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RETINAL AREA ANALYSIS & DETECTION USING SCANNING LASER OPHTHALMOSCOPE

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ABSTRACT - Scanning laser ophthalmoscopes (SLOs) can be used for early detection of retinal diseases. With the advent of latest screening technology, the advantage of using SLO is its wide field of view, which can image a large part of the retina for better diagnosis of the retinal diseases. On the other hand, during the imaging process, artefacts such as eyelashes and eyelids are also imaged along with the retinal area. This brings a big challenge on how to exclude these artefacts. In this paper, a novel approach is made to automatically extract out true retinal area from an SLO image based on image processing and machine learning approaches. To reduce the complexity of image processing tasks and provide a convenient primitive image pattern, we have grouped pixels into different regions based on the regional size and compactness, called super pixels. The framework then calculates image based features reflecting textural and structural information and classifies between retinal area and artefacts. The experimental evaluation results have shown good performance with high accuracy.

KEYWORDS:
ELM (extreme learning machine)algorithm-SLO(scanning laser ophthalmoscope)-Adaptive histogram equalizer-Retinal-artefacts extractions- Artificial neural network

I.INTRODUCTION

Early detection and treatment of retinal eye diseases is critical to avoid preventable vision loss. Conventionally, retinal disease identification techniques are based on manual observations. Optometrists and ophthalmologists often rely on image operations such as change of contrast and zooming to interpret these images and diagnose results based on their own experience and domain knowledge. These diagnostic techniques are time consuming. Automated analysis of retinal images has the potential to reduce the time, which clinicians need to look at the images, which can expect more patients to be screened and more consistent diagnoses can be given in a time efficient manner .

The 2-D retinal scans obtained from imaging instruments [e.g., fundus camera, scanning laser ophthalmoscope (SLO)] may contain structures other than the retinal area; collectively regarded as artefacts. Exclusion of artefacts is important as a pre-processing step before automated detection of features of retinal diseases. In a retinal scan, extraneous objects such as the eyelashes, eyelids, and dust on optical surfaces may appear bright and in focus. Therefore, automatic segmentation of these artefacts from an imaged retina is not a trivial task. The purpose of performing this study is to develop a method that can exclude artefacts from retinal scans so as to improve automatic detection of disease features from the retinal scans.

II. METHODOLOGY

The framework has been divided into three stages, namely training stage, testing and evaluation stage, and deployment stage. The training stage is concerned with building of classification model based on training images and the annotations reflecting the boundary around retinal area.

In the testing and evaluation stages, the automatic annotations are performed on the “test set” of images and the classifier performance is evaluated against the manual annotations for the determination of accuracy. Finally, the deployment stage performs the automatic extraction of retinal area.

Image Data Integration: It involves the integration of image data with their manual annotations around true retinal area.

Image Preprocessing: Images are then preprocessed in order to bring the intensity values of each image into a particular range.

Feature Generation: We generate image-based features which are used to distinguish between the retinal area and the artefacts. The image-based features reflect textural, grayscale, or regional information and they were calculated for each super-pixel of the image present in the training set. In testing stage, only those features will be generated which are selected by feature selection process.

Feature Selection: Due to a large number of features, the feature array needs to be reduced before classifier construction. This involves features selection of the most significant features for classification.

Classifier Construction: In conjunction with manual annotations, the selected features are then used to construct the binary classifier. The result of such a classifier is the super-pixel representing either the "true retinal area" or the "artefacts."

Image Post processing: Image post processing is performed by morphological filtering so as to determine the retinal area boundary using superpixels classified by the classification model.

III.EXISTING SYSTEM

Scanning laser ophthalmoscopes (SLOs) can be used for early detection of retinal diseases. With the advent of latest screening technology, the advantage of using SLO is its wide field of view, which can image a large part of the retina for better diagnosis of the retinal diseases. On the other hand, during the imaging process, artefacts such as eyelashes and eyelids are also imaged along with the retinal area. This brings a big challenge on how to exclude these artefacts. In this paper, we propose a novel approach to automatically extract out true retinal area from an SLO image based on image processing and machine learning approaches. To reduce the complexity of image processing tasks and provide a convenient primitive image pattern, we have grouped pixels into different regions based on the regional size and compactness, called super pixels. The framework then calculates image based features reflecting textural and structural information and classifies between retinal area and artefacts. The experimental evaluation results have shown good performance with an overall accuracy of 92%.

IV. PROPOSED SYSTEM

The most important part of the retina for Human vision is fovea. The destruction of delicate cones of fovea causes the person to become blind. The size of fovea zone in fundus eye image is related to various diseases that lead to blindness. If the radius is smaller then it may be an indication of an infection of the eye that may lead to disease. The radius of the fovea region is also an indication of the stages of retinopathy. This paper compares the cases where the images are exposed to two types of noises like salt and pepper and Gaussian noise ,Denoising using two different filters namely adaptive wavelet filter and Modified Decision Based Unsymmetrical Trimmed Median Filter (MDBUTMF) . The proposed method is used to carry out the blood vessel segmentation and detection in images. Then using Mathematical Morphology the blood vessel and hence the region is found. The result was tested in MATLAB and verified. The idea behind a trimmed filter is to reject the noisy pixel from the selected 3x3 window. A symmetrical filter called Alpha Trimmed Mean Filtering (ATMF) is used where the trimming is symmetrical in either end. In this method, even the uncorrupted pixels are also trimmed. This may lead to loss of image details and may end up blurring the image. Hence to get over this drawback

VI. CONCLUSION AND FUTURE WORK

In this project an attempt has been made to develop a complete detection of retinal area using the SLO. A precise detection of retinal diseases can be carried out with the retinal area detector using SLO. The most important part of the retina for human vision is fovea The destruction of delicate cones of fovea causes the person to become blind. The size of fovea zone in fundus eye image is related to various diseases that lead to blindness.

The system was applied for the recognition of scanned images for the retinal area covering almost all the area. In this we compares the cases where the images are exposed to two types of noises like salt and pepper and Gaussian noise, Denoising using two different filters namely adaptive wavelet filter and Modified Decision

Based Unsymmetrical Trimmed Median Filter (MDBUTMF).The proposed method is used to carry out the blood vessel segmentation and detection in images

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