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A Review on Vessel Extraction of Fundus Image to Detect Diabetic Retinopathy

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Abstract

Ophthalmology is an important term of medical field, which helps to visualize various diseases and treat them accordingly. Fundus images are processed so as to treat diseases like glaucoma, vein occlusions, and diabetic retinopathy (DR), obesity, glaucoma etc. There are types of supervised and unsupervised types of algorithms used so as to segment the Fundus images. There are three types of datasets available DRIVE, STARE and CHASE_DB1. These data sets are being segmented with the help of Laplace operator. This method makes preprocessing of images by using adaptive histogram equalization by CLAHE algorithm. The first step is to extract green channel and segment this image by using Laplace operator. Thus it helps to enhance extraction of blood vessels from fundus image. The detected blood vessels and measurement of these vessel is used for diagnosis of Diabetic Retinopathy (DR) and other eye diseases.

Index terms—

A Review on Vessel Extraction of Fundus Image to Detect Diabetic Retinopathy Prof Dr. S. S. Chorage ? & Sayali.S.Khot ? Abstract-Ophthalmology is an important term of medical field, which helps to visualize various diseases and treat them accordingly. Fundus images are processed so as to treat diseases like glaucoma, vein occlusions, and diabetic retinopathy (DR), obesity, glaucoma etc. There are types of supervised and unsupervised types of algorithms used so as to segment the Fundus images. There are three types of datasets available DRIVE, STARE and CHASE_DB1. These data sets are being segmented with the help of Laplace operator. This method makes preprocessing of images by using adaptive histogram equalization by CLAHE algorithm. The first step is to extract green channel and segment this image by using Laplace operator. Thus it helps to enhance extraction of blood vessels from fundus image. The detected blood vessels and measurement of these vessel is used for diagnosis of Diabetic Retinopathy (DR) and other eye diseases.

1 I. Introduction

egmentation of retinal blood vessel using fundus images has played an important role in assessing the severity of retina that leads to premature retinal diseases. In fundus image by analyzing the thickness of blood vessels any disease can be detected. The process of extraction analyze the amount of blood supplying the retina. The blood vessel blockages may cause the sight degradation and in the severe cases, blindness may occur. Irregularity of blood vessel diameter can be the first of eye disease like diabetic retinopathy or macula oedama. There are different types of techniques and algorithms that are being used for image segmentation. These algorithms are used for image validity and better accuracy.

2 II. Diabetic Retinopathy

Diabetes is happen to be a well known disease and is a major risk for cardiovascular diseases. It may cause abnormalities in the retina (diabetic retinopathy), kidneys (diabetic nephropathy), nervous system (diabetic neuropathy)etc. There are various types of diabetic eye disease that can cause vision loss and leads to blindness. Diabetes is therefore one of the most serious challenges to health care world-wide.

According to recent projections it has affected 239 million people in the year 2010. Diabetes has affected about 28 million in western Europe, 18.9 million in North America 138.2 million in Asia,1.3 million in Australasia. Sometimes the loss of vision irreversible due to diabetic retinopathy. However, early detection and treatment can reduce the risk of blindness by 95 percent. Because diabetic retinopathy often lacks early symptoms, people with diabetes should get a comprehensive dilated eye exam at least once a year.

3 III. Related Work

The majority of research work have focused on the algorithms used than the types of diseases. The algorithms are being justified for diabetic Retinopathy than any other diseases.

Sohini Roychowdhury et al. [1] have focused on unsupervised iterative blood vessel segmentation algorithm using fundus images which being used for different data sets. There is a stopping criteria used with the iterative algorithm for high resolution of fundus images. This algorithm helps to detect the density, tortuosity or width of the peripapillary vessels for analysis. This algorithm has about 90% of segmentation accuracy.

