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Visual Impairment and Blindness Identification Using Mathematical Analysis in the Retinal Vessels

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ABSTRACT: Detection of visual impairment and blindness identification from a fund us image is used to perform by a mathematical morphology. Early diagnosis and appropriate referral treatment can prevent visual loss. It is quite necessary to automatically extract and segment the optic disc contour from the fund us images without human interventions. Extraction of optic disc contours done using Principal Component Analysis (PCA) that proposes some rules for disease detection. PCA enables to obtain grey scale image that truly represent original RGB image that facilitates the segmentation. Algorithms Proposed in this work are Support Vector Machines(SVM**),** Stochastic Watershed Segmentation, Gabor Transform .The focus of the work is the automated segmentation of vessels in colour images of the retina. The relation between the size of the OD and the cup has been widely utilized for glaucoma diagnosis is an enhancement work, the optic cup will also be detected with the goal of measuring the cup-to-disc (C/D) ratioisone of the important clinical indicators of glaucoma. A highC/D ratio will indicate that a fundus is suspicious of glaucoma.

I.INTRODUCTION

Digital image processing remains a challenging domain of programming for several reasons. First the issue of digital image processing appeared relatively late in the computer history.

Secondly, digital image processing requires the most careful optimizations and especially for real time applications. Finally, digital image processing is by definition, a two dimensional domain .The original and basic way of representing a digital collared image in computers is obviously a bitmap. A bit map is constituted of rows of pixels, contraction of the words 'Picture Element'. Each pixel has a particular value which determines the appearing colour. This value is qualified by three numbers giving the decomposition of the colour in the three primary colours RED, GREEN, BLUE. Any colour visible to the human can be represented this way. There are about 16.8 million colours can be formed by using this RGB combination (256*256*256).

II.RELATED WORK

2.1 A.Erginay, J.C.Klein, P.Massin and Walter, [1] In the framework of computer assisted diagnosis of diabetic retinopathy, a new algorithm for detection of exudates is presented. The presence of exudates within the macular region is a main hallmark of diabetic macular Edam and allows its detection with a high sensitivity. Hence, detection of exudates is an important diagnostic task, in which computer assistance may play a major role. Exudates are found using their high grey level variation, and their contours are determined by means of morphological reconstruction techniques. The detection of the optic disc is indispensable for this approach.

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2.2 S.Beucher, F.Meyer, [2] The method we propose works on general image databases, with no prior categorization. It assumes that the object(s) hidden in a query can be distinguished pair wise using only a limited number of subsets of regions, and their features (hue, luminance, color moments, etc.). Determination of these discriminant groups is performed dynamically using evidential relaxation, and Shafer's combination law of evidence.

2.3 M. Abramoff, M. V. v. Ginneken, M. Niemeijer,M. Niemeijer, andJ. Staal, [3] A method is presented for automated segmentation of vessels in two-dimensional color images of the retina. This method can be used in computer analyses of retinal images, e.g., in automated screening for diabetic retinopathy. The system is based on extraction of image ridges, which coincide approximately with vessel centreline. The ridges are used to compose primitives in the form of line elements. With the line elements an image is partitioned into patches by assigning each image pixel to the closest line element.

2.4 O. Chutatape and H. Li,[4] Color retinal photography is an important tool to detect the evidence of various eye diseases . Novel methods to extract the main features in color retinal images have been developed in this paper. Principal component analysis is employed to locate optic disk.

2.5 Vincent,[5] Minimal paths are proposed as a powerful way to extract faint linear structures in noisy gray- level images . A global algorithm based on gray-weighted distance transforms is first proposed and shown to sometimes be a compelling alternative to watersheds. A more general local minimal path method is also introduced, together with an algorithm for extracting minimal path cost at each pixel location.

III.INTRODUCTION TO IMAGE PROCESSING IN MATLAB 7.0:

The image processing toolbox is a collection of functions that extend the capability of the MATLAB numeric computing environment. MATLAB stores most images as 2-D arrays (i.e., is in the form of matrices), in which each element corresponds to a single pixel in the displayed image.

