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Detection of Optic Disk in Fundus Image using Supervised Learning: Survey

S. Leema Jeya Rosy[1]
PG Scholar, Department of ECE, PSNA CET,
Dindigul, Tamil Nadu, India[1]

Dr. P. N. Sundararajan[2]
Assoc. Professor, Department of ECE, PSNA CET,
Dindigul, Tamil Nadu, India[2]

Abstract **- Glaucoma is a sight threatening retinal disease that needs attention at its early stage, though it does not reveal any symptoms. Glaucoma is identified usually through cup to disc ratio based on Image processing techniques. This work involves segmentation of OD region, segmentation of optic disc through proposed maximum voting of three segmentation algorithms (morphological based structure learning), segmentation of optic disc through intensity thresholding, feature extraction from these segmented structures, feature selection to identify significant features, and then the classification done using the decision trees to detect whether the input image is affected by Glaucoma or not.**

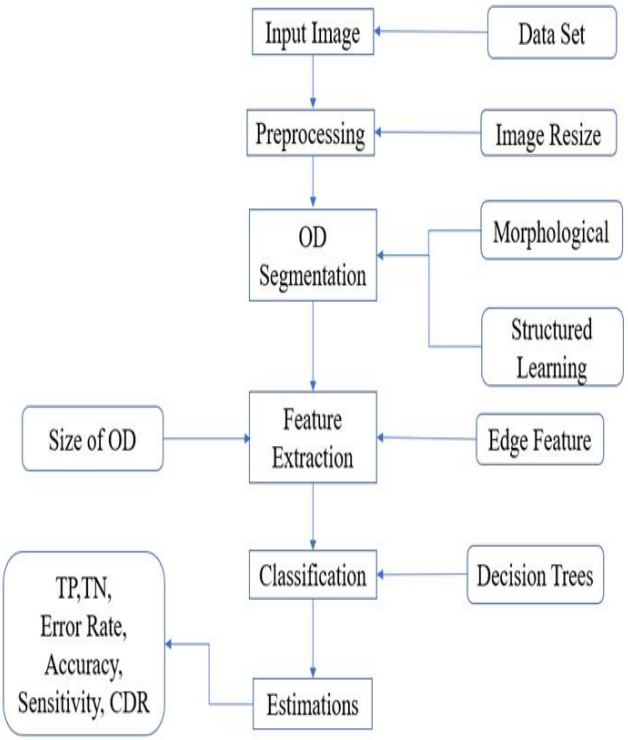
Keywords: Glaucoma, Optic Disc, Thresholding, Feature extraction, Decision trees.

I.INTRODUCTION

The basic idea behind this paper is to focus on segmentation of Optic disc region from the input image and also to improve its accuracy. Most of the applications of the vessel detection process is based on the invasive methods, so this process is implemented as non-invasive method to reduce the time consumption. The predominant algorithms used in unsupervised methods are vessel tracking, matched filtering, morphological transformations and model-based calculations. For the vessel enhancement in model-based methods the gaussian intensity profile of retinal blood vessels are drawn-out with the help of 2D structuring element. For achieving these steps gaussian filter and its derivatives were used. In order to extricate the boundary of vessel the structuring element is rotated 8-12 times to fit the vessel in different configurations. The main disadvantages of the existing systems are it consumes more time on segmentation. The reliability is not achievable and also the accuracy is also not consistent. This method has high time complexity since a stopping criterion is evaluated for each end pixel. It also suffers from over detection of blood vessel pixels due to the introduction of large number of false edges.

In this survey a various optic disc detection and vessel enhancement techniques were discussed. This proposed method uses an algorithm for OD detection based on structured learning. Here a classifier model is trained based on structured learning. Then this model is used to achieve the edge map of OD. This is followed by performing the thresholding operation on the edge map, the RGB image of OD is converted as binary image. Finally, the boundary approximation of OD by a circle is carried out by using circle Hough transform. The proposed algorithm has evaluated on public datasets and obtained promising results.

