IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 10, Issue 6, June 2021

DOI 10.17148/IJARCCE.2021.10609

AUTOMATIC DIAGNOSIS OF FAMILIAL EXUDATIVE VITREORETINOPATHY

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Abstract: A snapshot of retinal image is used to analyse the disease called familial exudative vitreoretinopathy (FEVR). FEVR disease mostly affects the retinal nerve parts and it leads to vision loss, retinal detachment, strabismus,
and a visible whiteness (leukocoria) in the normally black pupil. The symptoms may vary even within the same family. This disease is incurable when it reaches its severe stage. So it is very important to diagnose it in previous stage of infection. Along with FEVR we also diagnose the disease like glaucoma, refractive power and cataract. Mostly diabetes patients are affected with such type of retinal disease. Automatic retinal segmentation is complicated by the fact that retinal images are often noisy, poorly contrasted, and the vessel widths can vary from very large to very small. So in this project, we implement automate segmentation approach based on graph theoretical method to provide regional information using measure. We represent the segmented vascular structure of retina as a vessel segment graph and make problem of identify the vessels as one of finding the blood vessels to have good correlation. We plan a method of image processing with some insisted algorithms to diagnose and evaluate the retinal disease.

Keywords: Image Processing, SVM algorithm, IPACHI Model, MATLAB.

I. INTRODUCTION

Medical imaging is a technique and procedure to create visual demonstration of the internal body organs and analyses health condition. Medical imaging technique seeks to view the internal structures hidden by skin and bones as well as to diagnose and treat disease. This medical fundus eye image is given as input to diagnose familial exudative vitreoretinopathy. Normally this type of images contains huge noise. It is necessary to do filtration and segmentation which comes under image processing. Here median filter is used for filtration and IPACHI model to analyses similar vessel region to achieve segmentation. Then classification is done to diagnose the disease. Hence in proposed system SVM (Support Vector Machine) classification in implemented to diagnose disease and spot the infected area.

II. PROPOSED SYSTEM

Examination of blood vessels in the eye allows detection of eye diseases such as glaucoma and diabetic retinopathy. Traditionally, the vascular network is mapped by hand in a time-consuming process that requires both training and skill. Automating the process allows consistency, and most importantly, frees up the time that a skilled technician or doctor would normally use for manual screening. So we can implement automatic process to examine the blood vessels to identify the cardio vascular diseases in retinal images. The proposed method utilizes the concept of active contours to remove noise, enhance the image, track the edges of the vessels, calculate the perimeter of vessels and identify the cardio diseases. Implement graph theoretical model to segment blood vessels and calculate perimeter of the blood vessels. Finally proposed an efficient and effective infinite perimeter active contour model with hybrid region terms for vessel segmentation with good performance. This will be a powerful tool for analyzing vasculature for better management of a wide spectrum of vascular-related diseases. Retinal vascular caliber (CRAE and CRVE) was analyzed as continuous variables. We used analysis of covariance to estimate mean retinal vascular caliber associated with the presence versus absence of categorical variables or increasing quartiles of continuous variables to predict the cardio vascular diseases.

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WORKING PRINCIPLE

Image processing consist of five main steps. They are retinal image acquisition, preprocessing, segmentation, classification and feature extraction. In image acquisition retinal image is given as input. Preprocessing is method to convert colored input retinal image to black and white image using gray scale conversion and noise is filtered using median filter. In vessel segmentation, we can perform feature extraction and vessel segmentation steps using graph theoretical model. It can create vascular network using active contour with nearest neighbor measure with neighborhood function. In order to find the links between nodes (vessel segments), all the bifurcation points and their neighbors are removed from the centerline image and as result we get an image with separate components which are the vessel segments. SVM- Support Vector Machine algorithm is used for the classification of retinal image and gives out the feature extraction of diseased part in a given retinal image.

