International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 3 Issue: 3 1646 - 1648

Vessels Classification in Retinal Images by Graph-Based Approach

M. Divya
Department of Computer Science
Government Arts College (Autonomous)
Salem-636007, India

Dr C. Senthamarai, Assistant aprofessor
Department of Computer Science
Government Arts College (Autonomous)
Salem-636007, India

Abstract— The classification of retinal vessels into artery/vein (A/V) is an important phase for automating the detection of vascular changes. This paper presents an automatic approach for A/V classification based on the analysis of a graph extracted from the retinal vasculature. Classifier classifies the entire vascular tree deciding on the type of each intersection point (graph nodes) and assigning one of two labels to each vessel segment (graph links). Final classification of a vessel segment as A/V is performed through the combination of the graph-based labeling results with a set of intensity features. Our method out performs recent approaches for A/V classification. Normal retinal images vessels are segmented using the morphological operations and then using graph trace algorithm for identification the center line of the vessels and trace the pixel values as a feature and use the KNN classifier to classify the feature and assign which is the artery and which is the vein in retinal image. From features we extract the thickness of the vessels to identify the disease details.

Keywords-*Artery; Vein; Classification; KNN; Graph based method.*

*****

I. INTRODUCTION

Automated detection of retinopathy in eye images using digital image analysis methods has huge potential benefits, allowing the examination of a large number of images in less time, with lower cost and reduced subjectivity than current observer-based techniques. Another advantage is the possibility to perform automated screening for pathological conditions, such as diabetic retinopathy, in order to reduce the workload required of trained manual graders [1]. Several abnormalities such as diabetes, hypertension, and vascular disorders affect Retinal vessels. In diabetic retinopathy, the blood vessels often show abnormalities at early stages as well as vessel diameter alterations.

II. REVIEW OF PREVIOUS WORKS

Classification of Eye Movements Using Electrooculography and Neural Networks was proposed by Hema et al [2] where they proposed algorithms for classifying eleven eye movements acquired through electrooculography using dynamic neural networks. Signal processing techniques and time delay neural network were used to process the raw signals to identify the eye movements. Feature extraction algorithms were proposed using the Parseval and Plancherel theorems. The performances of the classifiers were compared with a feed forward network, which encouraged with an average classification accuracy of 91.40% and 90.89% for time delay neural network using the Parseval and Plancherel features.

Classification of Pathology in Diabetic Eye Disease was proposed by Jelinek et al [3] where they presented the utility of pattern analysis tools linked with a simple linear discriminate analysis that not only identifies new vessel growth in the retinal fundus but also localizes the area of pathology. Ten fluoresce in images were analyzed using seven feature descriptors including area, perimeter, circularity, curvature, entropy, wavelet second moment and the correlation dimension. Features like area or perimeter measures of neovascularisation associated with proliferative retinopathy were not sensitive enough to detect early proliferative retinopathy. The wavelet second moment provided the best discrimination with a SNR of 1.17. Combining second moment, curvature and global correlation dimension provided a 100% discrimination (SNR = Inf).

Effects of Preprocessing Eye Fundus Images on Appearance Based Glaucoma Classifcation was proposed by Meier et al [4] where they presented a novel automated classification system based on image features from fundus photographs which does not depend on structure segmentation or prior expert knowledge.

III. METHODOLOGY

The following Fig. 1 represents the Diagrammatic representation of Artery/Vein Classification. In this paper we use a graph-based method for automatic A/V classification. The graph extracted from the segmented retinal vasculature is analyzed based on the type of intersection points (graph nodes), and vessel segment (graph links). Finally, intensity features of the vessel segments are measured for assigning the final artery/vein class. The proposed method classifies the entire vascular tree deciding on the type of each intersection point (graph nodes) and assigning one of two labels to each vessel segment (graph links). Automatic method of entropy of vascular directions uses Optic disc center (ODC) to locates link labeling. For evaluating the proposed method, which is the combination of graph-based classification with LDA, we have calculated the accuracy both for centerline pixel classification and for vessel pixel classification. Accuracy values for centerline and vessel pixels and accuracy value of 98.0% was obtained, thus demonstrating that the proposed methodology for A/V classification is reliable for use in an automated procedure for AVR calculation.

