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An Efficient Detection of Retinal Images for Interpretable Diabetic Retinopathy using MIL Algorithm

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***Abstract*—A retinal image provides a snapshot of what is happening inside the human body. In particular, the state of the retinal vessels has been an image to reflect the cardiovascular condition of the body. Retinal images provide considerable methods on pathological changes caused by the local ocular disease. In which reveals diabetes, hypertension, arteriosclerosis, cardiovascular disease, and stroke. Computer-aided analysis of retinal images plays a central role in diagnostic procedures. However, automatic retinal segmentation is complicated by the fact that the retinal image is often noisy, poorly contrasted. So in this project, we can implement an automated segmentation approach based on graph theoretical method to provide regional information using measure. We represent the segmented vascular structure as a vessel segment graph and make the problem of identifying vessels. As one of finding the blood vessels in the graph given a set of constraints such as CRAE and CRVE. These measurements are found to have good correlation with hypertension, coronary heart disease, and stroke. However, they require the accurate implement of distinct vessels from a retinal image. We plan a method to solve this optimization problem and evaluate it on a large real-world dataset of retinal images.**

***Index Terms*— Multiple instance learning, diabetic retinopathy detection, Support vector machine, retinal image analysis.**

I. INTRODUCTION

Medical imaging seeks out to disclose internal structures hidden by the skin and bones, as well as to diagnose and treat disease. Medical imaging also establishes a database of normal anatomy and physiology to make it possible to identify the abnormality. Although the image of removed organs and tissues can be steps for medical reasons, such steps are usually considered part of pathology instead of the medical image. It is parts of biological imaging and incorporates radiology which uses the imaging technologies of X-ray radiography, etc.., like positron emission tomography. In the clinical context, "imperceptible light" medical imaging is generally associate to radiology and the medical practitioner responsible for understanding the images is a radiologist. Dermatology and wound care are two methods that use visible light imagery. Diagnostic radiography designates the methods aspects of medical imaging and in particular the acquisition of medical images.

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II. GOALS FOR MIPAV

- To develop computationalmethod and algorithm to analyze and quantify biomedical data
- To collaborate with NIH researchers and colleagues at other research centers in involving information analysis and visualization to the biomedical research problem.
- To develop tools (in both hardware and software) to give our collaborator the ability to analyze biomedical data to support the discovery and advancement of biomedical knowledge.

III. NEED FOR MIPAV

Imaging has become an essential component in any field of biomedical research and clinical practice. Analysis of these diverse several of images requires sophisticated computerized quantification and visualization tools. CIT is made major progress in the development of a platform-independent, n-dimensional.

IV. RETINAL IMAGING

Retinal image processing required in diagnosing and treatment of many diseases affecting the retina and behind it. Diabetic retinopathy is one of the complications of diabetes mellitus retina and choroid. Retinal image is a recent technological advancement in eye care. It enables optometrist to capture a digital image of the retina, blood vessels and optic nerve located at the back of eyes. This aids in the early detection and management of diseases that can affect both eyes and overall health. This includes glaucoma, macular degeneration, diabetes, and hypertension. With retinal imaging technology, the most subtle changes to the structures at the back of eyes can be detected. As the amount of blood supplying the retina decreased, the sight may be degraded and in severe cases, blindness may occur. The method tries to treat this dangerous disorder by applying optical energy to the revascularization. Argon laser is used in photocoagulation goal to cauterize the small vessels. In which increase the amount of blood supplying the retina and thus maintaining the sight. This treatment modality is achieved in many sessions. The physician asks the patient to fixate his/her eye to be able to direct the laser beam to the affected area. The current success rate of this procedure below 50% for the eradication of CNV following one with a recurrence and persistence rate of about 50%. The latter condition requires repeating the treatment. Development of a laser system to treat the whole retina in one session has become a necessity. This system intended to scan the retina and track it applying the laser energy to the whole area except the sensitive objects that may be damaged.

Fig 1. Retinal image

V. RETINAL BASED DISEASE DIAGNOSIS

- Retinal image acquisition
- Preprocessing
- IPACHI model Vessel classification
- Disease diagnosis

A. Retinal image acquisition

Retinal images of humans play an important role in the detection and diagnosis of cardiovascular diseases that including stroke diabetes, arteriosclerosis, cardiovascular diseases, and hypertension, to name only the most obvious. Vascular disease is often life-critical for individuals, and present a challenging public health problem for society. Therefore, the detection for image performing well in preprocessing, segmenting the retinal image and vascular pattern Human perception is highly sensitive to edges and fine details of an image. They are composed primarily by high-frequency component the visual quality of an image can be enormously degraded if the high frequencies are attenuated or completed removed. retinal image is necessary and among them, the detection of blood vessels is most important. The alterations about blood vessels, such as length, width and branching pattern. It can not only provide information on pathological changes but can also help to grade diseases severity or automatically diagnose.

