FINDING AN OPTIMAL FOREST GRAPH TO IDENTIFY THE CARDIOVASCULAR DISEASES

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***Abstract*:** The relationship between changes in retinal vessel morphology and the onset and progression of diseases such as hypertension, coronary heart disease, and stroke has been the subject of several large scale clinical studies. However, the difficulty of quantifying changes in retinal vessels in a sufficiently fast, accurate and repeatable manner has restricted the application of the insights gleaned from these studies to clinical practice. Accurate measurement of vessel diameters on retinal images plays an important part in diagnosing cardiovascular diseases. In this project, a method of vessel diameter measurement has been developed incorporating with a tracking technique. Vessel edges are then more precisely localized using image profiles computed perpendicularly across a spline fit of each detected vessel centerline, so that both local and global changes in vessel diameter can be readily quantified. The retinal vessel network is used to diagnosis of cardiovascular disease. We use the post processing step to identifying the true vessels from for vascular structure segmentation. So we construct the vessel segment graph and formulate the problem of finding optimal forest in the graph. Proposed work includes cup and OD segmentation for glaucoma assessment.

I INTRODUCTION

Retinal images obtained using Adaptive Optics have the potential to facilitate early detection of retinal pathologies. The retina is the only location where blood vessels can be directly visualized. Increasing technology leading to the development of digital imaging systems over the past two decades has revolutionized fundal imaging. Whilst digital imaging does not still have the resolution of conventional photography, modern digital imaging systems offer very high-resolution images that are sufficient for most clinical scenarios The retina is the only location where blood vessels can be directly visualized non-invasively in vivo.

The retina is a layered tissue lining the interior of the eye that enables the conversion of incoming light into a neural signal that is suitable for further processing in the visual cortex of the brain. A number of systemic diseases also affect the retina. Complications of such systemic diseases include diabetic retinopathy from diabetes, the second most common cause of blindness in the developed world, hypertensive retinopathy from cardiovascular disease, and multiple sclerosis. Thus, on the one hand, the retina is vulnerable to organ-specific and systemic diseases, while on the other hand, imaging the retina allows diseases of the eye proper, as well as complications of diabetes, hypertension and other cardiovascular diseases, to be detected, diagnosed and managed.

II VESSEL IDENTIFICATION

Various methods have been in existence for identifying vessel and tracking. The following describes the existing methods for vessel identification with its limitations. An automatic tracking method - The tracking algorithm starts from a number of seed points selected all over the image. This algorithm detects vessel edge points iteratively based on a statistical sampling model using a Bayesian method. New vessel edge points are detected by using local grey level statistics and expected vessel structures. The limitations of this techniques are the classification result does not strongly support

the use of one measure over the others, the segmentation method can affect the tortuosity of the extracted vessels, the length of the extracted segments can also affect the utility of the tortuosity measure for classification.

Automatic segmentation of the vessel tree from color retinal images - The vessels are modeled as trenches and the medial lines of the trenches are extracted using the curvature information derived from a novel curvature estimate. The Limitations are it is difficult to achieve as the ground truth generation is a tedious process that demands patience the problem of blood vessel detection can be formulated as an image analysis problem of trench detection.

Watersheds, watershed cut - Watersheds cuts are defined following the intuitive idea of drops of water owing on a topographic surface.. The link between minimum spanning forests (MSF) and flooding is used from marker algorithms. More precisely, a new transformation, called border thinning, that lowers the values of edges that match a simple local configuration. The limitations are hierarchical segmentation schemes based on watersheds as well as on watershed in weighted simplified complexes, it has to develop a new minimum spanning tree algorithm based on watersheds.

Points Of Interest And Visual Dictionaries - The technique is based on a unified feature detection and analysis framework that is capable of identifying different DR-related lesions such as hard exudates and micro aneurysms by correlating image specific features with the presence of specific lesions without the necessity of pre- and post processing of images. The Limitations are to construct detectors for two of the most common lesions in DR, the work continues in three different directions, the red lesion detector is still dependent on the number of spot signs in the images, it is possible that even a combination of techniques will not be enough to detect a very small number of microaneurysms

Ridge-based vessel segmentation - This approach is based on the intrinsic property that vessels are elongated structures. It uses image primitives formed from image ridges and are grouped into sets that approximate straight line elements. The Limitations are, it has a problem of finding a subset, the anatomy of the OD region is such that the r-bends are non-uniformly distributed across a cup boundary with more points on the top and bottom.