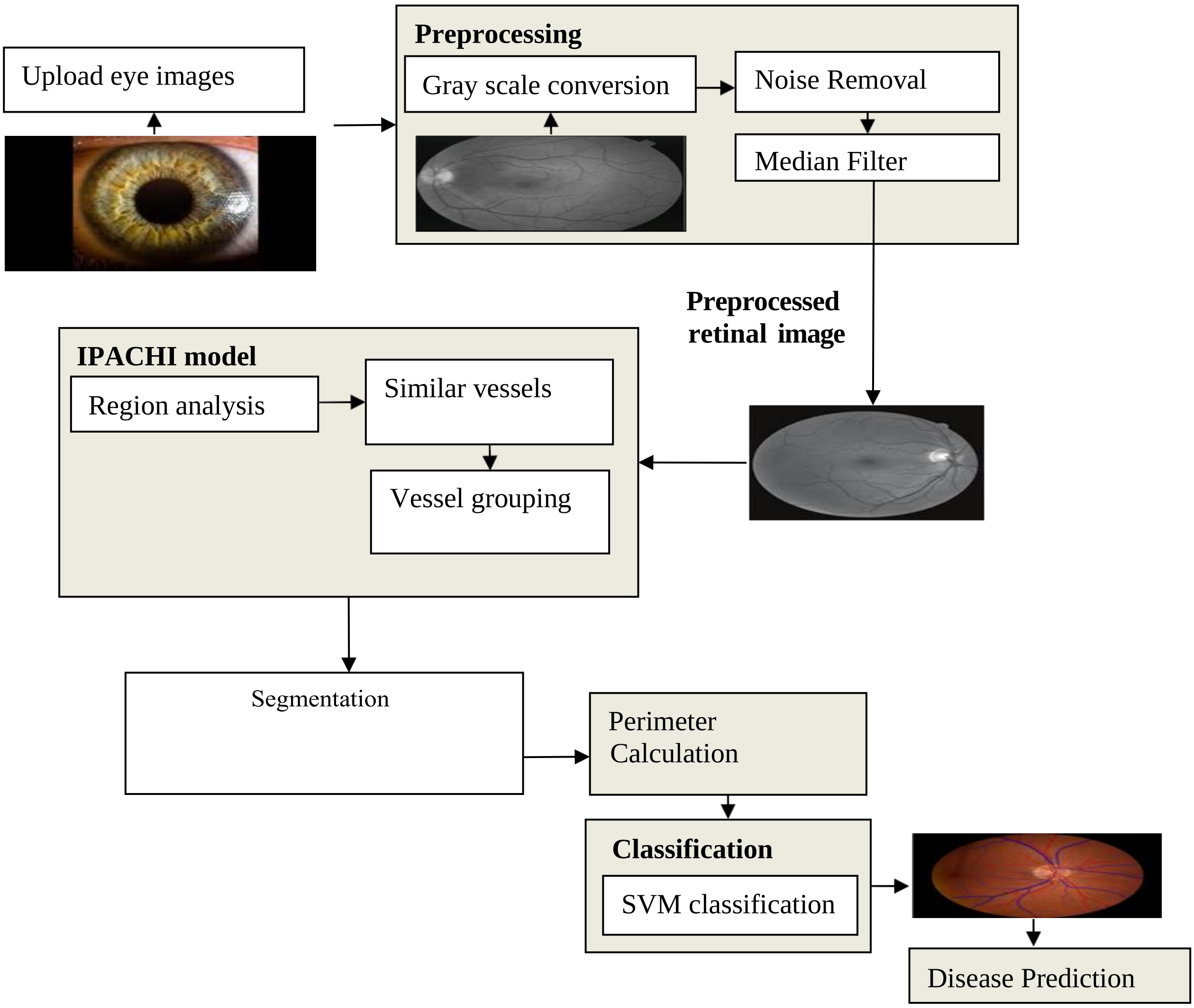

Fig. 1 Proposed System

III. MATERIALS AND METHODS

MATLAB

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include:

Math and computation Algorithm development

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Modeling, simulation, and prototyping
Data analysis, exploration, and visualization Scientific and engineering graphics
Application development, including graphical user interface building
MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar noninteractive language such as C or Fortran.
The name MATLAB stands for matrix laboratory. MATLAB was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects. Today, MATLAB uses software dev eloped by the LAPACK and ARPACK projects, which together represent the state-of-the-art in software for matrix computation.
MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis.

Toolboxes
MATLAB features a family of application-specific solutions called toolboxes. Very important to most users of MATLAB, toolboxes allow you to learn and apply specialized technology. Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others.

