Artery and Vein Classification in Retinal Images using Graph Based Approach

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Abstract - *Digital image analysis of eye fundus images has fewer benefits than current viewer-based methods. A symptom of various systemic diseases such as high blood pressure, glaucoma, diabetes and heart disease etc. affects the retinal arteries. Diseases such as diabetes indicate dysfunction and a wide range of changes in the retina. In retinal hypertension the blood vessels show dilation and dilation of the large arteries and veins. Arteriolar to Venular Diameter ratio (AVR) reveals high blood pressure levels, diabetic retinopathy and prematurity retinopathy. Among other image processing AVR measurements require vessel fragmentation, accurate vessel measurement and vein or vein segments [1]. The work is done to automatically detect retina vessels and that is why it is a challenging task.*

Key Words: artery and vein classification, graph, retinal images, segmentation.

1. INTRODUCTION

Today graph-based methods of image analysis have been used that are useful for retinal detachment, retinal image registration and retinal detachment [2]. Different vessels are analyzed using a cross-sectional type and assigned to the artery or vein labels on each part of the vessel. The combination of labels and strength characteristics therefore determines the final vein or vein phase. Many methods use strength factors to distinguish between arteries and veins. As a result of the acquisition process, retina images usually do not illuminate in the same way and show different local brightness and contrast, which may affect the performance of A / V-based separation methods based on size. For this reason, the proposed method uses additional structural information extracted from the graph representation of the vascular network. The results of the proposed method will show improvement in overcoming the normal variability in the natural contrast of the retina images.

2. LITERATURE REVIEW

In connection with the said work a thorough literature research is conducted in the manner described below,

1.Martinez- Perez et al. (2002) In a semi-automatic method [4] the geometric and topological features of single vessel components and small trees are calculated. Important points are obtained by the skeletal structure extracted from the result of the separation. For the purpose of labeling the root part of the tree is tracked and the algorithm will search for its different endpoints and determine if the part is an artery or artery.

2. Grisan et al. (2003) In the optic disc zone arteries are rarely cross veins and arteries rarely cross veins [5] and therefore through the vessel structure represented to classify the segments are distributed outside this area where little information is available to differentiate between arteries and and blood vessels. veins. By using imperial splitting that separates the fixed area near the optic disc into quadrants it makes the field phase analysis very robust.

3. S.Vazquez et al. (2009) Numeracy based on the merging algorithm [6] retina images are divided into four quadrants and then the result. Then a tracking system based on the smaller sections of the combined vessels is used to support the separation by voting.

4. C. Kondermann, D. Kondermann et al. (2007) Two-dimensional extraction methods and two differentiation methods [7], based on the supporting vector mechanism and the neural network to differentiate retinal vessels. One of the feature removal methods is based on ROI (Interest Region) near each central location while the other is based on profile. In order to reduce the size of the material element the main component analysis is used.

5.M. Niemeijer, B. van Ginneken et al. (2009) The image and distinct feature is an automatic method of dividing retinal arteries into veins and arteries [8]. A set of middle line features is extracted and a soft label is given to each center line, indicating that it is a pixel vein.

6.R.Estrada, C.Tomasi et al. (2012) introduced a [9] vessel structure to the human retina using the Dijkstra shortcut algorithm. The method does not require manual intervention, maintains the tensile strength and follows the vessel branch naturally and effectively.

7.M. Niemeijer, X. Xu, A. Dumitrescu, P. Gupta et al. (2011) In the method of classification [10] is considered step in calculating AVR value. AVR measurement requires vessel separation, accurate measurement of vessel width and artery velocity which is why a small error can have a significant impact on the final value.

3. PROPOSED ACTIVITY

The proposed approach to this project follows a graph-based approach, in which the features of a ship tree in the region adjacent to the optic disc are focused. In this region the arteries and veins do not often cross which helps to define the different types of crossings: bifurcation, crossing, junction and junction. The geometric representation of the graph representation of the vascular structure determines the type of junction point.