II. BLOCK DIAGRAM:



III. RELATED WORK

In [1] Helena M.Pakter, Sandra C. Fuchs, Marcelo K. Maestri, Leila B. Moreira, Luciana M. Dei Ricardi, Vitor F. Pamplona, Manuel M. oliveira, and Flavio D. Fuchs (2011) proposed a method in which the retinal vessel diameters have been measured by using computer assisted methods but it isn't clear which segment of the vessel they are estimating. This examination was led to think about estimations of diameter on retinal vessels by utilizing image processing programs on fundus photos and fluorescein angiographs.

In [2] R. Priya and P. Aruna (2013) proposed to diagnose diabetic retinopathy, three models like Probabilistic Neural network (PNN), Bayesian Classification and Support vector machine (SVM) are described and their performances are compared. Here the amount of the disease spread in the retina can be identified by extracting the features of the retina. Blood vessel segmentation from the image is also done by using Fuzzy C-means clustering.

In [3] Muhammad Moazam Fraz, Paolo Remagnino, Andreas Hoppe, Bunyarit Uyyanonvara, Alicja R. Rudnicka,

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Christopher G. Owen, and Sarah A. Barman (2012) proposed another managed strategy for segmentation of blood vessel in retinal photos. This strategy uses decision trees as algorithm and utilizes a characteristic vector based on the analysis of gradient vector field, morphological transformation, line strength measures, and Gabor filter responses.

In [4] S. Muthu Lakshmi (2012) proposed presents a supervised method for blood vessel detection in digital retinal image. The use of digital images for eye disease diagnosis could be used for early detection of Diabetic Retinopathy (DR). In this method preprocessing requires, vessel central light reflex removal, homogenize the background for extracting the pixel features.

In [5] P. C. Siddalingaswamy, K. Gopalakrishna Prabhu (2010) This proposed retinal vessel detection method is comprised of two steps that is the retinal vessel enhancement followed by entropic thresholding. In this a hybrid method for efficient segmentation of multiple oriented blood vessels in color retinal images. Initially, the appearance of the blood vessels is enhanced and back-ground noise is suppressed with the set of real components of a complex Gabor filter.

In [6] Sandra Morales, Valery Naranjo, Jesús Angulo, and Mariano Alcañiz (2013) proposed to automatically segment the optic disc from a fundus image. The extraction of the optic disc contour is mainly based on mathematical morphology along with principal component analysis (PCA). It makes use of different operations such as generalized distance function (GDF), a variant of the watershed transformation, the stochastic watershed, and geodesic transformations.

In [7] Arturo Aquino, Manuel Emilio Gegúndez-Arias, and Diego Marín (2010) proposed another template- based approach for sectioning the OD from computerized retinal pictures. This philosophy utilizes morphological and edge identification strategies pursued by the Circle Hough Transform to get a round OD limit estimate. Steps performed are as per the following, Optic Disk Location, Optic Disk Boundary Segmentation, Elimination of Blood Vessels, Obtaining Od Boundary Candidates, Final OD Boundary Segmentation.

In [8] Marc Lalonde, Mario Beaulieu, and Langis Gagnon (2001) proposed a method for locating the optic disk of fundus image in low resolution. The design includes Hausdorff-based template matching and pyramidal decomposition for object tracking. The process goes as the following. 1) Aggregate pyramidal candidate regions. 2) For each aggregated region: a) perform edge detection and do thresholding; b) perform Hausdorff-based matching; c) eliminate redundant solutions.

In [9] Huiqi Li and Opas Chutatape (2004) proposed New methods in order to extract the main features in colour retinal images.

Location of Optic Disk is done using the Principal component analysis and the shape is detected by a modified active shape model also for a better feature description in the retinal images, fundus coordinate system is established. A combined edge detection and region growing is also used.

