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## A Survey on Blood vessel and Glaucoma in Diabetic Patient.

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### ABSTRACT

Glaucoma is an eye disease which results in damage to the optic nerve caused by the increase in the intraocular pressure of the eye. Glaucoma generally affects the optic disk by enlarging the cup size and can cause retinal vessel occlusion. It can lead to blindness if it not detected and treated in proper time. A peculiar method for glaucoma detection and retinal blood vessel using digital Fundus image .Image processing techniques such as Preprocessing, Morphological operations and thresholding are extensively used for automatic detection of optic disc, blood vessel segmentation .The extracted features such as ratio of the distance between optic disc (OD) and optic nerve head to diameter of the optic disc (OD) , cup-to-disk ratio and ratio of blood vessel area in inferior-superior side to area of blood vessel in nasal-temporal side. These features are verified by classifying the normal and glaucoma images by using neural network classifier.

**Keywords:** Glaucoma detection, Blood vessel, Fundus image, optic disk segmentation, optic cup segmentation.

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**INTRODUCTION**

Diabetic retinopathy (DR) is also called as diabetic eye disease mainly damages the retina that leads to diabetics .The deadly impact of this disease leads to blindness. If it is not treated in the proper time .The ocular manifestation is a type of diabetes which affects up to 80 percent of the people in the world. And it affects who have diabetes more than for the 10 years or more. The Statistics of the research indicates that at least 90% of new cases can be decreased, if they regular noticed and check up for the eye. The person who has longer diabetes, they have the higher chances of developing diabetic retinopathy disease. For a year in the United States, diabetic retinopathy accounts for about 12%of all new cases of blindness. It also causes blindness at the age of 20 to 60 years.

Diabetic retinopathy in early has no signs. Even the macular edema, which can cause rapid vision loss, may not have any symptoms at any stage. Generally a person with macular edema is likely to have blurred vision, and making hard in doing things like reading and while in driving. In some cases vision will get worse or better during the day.

The stages that are involved in identifying the diabetics are namely non-proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR). In first stage, non-proliferative diabetic retinopathy (NPDR) has no symptoms; the person will have not clear vision of 20/20 and does not have signs of diabetic. The only way to detect diabetic is NPDR and it is done by funds photography, in which micro aneurysm can be seen. If the person has a reduced vision, the back of the eye can be executed by using fluorescein angiography. In this Narrowing or blocked retinal blood vessels can be viewed positively and then lack of blood flow is known as is called retinal ischemia. In the second stage, peculiar new blood vessels detected at the back of the eye is called as proliferative diabetic retinopathy (PDR). This leads to burst, bleed and blur the vision of a person, because these new blood vessels are fragile. If the bleeding occurs at the first time it may not be very severe. If these spots are followed within a few weeks blurred vision takes place due to leakage of blood. It may take a few days to months or even years to clear the blood inside of the eye and some cases not clear the blood in eye. This kind of large haemorrhage affects more than one time during sleep.



**Fig (1) (A) normal range of vision (B) advanced vision loss in glaucoma (C) diabetic retinopathy**

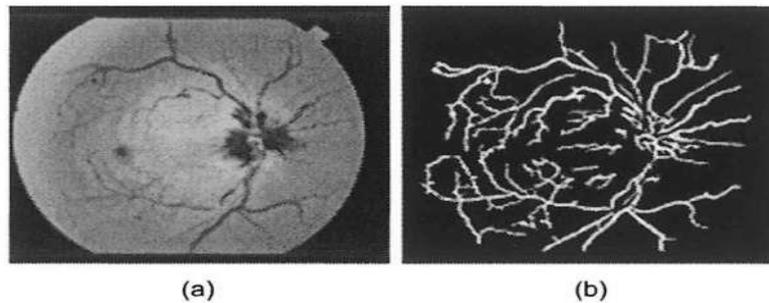
Glaucoma can be categorized into two types: “open-angle” and “closed-angle” glaucoma. Open-angle glaucoma usually less pain. The open–angle glaucoma has no symptoms still it increased slowly. Closed-angle glaucoma is chronic and asymptomatic in nature. Closed –angle has severe symptoms like sudden pain in eye, redness, blurred vision, mid-dilated pupil, nausea and vomiting. It can permanently damage the vision of the eye, first it decreases the peripheral vision and then it leads to blindness. Glaucoma also known as "silent thief of sight" due to vision loss problem takes place over a long ago. In the world, glaucoma is the second largest leading cause of blindness after cataracts.