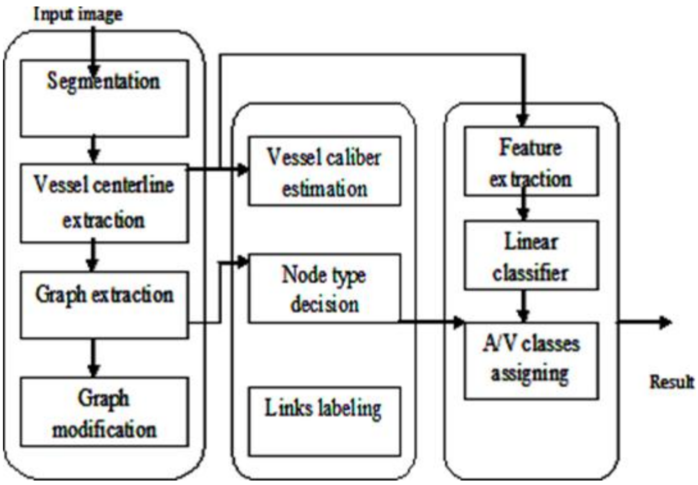


Fig. 1: Proposed block diagram of A/V Classification

Figure 1 shows a block diagram of the proposed vein or vein separation method. The route has the following stages. 1) Graphic production 2) Graph analysis3) Shipping.

The method starts by removing the graph from the ship structure and then deciding on the type of intersection point i.e. graph node. Based on the type of node in the categories of each small graphical vessel they are identified and labeled using two different labels such as artery or vein. The details of each section are as follows.

1) Graphic Design:

The following three-step graph is used.

i) Sorting of the vessel: This method follows a method based on pixel processing similar to the previous processing, in which tensing is usually done by removing the background image of the image, obtained by filtering with a large arithmetic mean. In the next phase, centreline candidates are obtained using information provided from a set of four guiding Offset Gaussian Filters, and then linked to the components by a regional growth process, and finally these components are validated based on their size and length characteristics. The third phase is ship classification, which is followed by the development of a multi-scale vessel and reconstruction methods to produce binary maps of vessels with four scales.

ii) Medium vessel extraction: A recurring vessel reduction algorithm is used to obtain an intermediate image image which is then used in the result of the ship division. This phase removes boundary pixels until the object is reduced to a slightly connected stroke. This is shown in fig.2 (c).

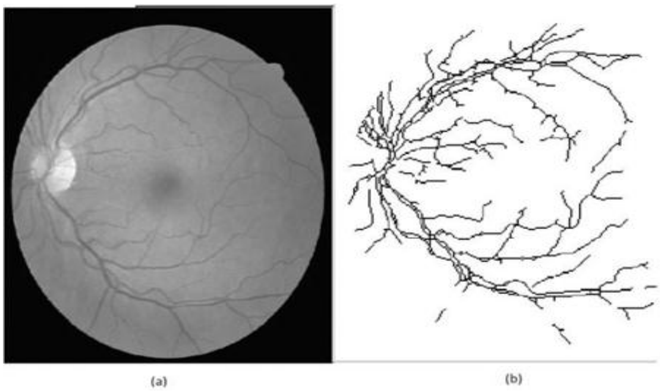


Fig. 2: Graph generation (a)Original image; (b)Vessel segmentation

iii) Graphic Disposal: This step involves the removal of graph nodes in the center image by obtaining meeting places and final points. In order to find links between the nodes, all of the opposite fields are removed from the center image and the image with the segments of the different vessels found in the center image.

iv) Graphical Modification: The structure of the extruded arteries may contain the following image errors.

- Dividing one node into two nodes
- Loss of link on one side of the node
- False link.

In the event of these errors the drawn graph should be corrected.

2) Graph analysis: In the graph analysis phase the type of node is identified. But at this stage we are not sure about each label associated with the artery or vein category. There are four different types of nodes. These are categorized based on the number of links connected in each location, the position of each link, the angles between the links, the level of the vessel in each link and the level of the nearest node. These are as follows.

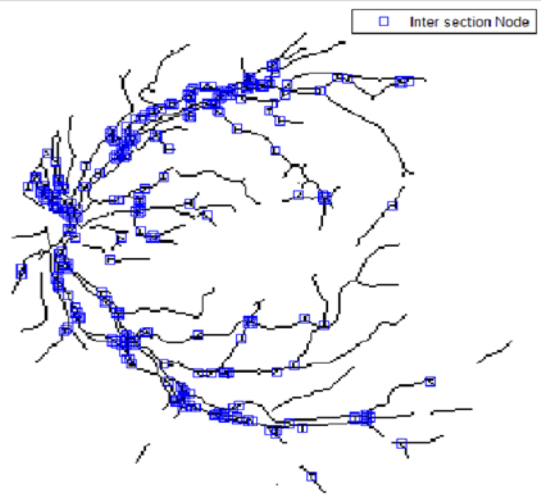
1.The connection point: This is the point at which the boats never cross; however these continuous nodes connect different parts of the same vessel.

