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Identifying new Vessels on Optic Disc using Funds Photograph

M. Rajesh Khanna[1], **D. Anandhan**[2], **S. Venkatesan**[3] **and K. Nishitha**[4]

ABSTRACT

The consequence of diabetes on the eyeball is called Diabetic Retinopathy (DR). It is notorious to damage the small blood vessel of the retinaldehyde an this valor laed to defeat of vision. We describe a method for automatically detecting new-fangled vessels on the optic nerve using retinal (fundus) photography. Normal and abnoraml segments are first detected using a method based on Gaussian filter, Canny edge analysis and watershed transform. Parameters, associated with segment length, gradient, gradient varition, direction, grey level and vessel density are calculated for each image segment. Pedestal on these features, each segment is classified and trained as normal or abnormal using a Artifical Neural Netwrok (ANN) classifier, The system is trained and tested by using 108 images with abnoraml and 98 normal images from fundus photography of one eye hospital. The discrimination act of the features was hardened against a clincal reference customary.

Key words: Artificial Nueral Network, Diabetic Retinopathy, Fundus camera, Optical disc

Journal of Economic Literature (JEL) Classification Number: C45

1. INTRODUCTION

In topical times, Sweden and supplementary parts of the world have been countenance with an augment in age and civilization related diseases be fond of diabetes. According to latest examination, 4% of the country population has been spotted of diabetes infirmity alone and it have been make out and acknowledged as one of the foremost cause of blindness in the nation if not correctly treated and deled with. Premature detection and diagnosis have been notorious as one of the way to accomplish a lessening in the cut of visual impairment caused by diabetes with more prominence on routine medical test out with the use of unique facilities for detection and monitored of the whispered disease. The outcome of this on the medical personnel need not be over stress, it has lead to increase work load on the personnel and the facilities, augment in diabetes showing activities just to mention a few. A lot of approaches have been suggested and identified as means of dipping the stress caused by this unvarying check up and screening related activities related among which the use of medical digital picture signal is dispensation for diagnosis of diabetes related illness like diabetic retinopathy using imagery of retina. The effect of diabetes on the eye is called Diabetic Retinopathy (DR). It is known to damage the minute blood vessel of the retina and this strength lead to loss of vision. In the BDR phase, the arteries in the retina become damaged and leak, structured small, dot like hemorrhages. These revealed vessels often lead to engorgement or long term edema in the retina and decreased vision.

In the PDR point, movement problems cause vicinities of the retina to happen to oxygen deprived or ischemic. New-fangled fragile, vessels develop as the circulatory scheme attempts to maintain adequate oxygen levels with the retina. This phenomenon is called neo vascularisation. Blood may leak into the retinaldehyde and vitreous, causing spots or floaters, along with shrink vision. In the SDR part of the ailment, here is continued anomalous vessel growth and scar tissue, which may cause solemn problems

[1,2,3,4] Vel Tech Multi Tech Dr. RANGARAJAN Dr. SAKUNTHALA Engineering College, Chennai, Tamil Nadu, *Emails: seenum84@gmail.com, anandhan@veltechmultitech.org, svsan81@gmail.com, nishitha@veltechmultitech.org*

Figure 1: Left showing the normal fundus image. And in right showing the eye affected with proliferative retinopathy

such as retinal detachment and glaucoma and plodding loss of vision. This project is one of the methods of applying digital image dealing out to the field of medical diagnosis in regulate to lessen the moment and anxiety undergone by the ophthalmologist and other associates of the group in the screening, diagnosis and treatment of diabetic retinopathy.

The obtainable system of working out the datasets was using support vector machines, for edge detection it uses various detection mechanisms such as Robert's edge detector, Prewitt edge detector and sobel edge detector. And finally making all those segmentation and for applying rank list, it uses to ranking mechanism namely ansari-bradely rank test and wilcoxon rank test. These two rank tests have been used to overcome the pitfalls of each other. The inefficiency that is caused by one will overcome by other. In existing methodology there is no complete automatic detection.

2. GENERATION OF THE DATA

The proposed system of training the datasets is artificial neural network, for edge detection canny edge detector is used. In proposed methodology there is a complete automatic detection. Pixel prediction and large datasets training is made easy and efficient by using the ANN. Finally a special kind of ranking mechanism will be applied to make disease classification.