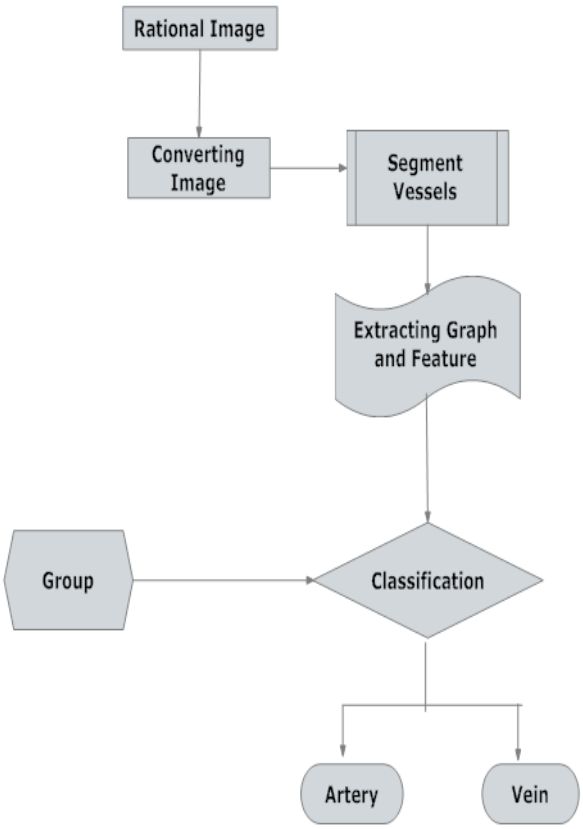

Fig 1. Diagrammatic representation of Artery/Vein Classification.

The k-Nearest-Neighbors (KNN) is a classical classification technique and non-parametric classification method, which is simple but effective [5]. Majority voting among the data records in the neighborhood is usually used to decide the classification fort with or without consideration of distance-based weighting. However, to apply KNN we need to choose an appropriable value fork, and the success of classification is very much dependent on this value. In a sense, the KNN method is biased by k. There are many ways of choosing the k value, but a simple one is to run the algorithm many times with different k values and choose the one with the best performance.

IV. FUTURE ENCHANCEMENT

The disease like Diabetes and some another disease affect the retinal vessels. In feature we used that artery and vein feature to classify the retinal is normal and abnormal. We use some feature extraction method to train normal and abnormal dates. Use robust classifier to classify that feature to find the retinal is normal or abnormal.

V. CONCLUSION

Arteries and veins classification is used in analyzing various disorders. It is classified by extracting the features from input retinal image and the Rational retinal images are converted to segment the vessels. We performed both the extraction of graph and features of retinal images. Finally the extracted features are passed to KNN classifier to perform artery/vein classification. The graph-based method with LDA out performs the accuracy of the LDA classifier using intensity features, which shows the relevance of using structural information for A/V classification. KNN classifier gives better results in classifying arteries/veins.