Walid M. Abdelmoula et al. [2] have proposed an iterative self organized data analysis(ISODATA) classifier that groups the pixels into distinguished regions by the observer. This method involves several steps to extract vectors of different pixels into different classes. This method helps in segmentation of Choroidal Neovascularization. It uses a linear time invariant system with a feedback loop proposed to describe the dilution of fluorescein.

Asiri Wijesinghe et al. [3] has introduced an Unsupervised adaptive k-means clustering algorithm that segment the original image to detect distinct abnormal regions and ANN. Fuzzy C-means algorithm is used for blood vessel tracking and needs no any information on edges. It under goes through several steps to detect fundus images.

Lama Seoud et al. [4] uses Adaptive Contrast Equalization method to separate red lesions, into microaneurysms (MA) and hemorrhages (HE). This is obtained by proposing several steps so as to extract the green channel from the optic disc. A novel red lesion detection method uses a set of shape features, the DSFs, were presented and evaluated on six different databases. IV. Proposed Methodology Automatic detection of the blood vessels in retinal images is done with the help of set of data. The proposed method consists of two phases Vessel detection and processing of images.

There are three types of retinal image databases, namely, DRIVE, STARE and CHASE for evaluation.

4 a) Structure Of Eye

The retina is a light-sensitive layer of nerve tissue lining the inner surface of the eye. The retina creates an image projected on its surface with help of the cornea and crystalline lens, and transforms it into nerve impulses sent to the brain. ii. STARE database STARE (Structured Analysis of the Retina) dataset, consists of 81 fundus images that are digitized at 605×700 pixels has resolution, 24 bits per pixel (standard RGB).

iii. CHASE_DB1 database CHASE_DB1 data set contains 28 colour images of retinal fundu images. A resolution of 1280x960 image pixels captured at 30 field of view . The very first step involved is the fundus image that is given as input. An Optical camera is used to see through the pupil of the eye to the inner surface of the eyeball. The resulting retinal image shows the optic nerve, fovea, and the blood vessels.

5 a) Adaptive Histogram Equalization

This process is being used so as to obtain the equalized image by choosing the green channel (RGBimage). It improves the quality of fundus image. The blood vessel then locates the optic disk. The method CLAHE - Contrast Limited Adaptive histogram equalization using OpenCV1 (Open Computer Vison) computes new value of brightness form surrounding pixels by forming a framework. This

6 V. Proposed Technique

The use of Laplace operator algorithm proposed blood vessels and veins extraction from Fundus image. The extraction of blood vessel involves several steps. method is used to limit the noise by using the clip factor. The limit of clip factor is being set to 5000 The Laplace operator is being used for the edge detection which is based on second partial derivative. It can be obtained by using following expression ? 2 ?? = ?? 2 ?? ???? 2 + ?? 2 ???? 2

7 c) Erosion Operation

The false structure that is being generated is being eroded to get a noise free amplified image. This operation helps to separate bonding of the pixels.

8 d) Small Segments Removed

The specific size of pixels for the used data is being selected other segmented having maximum size is being eroded. Thus we can see separate image. In the above Image, by using Laplace operator an enhanced image is being obtained that is used to obtain the filtered image which will further help to analyze the blood blockage in the vessels and thus results in detecting DR.

9 VII. Conclusion

In this paper review of Segmentation of fundus images approach have done, from this it is observed that analysis of retinal images is the key contributor detect DR Since its early detection is possible it helps to treat accordingly and thus the vision loss can be avoided. Studies such as the Diabetes Control and Complications Trial (DCCT) have shown that controlling diabetes slows the onset and worsening of diabetic retinopathy.