The MATLAB System
The MATLAB system consists of five main parts: Development Environment. This is the set of tools and facilities that help you use MATLAB functions and files. Many of these tools are graphical user interfaces. It includes the MATLAB desktop and Command Window, a command history, and browsers for viewing help, the workspace, files, and the searchpath. The MATLAB Mathematical Function Library. This is a vast collection of computational algorithms ranging from elementary functions like sum, sine, cosine, and complex arithmetic, to more sophisticated functions like matrix inverse, matrix eigenvalues, Bessel functions, and fast Fourier transforms. The MATLAB language: This is a high-level matrix/array language with control flow statements, functions, data structures, input/output, and object-oriented programming features. It allows both “programming in the small” to rapidly create quick and dirty throw-away programs, and “programming in the large” to create complete large and complex application programs.

IV. RESULT AND DISCUSSION

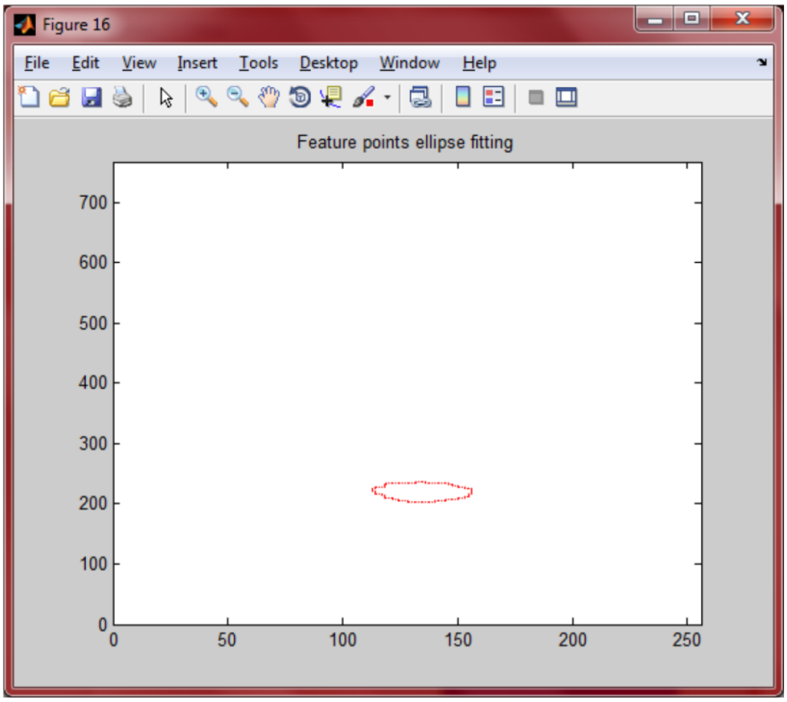

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Fig. 2 Feature points ellipse fitting

We can diagnosis the diseases using AVR ratio based on CRAE and CRVE measurements. The vessel measurements CRAE, CRVE have been found to be 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 is mainly due to current cigarette smoking, higher blood pressure, systemic inflammation and obesity. Those with higher blood pressure (75th percentile) had on average 4.8 microns smaller CRAE and 2.6 microns wider CRVE than those with lower blood pressure (25th percentile). 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 a common determinant in pre-clinical target organ damage. This is in support of earlier studies examining the association between retinal vascular signs and incident hypertension providing evidence that a decrease in CRAE is indeed an antecedent to clinical onset of hypertension and occurs prior to other signs of target organ damage. Besides the value of CRAE in predicting hypertension, it also shows great potential in other pathologies including stroke and diabetes. Generalized arteriolar narrowing as reflected by a decrease in CRAE is associated with an increased risk of stroke with odds ratios reported between 1.1 and 3.0.15,22,23 While in diabetes, an increase of CRVE is associated with increased incidence of diabetic retinopathy (DR), progression of DR, progression to proliferative DR and macular oedema, but is unrelated to CRAE.

V. CONCLUSION

To conclude that, our proposed system implemented successfully with accurate identification of true vessels 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 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. 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 its use in primary 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 outperforms the accuracy of the SVM classifier by means of intensity features, which shows the significance of using structural information for A/V classification. Furthermore, we compared the performance of our approach with other recently proposed methods, and we conclude that we are achieving better results.

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