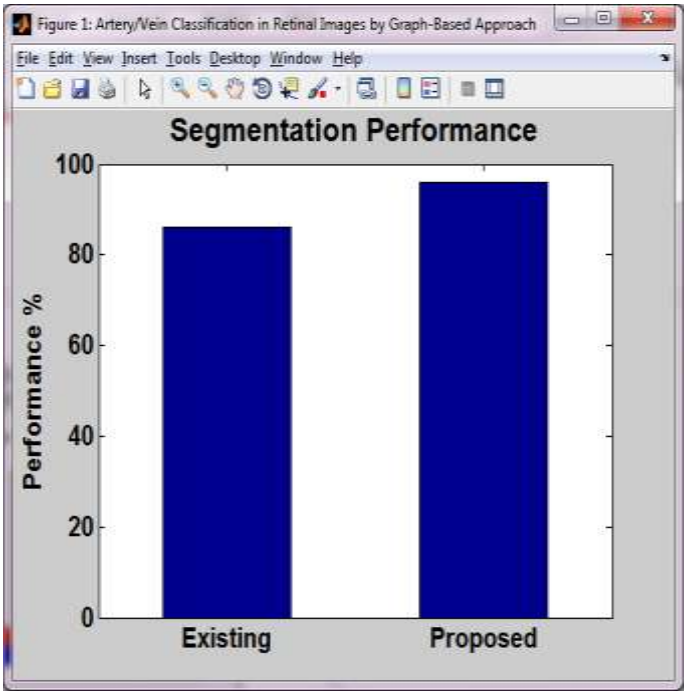

Fig 2. Segmentation Performance

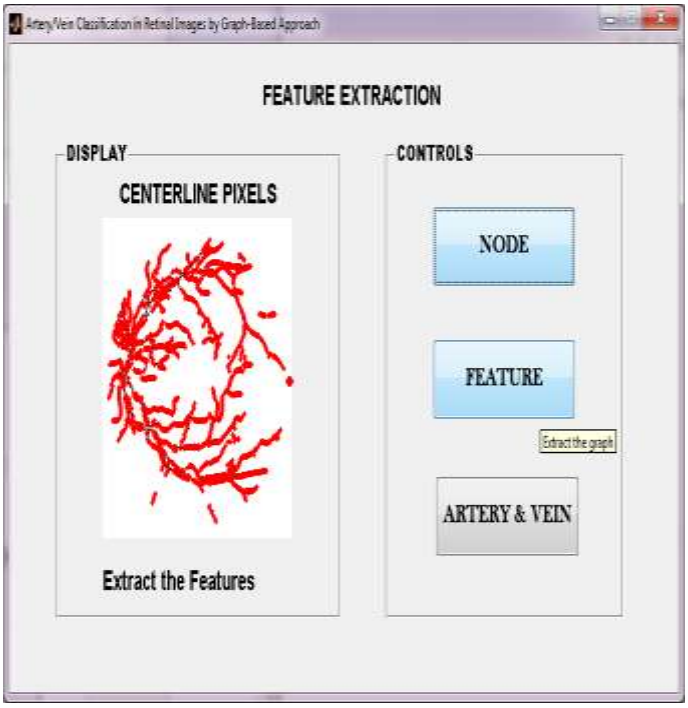

Fig 3. Feature Extraction

 ISSN: 2321-8169
1646 - 1648

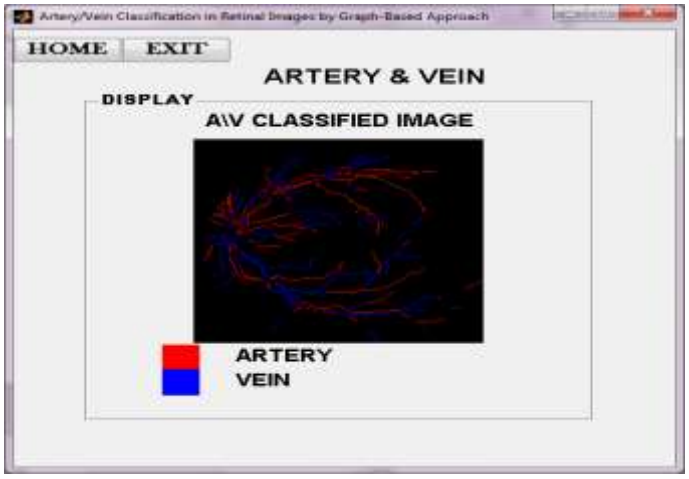

Fig 4: Artery/Vein Classification

REFERENCES

[1] www.mathworks.com.

[2] Hema.C.R, Paulraj.M.P and Ramkumar.S, Classification of Eye Movements Using Electrooculography and Neural Networks, International Journal of Human Computer Interaction (IJHCI) , Volume (5) : Issue (4) : 2014.

[3] H. F. Jelinek, J. Leandro, R. M. Cesar, Jr and M. J. Cree, Classification of Pathology in Diabetic Eye Disease, www.wdic2005.aprs.org.au.

[4] Jorg Meier, Rudiger Bock, Georg Michelson, La szlo G. Nyul, andJoachim Hornegger, Appearance Based Glaucoma Classifcation, www5.informatik.uni-erlangen.de.

[5] www.wikipedia.com.