There are many types of images in image processing toolbox.

- Intensity image:

This is equivalent to a 'gray scale image'. It represents an image as a matrix where every element has a value corresponding to how bright/dark the pixel at the corresponding position is colored.

- Binary image:

This image format also stores an image as a matrix but can only color a pixel black or white(and nothing in between).it assigns 1 for white and 0 for black.

- Indexed image:

This is a practical way of representing color images. An indexed image stores an image as two matrices. The first matrix has the same size as the image and one number for each pixel. The second matrix is called the color map and its size may be different from the image.

- RGB image:

This is a format for color images. It represents an image with three matrices of sizes matching and image format. Each matrix corresponds to one of the colors red, green or blue.

IV.PROJECT DESCRIPTION

In image processing environment starts from the capture of fungus images. The PCA is applied on the RGB fundus image to get the grey image. Vessels and OD of the retina more accurately detected. This is very important stage to determine final result. The vessels are removed through in painting technique to make the segmentation task.

A variant of watershed transformation is implemented on a region of original image. Stochastic watershed transformation is used to avoid sub segmentation problem related to classical watershed transformation. Centroid calculation and region discrimination operations are processed and contour of final region obtained by proposed method

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and its circular approximation.

V.MODULE DESCRIPTION

ThereareFour Modulesdesignedtoimplementthe projectthoseFourModulesare designed in thefollowing order:

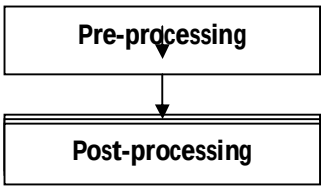
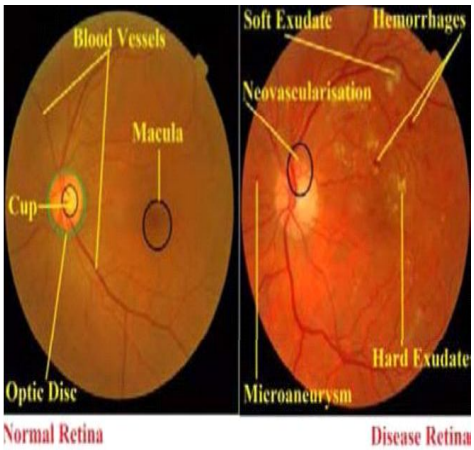


Image Pre-processing:
To analyse retinal image, pre-processing is a necessary step. It reduces image variation by normalizing the actual image with a reference model. It assists to reduce intra and inter image variability as well pre-processing consists of three stages.

Mathematical morphology includes principal component analysis in pre-processing stage. Initial gray-scale image is necessary to carry out most of the segmentation algorithms.

Feature Extraction:
The aim of the feature extraction module is pixel characterization by means of a feature vector, a pixel representation in terms of some quantifiable measurements which may be easily used in the classification stage to decide whether pixels belong to a real blood vessel or not.



Classification:
In the feature extraction stage, each pixel from a fundus image is characterized by a vector in a 7-D feature space Now, a classification procedure assigns one of the classes (vessel) or (nonvessel) to each candidate pixel when its representation is known.
In order to select a suitable classifier, the distribution of the training set data in the feature space was analyzed. The results of this analysis showed that the class linear separability grade was not high enough for the accuracy level required for vasculature segmentation in retinal images.

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Post-processing:

Classifier performance is enhanced by the inclusion of a two steps post processing stage: the first step is aimed at filling pixel gaps in detected blood vessels, while the second step is aimed at removing falsely detected isolated vessel pixels. From visual inspection of the NN output, vessels may have a few gaps.

VI. CONCLUSION

Automatic detection of optic disc from the fungus image is implemented. It took the new gray image as the output from the PCA for further operations. To locate the OD Support Vector Machines (SVM), Stochastic Watershed Segmentation and Gabor Transform algorithms are used .The final goal of the proposed method is to make easier the early detection of diseases related to the fundus. Its main advantage is the full automation of the algorithms incept does not require any intervention by clinicians, which releases necessary resources and reduces the consultation time. Finally identify the retinal images diseases free or not.

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