**METHODOLOGY**

There are different methods used to detect the existence of glaucoma and blood vessel in human eye.

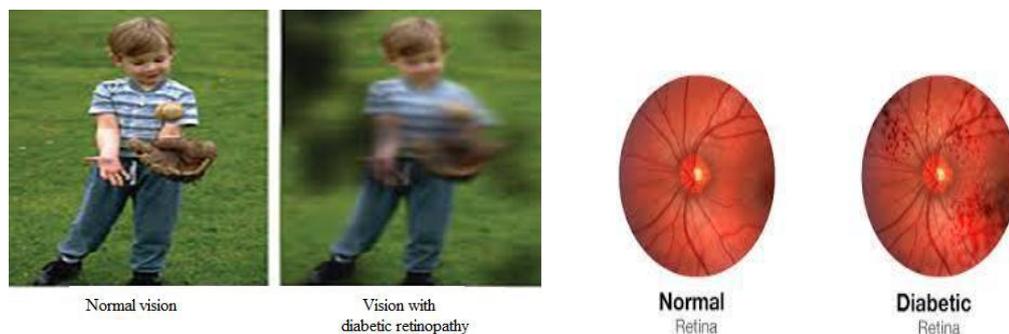
**Blood vessel segmentation techniques**

Prof Yashowardhan kelkar, mohammed Imran khan (2013), in this paper uses blood vessel detection in digital retinal images. There are three basic methods for automated segmentation of blood vessel namely gray thresholding method, vessel tracking method and Bayesian trained classifier and neural network classifiers. Multi-scale single channel linear tracking (MSLTA) Algorithm can be used under the green channel to process images because green channel images have high vascular contrast and then median filter used for removal of noise in green channel and increase the accuracy of confidence matrix. Finally blood vessel can be segmented through vascular diameter. This method can be used for such databases such as DRIVE and STARE .The performance on both sets of tested images is better solution and then method can be determined in exact for vessel detection in STARE images.



**Fig (2) a) input image b) blood vessel extraction**

Chandani nayak, lakhwinder kaur, smriti kumar (2014), in this paper mainly uses automatic retinal vessel segmentation. Input image is used for colour retinal images. A retinal image of blood vessel can be segmented from an image is a tough task expected through thin vessels .The low contrast images automatically used for vessel edges and Background system. It mainly builds the vascular pattern used for 2-D mort let wavelet and then thresholding method is used to generate gray level segmented image. Mort let wavelet is the most accuracy than any other vessel detection technique. It upgrades their vessel contrast and filter removed their noise. It mainly used in other scales and available for blood vessel segmentation.



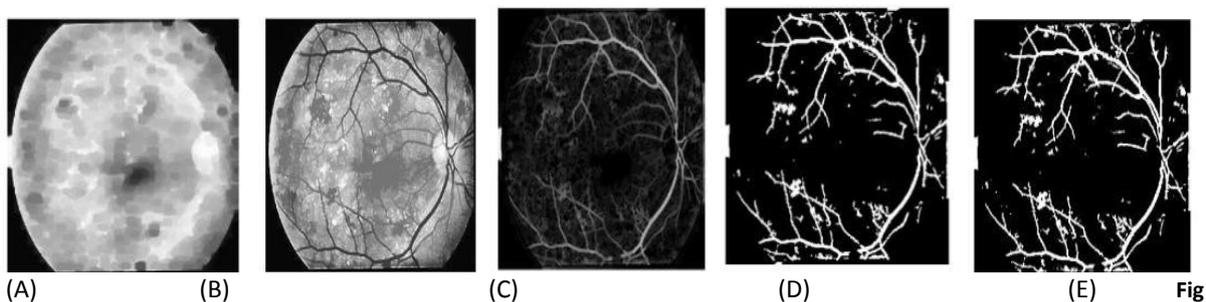
**Fig (3) shows the difference between normal retinal image and diabetic retinal image**

**Detection of optic disc and blood vessel**

OAKAR PHYO, AUNGSOE KHAING (2014), in this paper uses the mathematical morphology method is used to detect and eliminate the optic disc (OD) and blood vessels. Input image is mainly used coloured retinal images. Then coloured image RGB is converted to HSI colour space Image by using contrast-limited adaptive histogram equalization (CLAHE) technique for image enhancement. It mainly uses three filtering techniques namely Median filter, Averaging filter, wiener filter. By using three filtering techniques median filter is the most suitable filter used to reduce the effect of noise.