2. Crossing point: At this point the veins and veins intersect.

3. Bifurcation Point: A bifurcation point is a meeting place where the vessel twice turns into a small part.

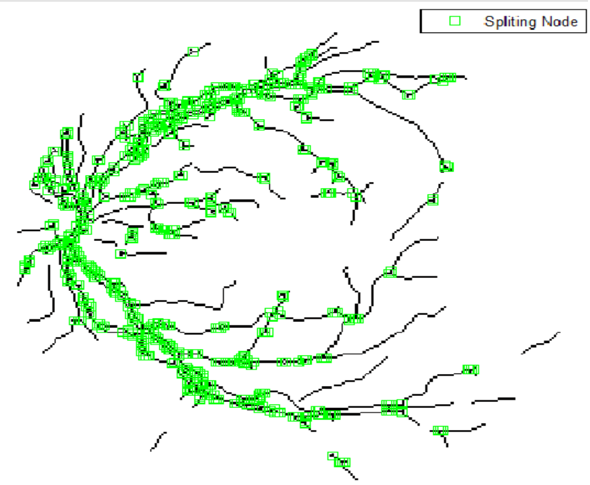
4. Betting point: Two different types are very close and meet without crossing. Here the vessels end up in another vessel. In the proposed system node analysis is divided into different cases. The nodes under analysis are represented by gray dots and some nodes are represented as black dots, with the exception of the final points represented as white dots. Solid lines indicate links to one label and dash lines represent another label.

Intersection Node: At this point the ship will cross at this point giving the name of the road area. It is represented by a blue square box. Shown in fig.3 (a).



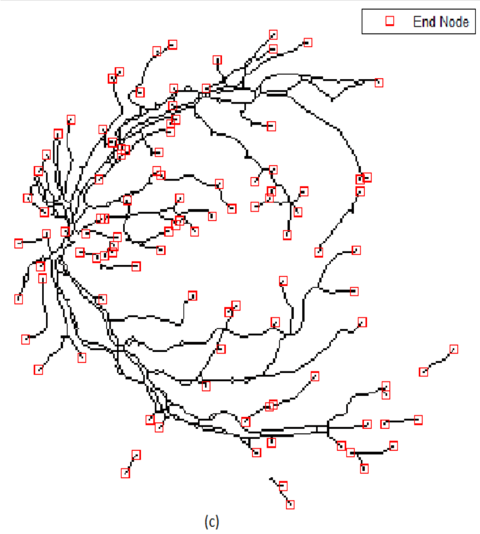
(a)

Spliting Node: At this point the ship separates from the main ship line and ends at the end. It is represented by a green square box. Shown on a fig tree. 3 (b).



(b)

End Node: In this node format it will show the exact end point of the vessel. It is represented by a red square box. Shown on a fig tree. 3 (c)



(c)

Fig. 3.Node Generation, (a) intersection node; (b) splitting node; (c) end node

4. ARTERY/VEIN CLASSIFICATION

Based on the information of the above label phase the final task is to assign the artery phase (A) to one of the labels, and to the vein phase (V) to the other. This can be done by adding structural information to the ship's durability information. Each center line pixel is measured and zeroed to the deviation of the scale and unit with the 30 features given below. A book followed by a period. For example, see the article "C. Category Topics " above.Level 3: Level 3 title should be indented, italicized and numbered in Arabic followed by right Brackets. Level 3 titles should end with a colon.

Table: 1 List of features measured in each Pixel centerline

Sr.	Features
1-3	Red, Green and Blue intensities of the centerline pixels.
4-6	Hue, saturation and intensities of the centerline pixels.
7-9	Mean of Red, Green and Blue intensities in the vessel.
10-12	Mean of Hue, Saturation and Intensity in the vessel
13-15	Standard deviation of Red, Green and Blue intensities in the vessel.
16-18	Standard deviation of Hue, Saturation and Intensity in the vessel
19-22	Maximum and minimum of Red and Green intensities in the vessel
23-30	Intensities of the centerline pixel in a Gaussian blurred (σ = 2,4,8,16) of Red and Green Plane

In the proposed system the features are tested using different line dividers. In selecting features, we use a continuous floating selection option, starting with a blank feature set and adding or removing features where this improves the functionality of the separator. The trained category is used to assign A / V classes to individual graph labels.

5. CONCLUSION

After the completion of the work the following objectives have been achieved,

1. Collection of raw image from website.
2. Remove the parts of the ship from the whole picture.
3. Pulling out the graph from the vascular structure.
4. Decide on the type of merger point (Graph node).
5. Identification of ship parts (Graph link) for a specific vessel and label using two different labels.
6. To remove a set of features and use the line separator assigns an Artery or Vein class.

6. REFERENCES

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