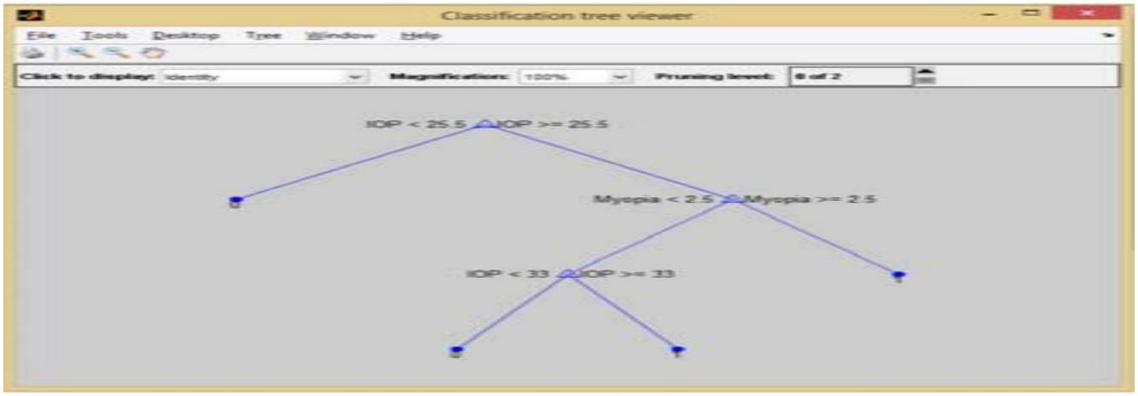

Figure: 6 Tree View

III. GLAUCOMA DETECTION USING CDR ON MORPHOLOGY AND HOUGH TECHNIQUES

Automated Segmentation of cup and disk boundary using Hough transform based techniques. Many of the past works have not considered sensor error while proposing a mechanism for CDR detection. Noise is an inherent part of a real-time scanning system. Hence, we propose to perform simple median filtering on independent colour channels post segmentation before contour extraction of OC and OD and determining CDR.

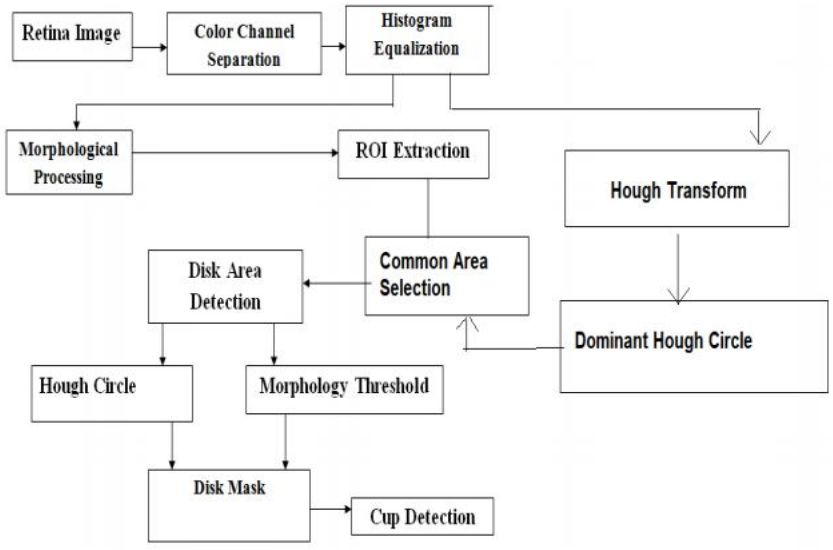

Figure:7 Architecture of Blood vessel and Optic disk segmentation of the retinal image

Human Beings respond to colour through sensory cells called as cones, and we find three types of cones based on to their sensitivity to light by different wavelengths. Among these three cones one is affected by red light, another type of cone is affected by green light and another cone is affected by blue light. So, the combination of these three colours red, green and blue is controlled by emitting and we stimulate the three cones. This makes to store the images in three separate image matrices; one stores the amount of (R) in each pixel and similarly for G and B. so this results to store the images in RGB format. The image containing all the red, blue and green channels can be extracted and separated by colour channel separator. But the only channel that is extracted is green as fundus images are almost always saturated in the red channel and have very low contrast in the blue channel. The Morphological operation includes partitioning of three channels where better vessel background contrast is provided by the green channel.