DCCT study participants who kept their blood glucose level as close to normal as possible were significantly less likely than those without optimal Year 2016 ( ) glucose control to develop diabetic retinopathy, as well as kidney and nerve diseases. Other trials have shown that controlling elevated blood pressure and cholesterol can reduce the risk of vision loss among people with diabetes. Thus segmenting fundus image plays vital role in early analysis of DR. [1]

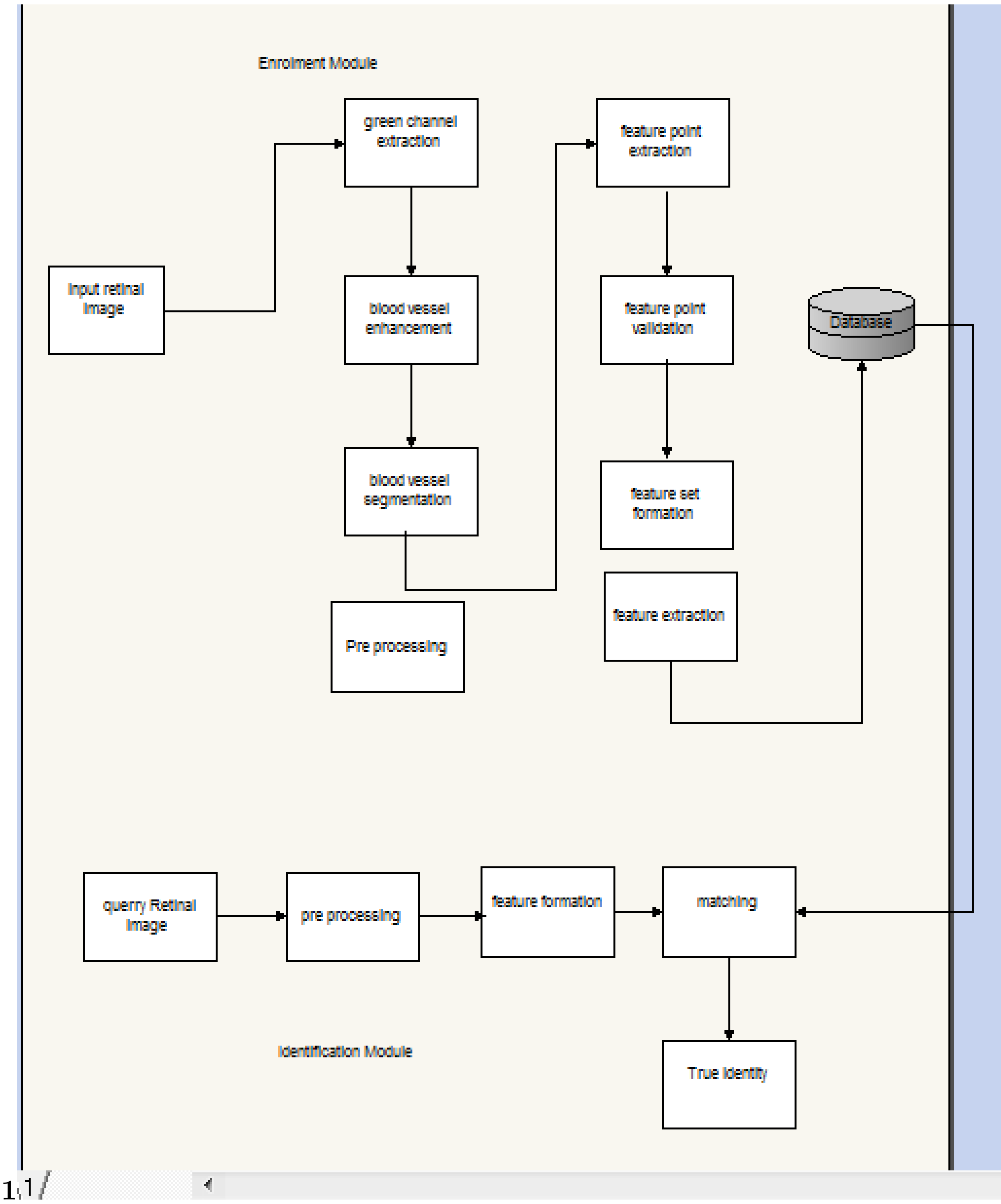

Figure 1: Figure 1 :