2.1. Overall Architecture

Artificial neural network are one of the most efficient methods for pattern recognition. They are used as a model for simulation of the working of a brain. They cannot replace a doctor, but ANNs can help him in diagnosis. The system is trained and tested by using 108 images with abnormal and 98 normal images from fundus photography of one eye hospital.

3. MODULE DESIGN

3.1. Image acquisition

Image where collected from three sources a government eye hospital eye, covering a population of approximately 100 people with diabetes. A total of 130 images of size 1500*1152 were included in the data set 98 with confirmed normal and a further 32 images abnormal. We use NIKON 2XTELEPLUS PRO 300 camera to capture retina images. The machine used is IRC RETINAL CAMERA50DX and the manufacturer name is TOP CON.

3.2. Preprocessing

In detecting abnormalities associated with fundus image, the images have to be preprocessed in order to correct the problems of uneven of illumination problem, nonsufficient contrast between exudates and image background pixels and present of noise in the input fundus image. Aside from other problems, this section is also responsible for color space conversion and image size standardization for the system. This section,

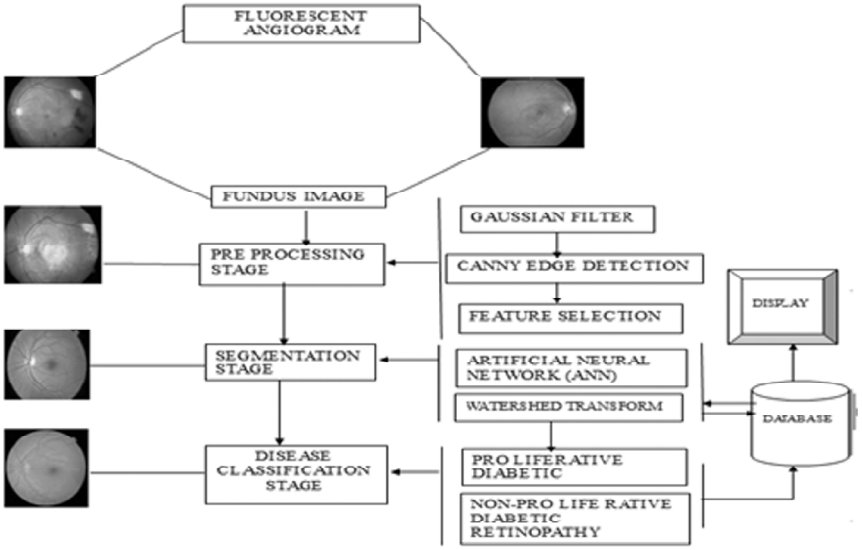

Figure 2: Overall Architecture

which is preprocessing stage, can be regarded as the rock for this process. Preprocessing includes applying grey scale; normalization and Gaussian filter to get a noise free image. In electronics and signal processing, a Gaussian filter is a filter whose impulse response is a Gaussian function. Gaussian filters are designed to give no overshoot to a step function input while minimizing the rise and fall time. This behavior is closely connected to the ace that the Gaussian filter has the minimum possible group delay.

In Image processing, the impulse response, or impulse response function (IRF), of a dynamic system is its output when presented with a brief input signal, called an impulse. More generally, an impulse response refers to the reaction of any dynamic system in response to some external change. In both cases, the impulse response describes the reaction of the system as a function of time.

3.3. Detection of new vessels

After preprocessing the detection of vessels is an important step for training and disease classification. Detection of edge's needs the step such as canny edge detector, watershed transform, by using this canny edge detection method we can able to make clear edges of the vessels and in order to make it more efficient we use watershed transform which apply dam construction to give accurate edges.

3.4. Training and disease classification

The 15 parameters will be trained using artificial neural network, forever single parameter neurons will be created and trained features will be stored in data base for further process. Depending upon the percentage of difference the disease classification will be made and results will be displayed.

4. RESULTS

Artificial Neural Network Training and Classification

STEP 1: for each layer (except input layer)
For each neuron layer;
For each weight of neuron
Set random weight.