Quantitative descriptors - This technique proposes a set of automated methods in order to analyze the retinal vessel network and to quantify its morphologic properties with respect to arteries and veins, in two-dimensional color fundus images. The analytical methods include formation of a well connected vessel network, Structural mapping of a vessel network, Artery-venous classification, and Blood vessel hemorrhage detection. The limitation is that it is difficult to find the vessels subset. Web-based implementation – It uses post processing and the first task of it is to improve the performance of the tracking algorithm. After this preliminary step, it analyzes the segmented vessels network in order to detect some points of interests in the image, some of them belonging to the vascular network as bifurcations and crossing points, other inferring from it as the optic disk and the fovea. Limitation is that it poses higher cost on using image tools.

III METHOD

The method for finding all the true vessels included a novel technique that performs the vessel segmentation using the fuzzy segmentation and uses the median filter to remove noise before segmentation.

After segmentation it implements the graph tracer algorithm to identify true vessels by tracking all the crossover points in the vessel and applies CRAE and CRVE measurements to the six large arteries for cardio – vascular disease.

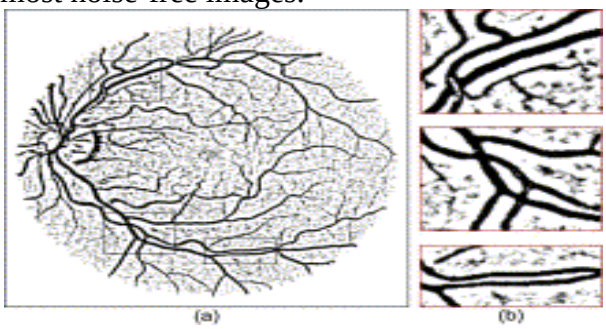
Graph Tracer - In this method vessels are arranged in a binary tree and it identifies all the crossovers and optimal forest is searched from the binary tree

IV MEDIAN FILTER

In image processing, it is often desirable to be able to perform some kind of noise reduction on an image or signal. The median filter is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is a typical pre-processing step to improve the results of later processing The main idea of the median filter is to run through the signal entry by entry, replacing each entry with the median of neighboring entries. The pattern of neighbors is called the "window", which slides, entry by entry, over the entire signal. Median filtering is a nonlinear process useful in reducing impulsive or salt-and-pepper noise. It is also useful in preserving edges in an image while reducing random noise. Impulsive or salt-and pepper noise can occur due to a random bit error in a communication channel. Advantages: Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise.

V FUZZY SEGMENTATION

Image segmentation is an important and challenging problem and a necessary first step in image analysis as well as in high-level image interpretation and understanding such as robot vision, object recognition, and medical imaging. In this paper, a clustering based method for image segmentation will be considered. Clustering is a process for classifying objects or patterns in such a way that samples of the same group are more similar to one another than samples belonging to different groups. Advantage: Fuzzy segmentation algorithm is the most popular method used in image segmentation because it has robust characteristics for ambiguity and can retain much more information than hard segmentation methods and the conventional fuzzy segmentation algorithm works well on most noise-free images.



VI PROPOSED WORK

In addition to finding the cardio – vascular diseases, a special technique is introduced to find the glaucoma diseases that it helps in early detection of the eye related infections. It uses the special cup and OD (Optical Disk) segmentation using the cup boundary algorithm which uses the cup to disk ratio for assessment. Since enlargement of the cup with respect to OD is an important indicator of glaucoma progression, various parameters are estimated and recorded to assess the glaucoma stage.

VII CONCLUSION

Thus it is concluded that comparing the existing methods for vessel identification the vessel identification using the cross over points give accurate results in identifying the diseases. This system implemented successfully with accurate identification of true vessels to obtain correct retinal ophthalmology measurements. And it implements the post processing step to

vessel segmentation. This step is used to track all true vessels and find the optimal forest. We can overcome wrong diagnosis of crossovers by using simultaneous identification of blood vessels from retina. The final goal of the proposed method is to make easier the early detection of diseases related to the blood vessels of retina.

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