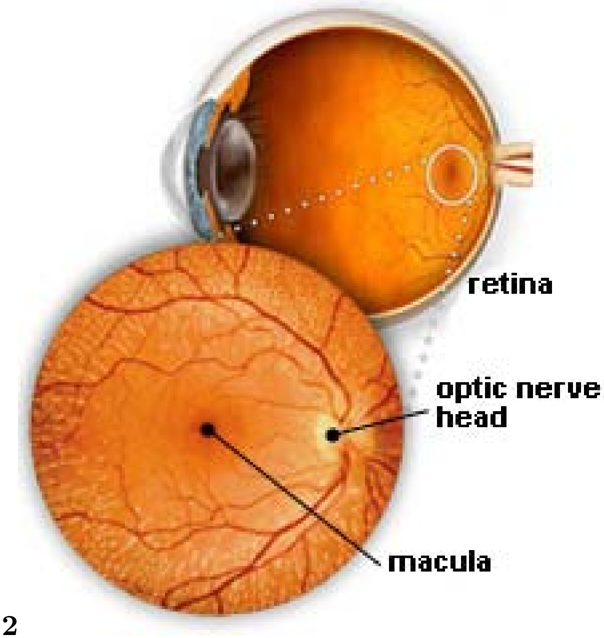

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Figure 2: Figure 2 :

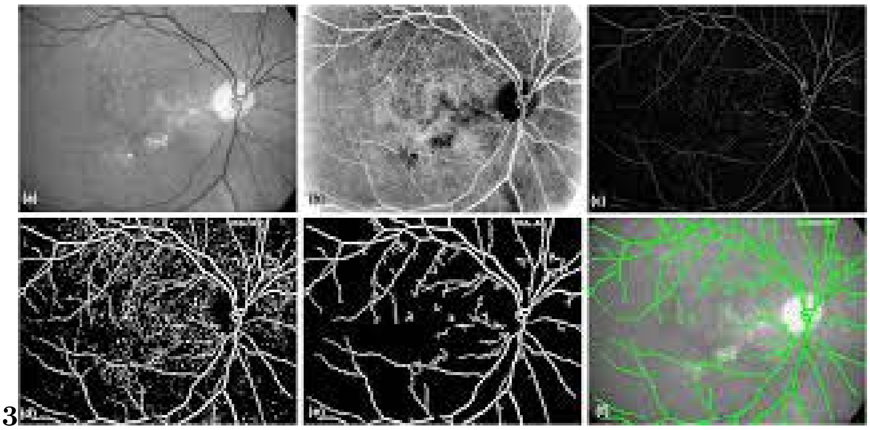

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Figure 3: Figure 3 :