STEP 2: while total network error is greater than threshold
For each parameter (15 parameter) in training set

Read each parameter's threshold
Calc values to the range between normal image and abnormal images

STEP 3: for each layer (except input layer)
For each neuron in layer
Sum all rations of weights and last layer outputs
Compute output of this layer

STEP 4: for each layer (except input layer)
For each neuron in layer
For each weight of neuron
Compute new eight values;

STEP 5: for each parameter
For each neuron in output layer
Sum output errors
Compute total networks results;

STEP 6: for each neuron in layer
Sum all rations of weights and last layer outputs
Compute outputs of this layer;
Sort and show the results;

4.1. Original Image

The first step will be injecting the patient with fluorescent injection and this process is called fluorescent angiogram. By doing this we can get clear fundus photography.

The second step will be preprocessing the collected images. Preprocessing includes applying grey scale; normalization and Gaussian filter to get a noise free image.

After getting a noise free image, the edges of the vessels has to be detected to make segmentation. Applying canny edge detector to find the maximum edges of the vessels and apply watershed transform to fill the edges with rigid dam construction along the edges.

The preprocessed image will be moved on for segmentation, training and disease classification.

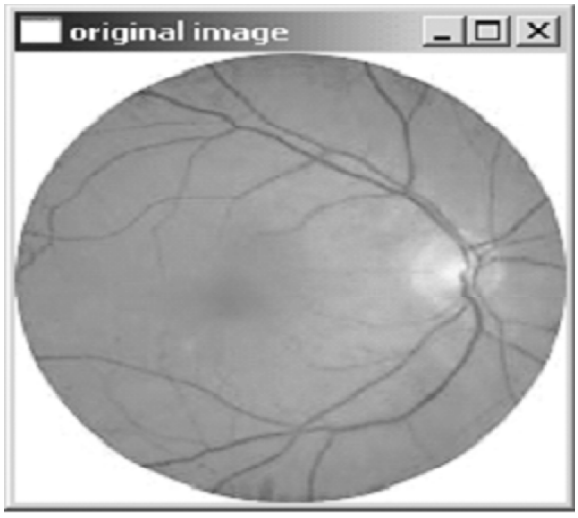

Figure 3: Original Image

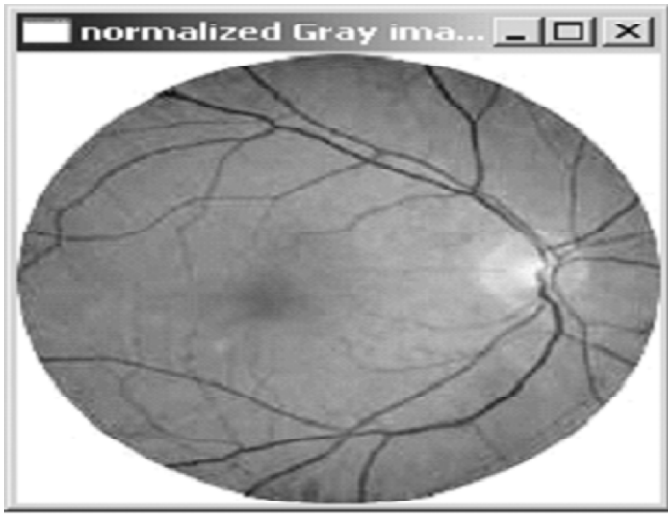

Figure 4: Normalized and Gray image

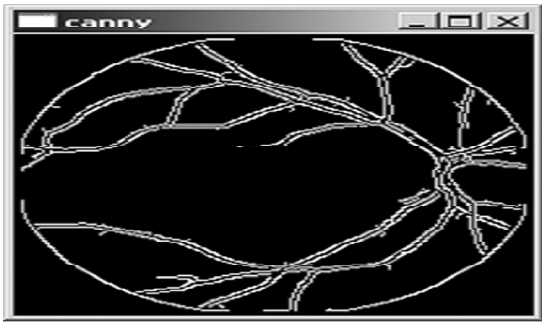

Figure 5: Canny edge detection

Figure 6: Watershed algorithm

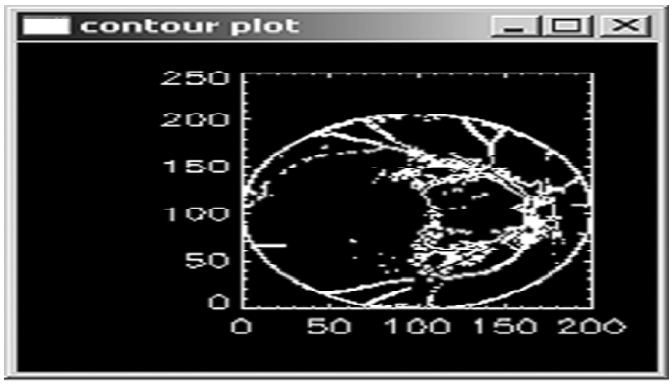

Figure 7: Contour plot

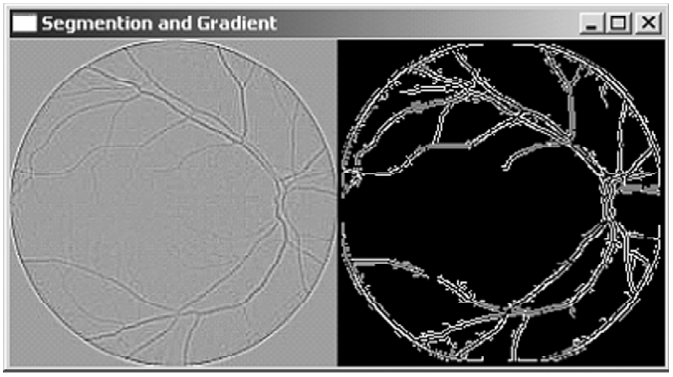

Figure 8: Segmentation and Gradient image

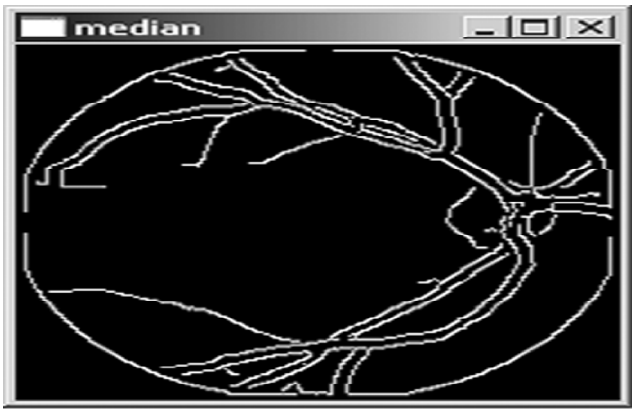

Figure 9: Median Image

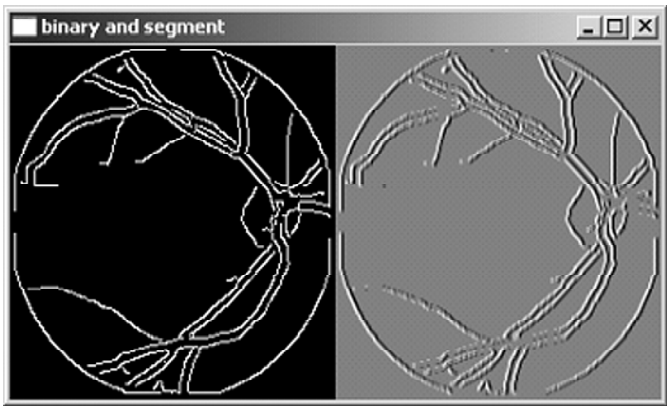

Figure 10 : Binary and segment Image

4.2. The features of the eye vessels are calculated

For training purpose we use artificial neural network. The images will be trained based upon 15 parameters and these parameters will be stored in a database for disease classification.