IV. CONCLUSION AND FUTURE PLAN

The Automated Glaucoma detection from the retina image has been one of the major research areas in the recent. This computer-aided system of retina image analysis not only enhances the accuracy of detection of such diseases by assisting the doctor in tasking better decision but also it helps countries like India to more efficiently offer the public health system. In the proposed work, the bin rushed public dataset is extensively used, and from this dataset, the cup to disk ratio and radius of the cup. It is also dependent on age factor; it was found that the people having age above 50 are more prone to this disease. When applying datasets of different patients on rapid miner tool using cross validation algorithm it gives out an accuracy of about 82.83%.

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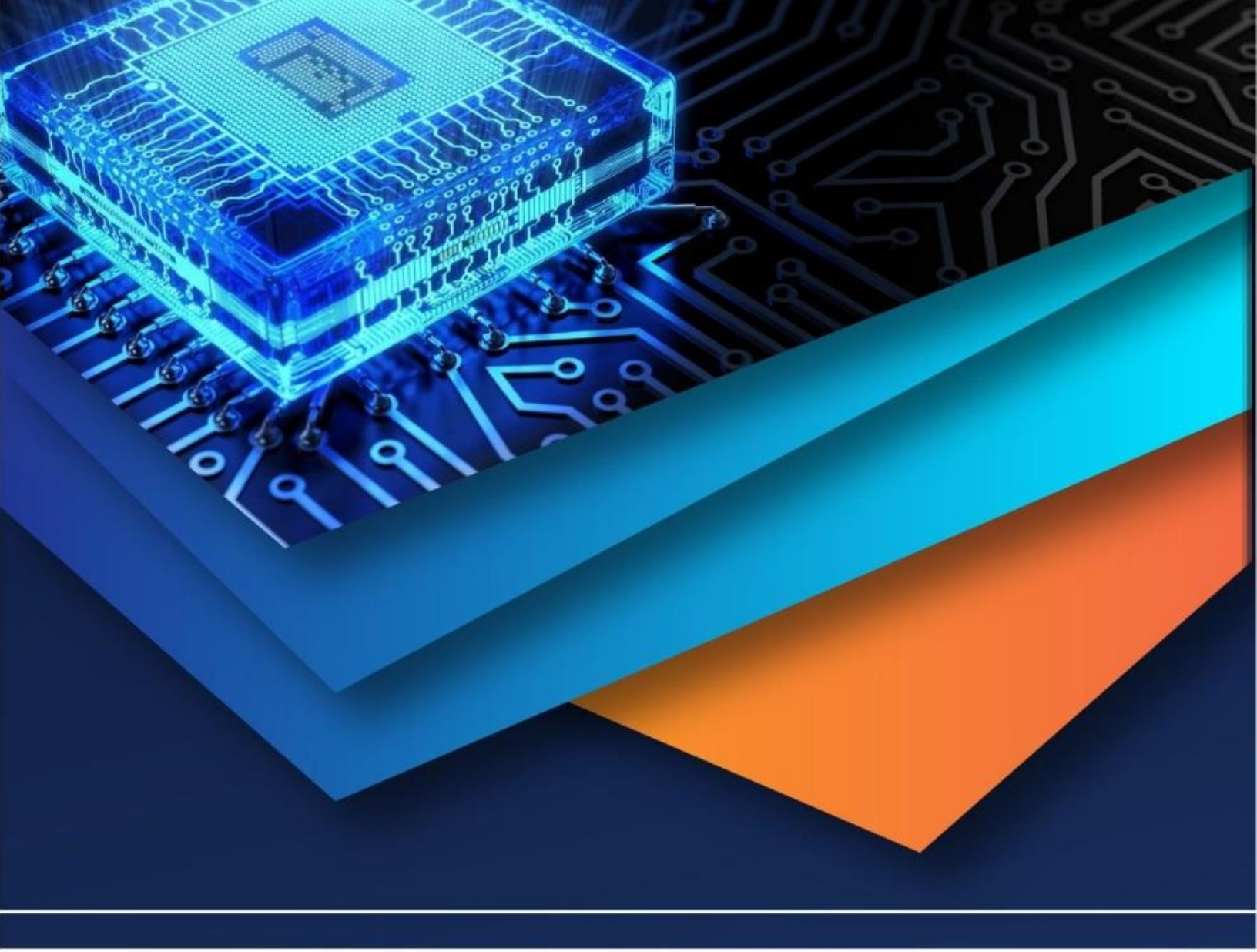

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