B. Preprocessing

In this module, we upload the retinal images. The fundus of the eye is the of the eye and opposite the lens included. In the retina, we the vessels. Blood vessels show abnormalities at early stages also blood vessel alterations. The frequency components of an image lead to an improvement in visual quality. Image sharpening refers to any enhancement technique that highlight edge and fine details in an image. An image in the printing and photographic industries for increasing the local contrast and sharpening the images.

C. Vessel segmentation

In this module, we can perform feature extraction and vessel using graph theoretical model. It can create a vascular network using active contour with nearest neighbor measurement with neighborhood function. We can extract the map is a representation vascular network where each node denotes an intersection point. For generating the graph, we have used active contour method. The node is extracted from the centerline image by finding the bifurcation points which are detected by considering pixels. And more than two neighbors and the endpoints or terminal points by pixels having just one neighbor. In order to find the links between nodes, all the bifurcation points and neighbors are removed from the image. As a result, we get an image with separate components which are the vessel segments. The blood vessels are marked by the masking procedure which assigns one to all those pixels which belong to blood vessels and zero to non-vessels pixels. Final refined vessel segmentation mask is created by active contour model.

D. Vessel classification

The segmented vessels are classified as into arteries and veins. Correct classification of vessels is vital because heart diseases affect arteries and veins differently. After extraction of blood vessels, a feature vector is formed - based on properties of artery and veins. The feature gets extracted on the of centerline extracted image and a label is assigned to each centerline, indicating the artery and vein pixel. Based on this labeling phase the final goal now to assign one of the labels with the artery class (A) and the other with vein class (V). In order to allow the final classification between A/V with vessel intensity information the structural information also used.

$$Pa (Ci\ j) = a\ Ci\ j /(a\ Ci\ j + NV\ Ci)$$

E. Disease diagnosis

In this module, we can diagnosis the diseases using AVR ratio based on CRAE and CRVE measurements. The vessel measurements CRAE, CRVE are correlated with risks factors of cardiovascular diseases and are positive real numbers. The major systemic determinant for smaller CRAE is higher blood pressure whereas wider CRVE due to current cigarette smoking, higher blood pressure, systemic inflammation, and obesity. A more recent study found a strong negative correlation between renal function and retinal parameters (CRAE and CRVE) in a cohort of eighty healthy individuals which suggests an in pre-clinical target organ damage. Generalized arteriolar narrowing as reflected by a decrease. CRAE is associated with an increased risk of stroke between 1.1 CRVE is associated with an increased incidence of diabetic retinopathy(DR).

VI. Support Vector Machine

The SVM Classification is done with the help of SVM classifier In the recent years SVM classifiers have established excellent performance in a variety of pattern recognition troubles. Space is planned into a high dimensional feature space. Then, the hyperplane the margin of between classes is constructed. The lie closest to the decision surface are called support vectors directly involves its location.

