A Novel Technique for the Detection of Ma and Ha in Diabetic Retinopathy Disease using an Automated Decision Supported System

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Abstract:- Now a day, Diabetic retinopathy (DR) is a common eye disease which causes legal blindness in diabetic patients. It occurs when diabetes damages the tiny blood vessels inside the retina and the light-sensitive tissue at the back of the eye. This paper provides an automated diagnosis system for Diabetic retinopathy. The grading of the severity level of Diabetic retinopathy is based on detecting and analyzing the presence of Micro aneurysms and retinal hemorrhages in the retina. The system extracts some retinal features such as optic disc, fovea and retinal tissue for easier segmentation of dark spot lesions in the fundus images which is followed by the classification of the segmented spots into MAs and HAs. Based on the number and location of MAs and HAs, the system quantifies the severity level of Diabetic Retinopathy.

Keywords:- *Diabetic retinopathy, preprocessing, segmentation.*

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1. INTRODUCTION

Over time, diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves. Diabetic retinopathy is the most common form of diabetic eye disease. Diabetic retinopathy usually affects people who have diabetes for a significant number of years. Retinopathy can affect all diabetics and becomes particularly dangerous, increasing the risk of blindness. The risk of developing diabetic retinopathy is increases with age as well with less well controlled blood sugar and blood pressure level. Diabetic retinopathy occurs when changes in blood glucose levels cause changes in retinal blood vessels. In some cases, these vessels will swell up and leak fluid into the rear of the eye. In other cases, abnormal blood vessels will grow on the surface of the retina. Unless treated, diabetic retinopathy can gradually become more serious and progress from 'background retinopathy' to seriously affecting vision and can lead to blindness.

2. PROPOSED MODEL

2.1 Input

Input to the developed system is the colour image of human retina. Database of 98 low resolution colour images are compressed by JPEG image. The main components of human eye retina are optic disc, fovea, tissue and blood vessels. Removing these components will help in avoiding the errors as much as possible.

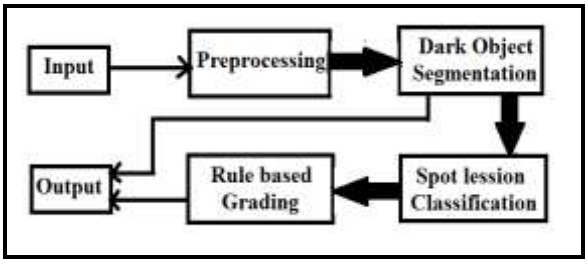

Figure 1. Block Diagram of Automate Decision Support System.

2.2 Pre-Processing

These images are then passed through the different stages which are listed below:

2.2.1 Green channel extraction

Among the different colour pixels, green-channel provides the maximum contrast. So to detect MA and HA clearly, the green channel is first extract from the color images.

2.2.2 Optic disc and fovea removal

Fovea appears as dark region and located at the center of the retina. Optic disc has high intensity, circular shape and constant size. This characteristic of optic disc indicates exact location in the image. Sometimes some dark objects also appear inside the optic disc which may be incorrectly considered as MA and HA. Such confusions can be easily avoided by removing optic disc. The optic disc can be removed by passing through different blocks. The first block is Median filter. It is used to remove noise without blurring the sharp border edges. The second block is Top hat transformation which extracts minor elements and details from the given image. It is followed by contrast stretching block. It enhances the image quality by improving the contrast in the image by stretching the range of intensity values. Then thresholding block is used to create binary image and finally morphological operations block is used for eliminating small objects.

2.2.3 Background Removal

By eliminating the background variations from the image the foreground objects can be easily analyzed which represents brighter parts of the image

2.3 Dark Spot Segmentation

Dark spot lesions such as MAs and HAs can be efficiently segmented using a sequence of stages that is H-Maxima transformation, thresholding and feature extraction.

2.4 Dark Spot Classification

MA appears small and round in shape while HA appears larger and arbitrary in shape. Based on some threshold values for size an object can be judged as normal or mild or moderate or severe case.

2.5 Output

Thus at the output the image contains blood vessels, MAs, HAs and also severity level of diabetic retinopathy can be determined.

3. ADVANTAGES & DISADVANTAGES

3.1 Advantages

The severity level of diabetic retinopathy can be determined and graded into four scales, i.e. normal, mild, moderate, or severe.

Various image processing tasks, such as feature extraction, background equalization, image enhancement can be performed using this algorithm.

Automated decision support system includes low quality as well as high quality image analysis.

H-maxima transform and multilevel thresholding methods decrease the intensity level of the images which make the dark spots segmentation easier.

3.2 Disadvantages

In the process of thresholding, blood vessels as well as some unwanted pixels appears in the resultant binary image, and therefore, some more algorithms must be implemented for refining the image and retaining the desired objects, namely MAs and HAs.

4. CONCLUSION

The main components of the human retina, i.e. the optic disc, fovea, and tissues can be extracted by using median filtering, morphological Top hat transformation, Contrast stretching, thresholding, morphological opening and closing for easier segmentation. Then, an efficient algorithm based on h-maxima transformation and multilevel thresholding will be employed for dark spot segmentation. The severity level can be determined and graded into four scales, i.e. normal, mild, moderate, or severe based on the number and location of MAs and HAs.

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