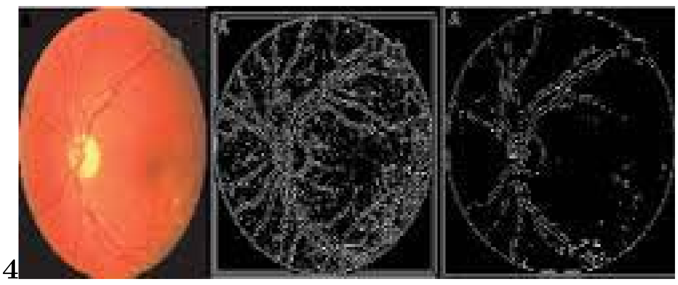

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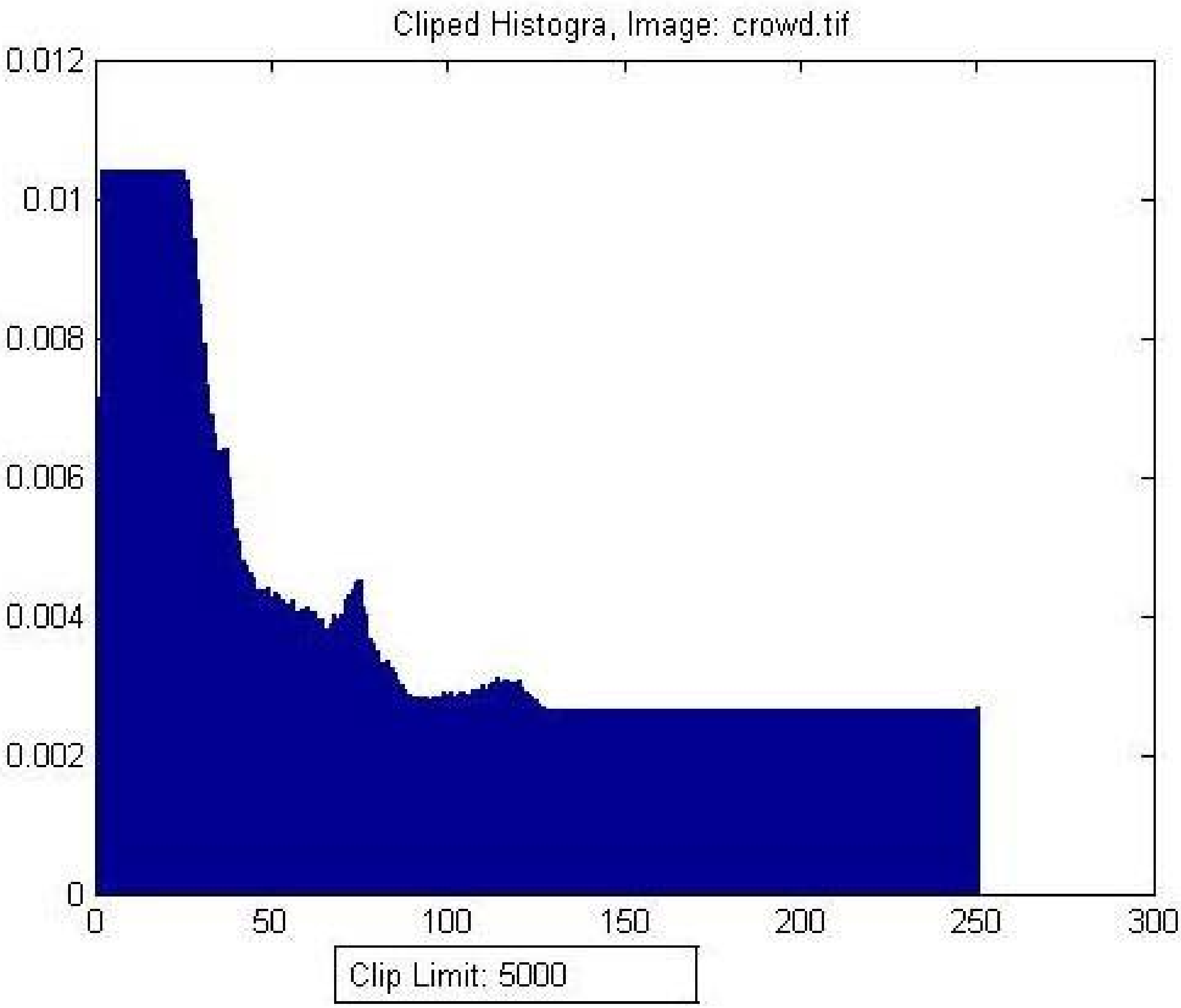
Figure 4: AFigure 4 :