In [10] James Lowell, Andrew Hunter, David Steel, Ansu Basu, Robert Ryder, Eric Fletcher, and Lee Kennedy proposed (2004) an algorithm for the localization and segmentation of the optic nerve head boundary in low-resolution images (about20/pixel). Localization is achieved using specialized template matching, and segmentation by a deformable contour model. It also uses a global elliptical model and a local deformable model with variable edge-strength dependent stiffness.

IV. RESULT AND DISCUSSION

The various optic disk segmentation and blood vessel enhancement algorithms for the retinal and fundus images were studied in this survey. In these papers different methods were used for the detection and segmentation of optic disk using template based and morphological based methods. It might provide false edge detections. Some of the hybrid methods suffer from problems associated with detecting smaller and tortuous vessels that are prone to changes in background intensity.

V. CONCLUSION

From the above discussion, we conclude that optic disc detection technique is more valuable in tradition in digital image processing applications. We presented a survey on detection and segmentation of optic disc along with the vessel enhancement algorithms even though they have some drawbacks.so a new optic disc detection algorithm is proposed in our work.

REFERENCES

[1] Helena M. Pakter, Sandra C. Fuchs, Marcelo K. Maestri, Leila B. Moreira, Luciana M. Dei Ricardi, Vitor F. Pamplona, Manuel M. oliveira, and Flavio D. Fuchs," Computer-Assisted Methods to Evaluate Retinal Vascular Caliber: What Are They Measuring?", *IOVS*, February 2011, Vol. 52, No. 2

[2] R. Priya and P. Aruna," Diagnosis of Diabetic Retinopathy using Machine Learning Techniques", ICTACT Journal on Soft Computing, July 2013, volume: 03, issue: 04

[3] Muhammad Moazam Fraz, Paolo Remagnino, Andreas Hoppe, Bunyarit Uyyanonvara, Alicja R. Rudnicka, Christopher G. Owen, and Sarah A. Barman," An Ensemble Classification-Based Approach Applied to Retinal Blood Vessel Segmentation", IEEE Transactions on Biomedical Engineering, vol. 59, no. 9, September 2012

[4] S. Muthu Lakshmi," Supervised Blood Vessel Segmentation in Retinal Images Using Feature Based Classification", International Journal of Advanced and Innovative Research ISSN: 2278-7844 Volume 1, Issue 1, June 2012

[5] P. C. Siddalingaswamy, K. Gopalakrishna Prabhu," Automatic detection of multiple oriented blood vessels in retinal images", J. Biomedical Science and Engineering, 2010, 3, 101-107

[6] Sandra Morales, Valery Naranjo, Jesús Angulo, and Mariano Alcañiz," Automatic Detection of Optic Disc Based on PCA and Mathematical Morphology", IEEE Transactions on Medical Imaging, vol.32, no.4, April2013

[7] Arturo Aquino, Manuel Emilio Gegúndez-Arias, and Diego Marín," Detecting the Optic Disc Boundary in Digital Fundus Images Using Morphological, Edge Detection, and Feature Extraction Techniques", IEEE Transactions on Medical Imaging, vol. 29, no. 11, November 2010

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Vol. 8 Issue 09, September-2019

[8] Marc Lalonde, Mario Beaulieu, and Langis Gagnon," Fast and Robust Optic Disc Detection Using Pyramidal Decomposition and Hausdorff-Based Template Matching", IEEE Transactions on Medical Imaging, vol. 20, no. 11, November 2001

[9] Huiqi Li*, Member, IEEE, and Opas Chutatape, Senior Member, IEEE," Automated Feature Extraction in Color Retinal Images by a Model Based Approach", IEEE Transactions on Biomedical Engineering, vol. 51, no. 2, February 2004

[10] James Lowell, Andrew Hunter*, David Steel, Ansu Basu, Robert Ryder, Eric Fletcher, and Lee Kennedy," Optic Nerve Head Segmentation", IEEE Transactions on Medical imaging, vol. 23, no. 2, February 2004