VII. SYSTEM DESCRIPTION

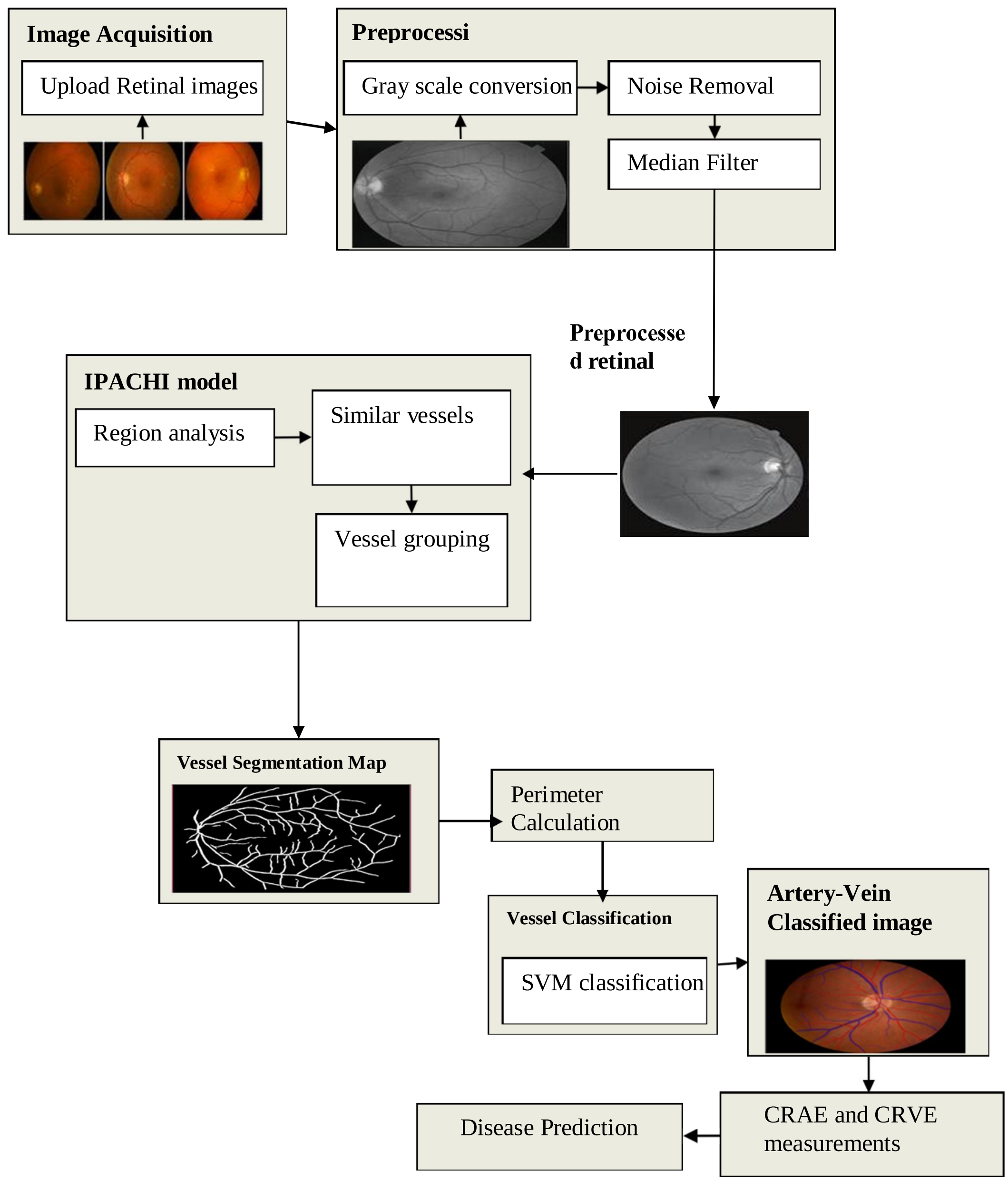

Fig.2 Block diagram

VIII. SIMULATION RESULT

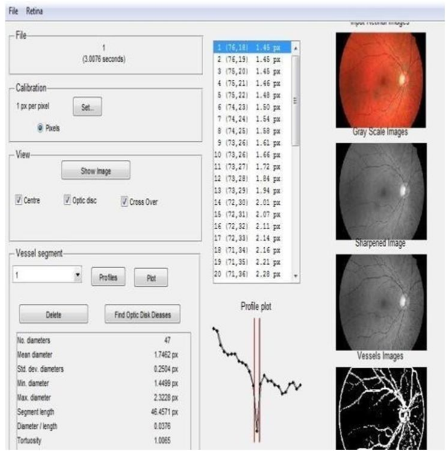

Fig .3Output ofinput image

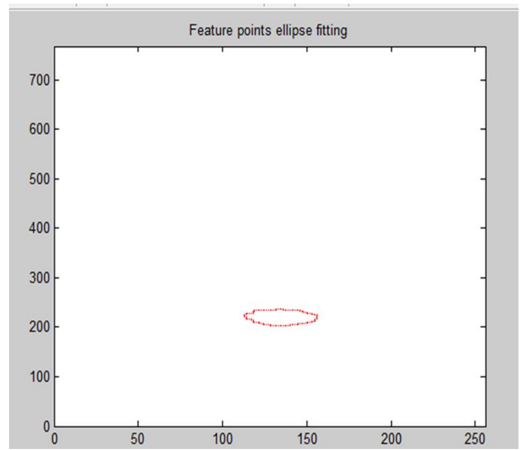

Fig.4 feature points ellipse fitting

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Number of pixels present in disc area= 75

number of pixels present in cup area = 82

Cup to disc ratio = 1.093333
-------------------------------------------------------------------------------
Accuracy               SPECIFICITY        SENSITIVITY
-------------------------------------------------------------------------------

 96.0854                96.9213            76.0854

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Fig.5 Accuracy level of output

IX. CONCLUSION

To conclude that our proposed system implemented successfully with accurate identification of to obtain correct retinal ophthalmology measurements. And we implement the post-processing step to vessel segmentation. This step is used to track all true vessels and find the optimal forest. We can overcome the wrong diagnosis of crossovers by using simultaneous identification of blood vessels from the retina. The final goal of the proposed method is to make easier the early detection of diseases related to the blood vessels of the retina. Its main advantage is the full automation of the algorithm since it does not require any intervention by clinicians, which releases necessary resources (specialists) and reduces the consultation time; hence care is facilitated. Then we realized the classification of arteries and veins in retinal images are essential for the automatic assessment of vascular changes. The graph theoretical method with SVM accuracy of the SVM classifier by means of intensity features, which shows using structural information for A/V classification. Furthermore, we compared the performance of our approach with other recently proposed method and we conclude that are achieving better results.

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