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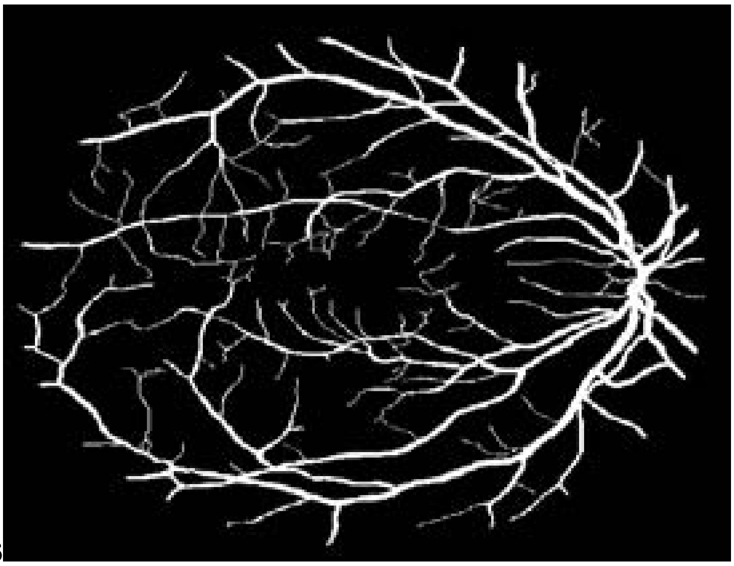

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Figure 6: Figure 6 :

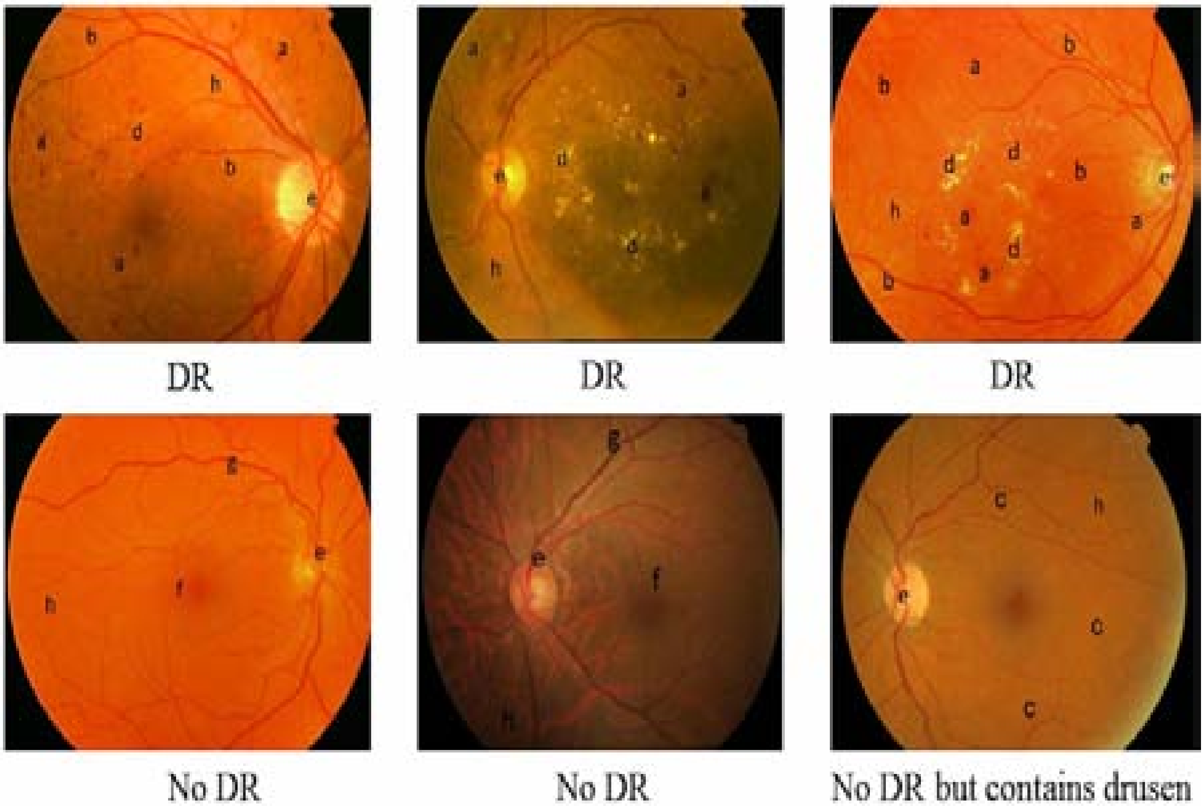

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Figure 7: Figure 7 :