5. CONCLUSION

The clinical characterization of new vessels at the disc embraces new-fangled vessels outside the disc but within one optic disc but within solitary optic disc span of the disc as well as the new vessels on the disc itself. The methods described here notice the new vessels on the disc itself. The new vessels outer surfaces of the disc are more akin to new vessels elsewhere taking place the retina than the new-fangled vessels on the disc itself, and would be detected by a poles apart detector. There are a numeral of areas which worth further exploration. For example, for the new-fangled vessels on the optic disc to be spotted it is necessary first to correctly locate the disc itself. The technique used here is report to detect the disc successfully in

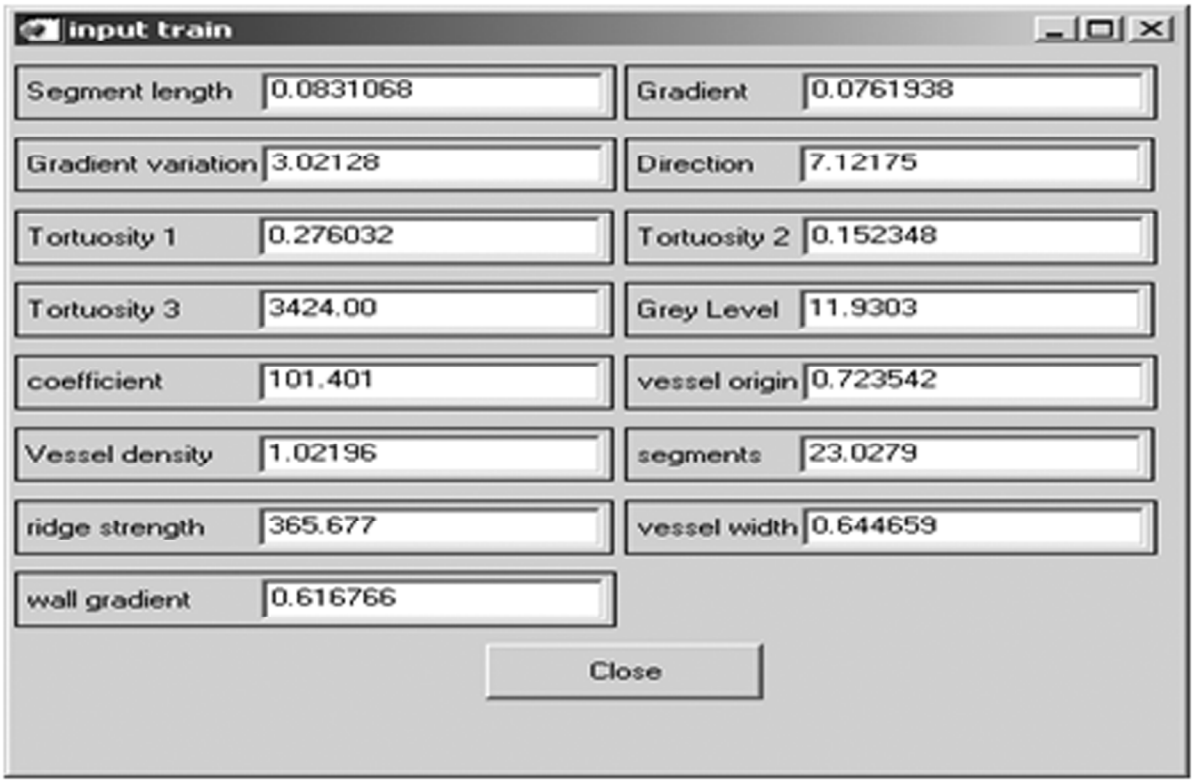

Figure 11: Trained Inputs

98.4% of cases. Other methods have reported likewise high detection rates however; it would be helpful if the detector calculated a confidence calculate that allowed more doubtful disc location to be passed to be tested for plenty image clarity. This suggests that improvements to the candidate selection have the potential are to increase overall performance. Although the features and classifier described are fast and have good accuracy, the potential advantages of other features or classifiers could also be investigated. This paper has demonstrated an automated system which is able distinguish normal and vasculature on the optic disc.

Future Enhancement

The next attainment of this scrutinize work comprise the detection of red and bleeding in this effort, though more still need to be done in order to lessen the fault due to over augmentation of blare and misdetection in this work. This is a very fine result in the verdict process and it proves how far the use of image dispensation can replace the tiresome and laborious work at our variety of hospitals. Further diseases are also to be incorporated into this examine work in regulate to complete the whole DR diagnosis. Only focal point on red spot and bleeding, diseases like new vein growth, micro aneurysm and intraregional micro aneurysm will still need to be diagnosed as part of future work.

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