The result image of the median filter used for two methods. Firstly, histogram equalization technique used for contrast image can be converted the values in an intensity image. Secondly, Adaptive histogram equalization technique must be operated on tiny data region in the retinal image. By using these two methods,

adaptive histogram is better result for image enhancement process. The mathematical morphological operation can be used for Dilation, erosion, closing, opening process. Finally Otsu's algorithm is a thresholding technique used to the image to detect the desire area. This technique helps to eliminate the blur image and provide better output.



(4) A) closing B) Filing C) difference D) Thresholding E) Detect the blood vessel The results of the blood vessels detection are shown in Fig.4 (a), (b), (c), (d) and (e). The result of closing and filling images is shown in Fig.4 (a) and Fig.4 (b). To get the blood vessels area, Otsu algorithm can be used for different images between closing and filling images. The output images are shown in Fig.4 (c) and (d). The blood vessels detected area is shown in Fig.4 (e).

### Optic cup and Optic disk

D.JEYASHREE, G.SHARMILA, K. RAMASAMY (2014), in this paper mainly used for diagnosis of diabetic retinopathy and glaucoma. This process can be collected by retinal images from medical databases such as STARE and DRIVE. Input image prefer from green to red channel. Green channel have higher contrast than background but Red channel mainly use to extract the optic disc and optic cup to determine glaucoma. Then curvelet transform can be enhanced the blood vessel in retinal images and efficiency can be used to represent edges along with curves. Morphological operation takes place in certain process such as erosion, dilation; opening, closing process can be implemented. If CDR is measured by area of optic disc to optic cup. Then CDR value below 0.3 it is normal image and value exceeds above 0.3 then glaucoma is diagnosed. This work shows better results with both PSNR (32.935) and accuracy (92.99%).

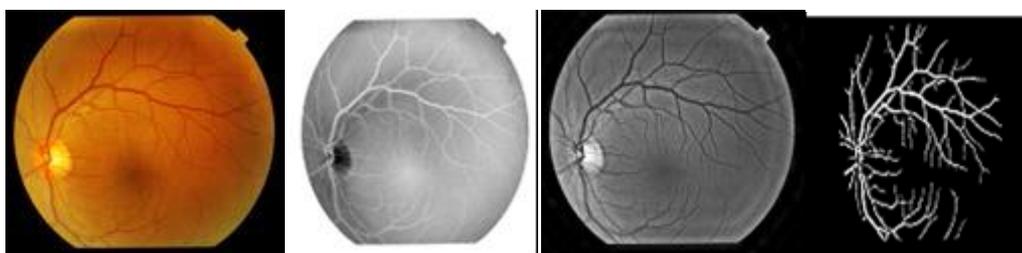


Fig (5) results of detection of blood vessel are shown a)input image b)complement image c)enhanced image d) blood vessel detection

HUSANDEEP KAUR, AMANDEEP KAUR (2014), in this paper mainly used for detection of optic disc and optic cup segmentation in a retinal image. Input image is coloured retinal images. Super pixel classification technique is used to segment the optic disc, optic cup and cup-to-disk ratio. But nasal side of cup boundary is used to find difficult to the blood vessel.

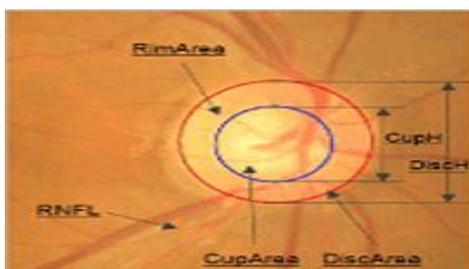


Fig (6) Find the cup to disc value

Multi threshold segmentation is used to detect cup-to disk ratio but detected CDR measurement process is tough due to colour texture enclosed by both optic disc (OD) and optic cup (OC) is not clear. Optic disc (OD) boundaries can be tough to find blood vessel. If the CDR value rises above 0.3, it affected high glaucoma for that patient. Kaur will be used for mathematical morphology method to overcome these problems and detect the better CDR value

### CONCLUSION

This survey paper suggests various methods to detection of the blood vessel and glaucoma. We analysed various methods and input to detect the blood vessel extraction by using Diabetic retinopathy database, fundus images are recent trends used here. This paper mainly understands the diabetic retinopathy normally affects the vision and blood vessel detection can be done in mathematical morphological method. Glaucoma is affected when the CDR value increases by 0.3 and then normal eye value is decreases by 0.3. So the automated screening system can be used to find the early stage glaucoma and to prevent the permanent blindness.

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