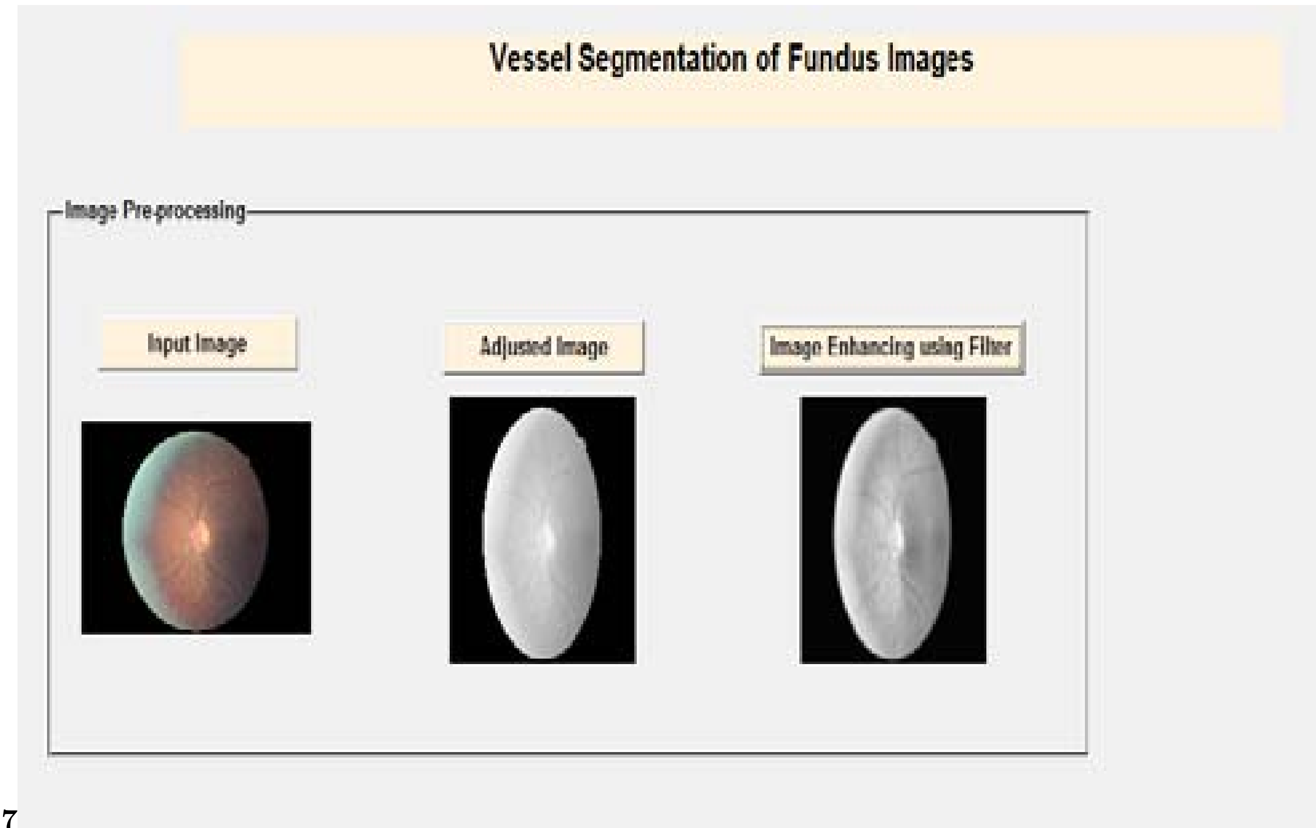

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Figure 8: Figure 7 :

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