OPTIC DISK AND BLOOD VESSEL ELIMINATION USING OTSU'S THRESHOLDING

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ABSTRACT:

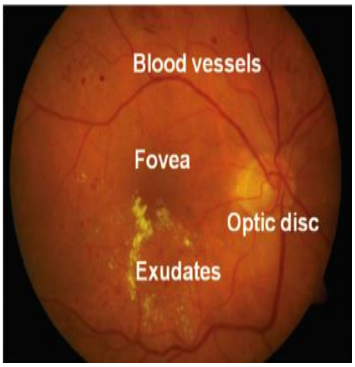
An optic disk and vessel Segmentation, location is a very essential task for retinal image analysis. This research gives automated method for segmentation of the optic disc in retinal images using otsu's thresholding and boundary extraction. First, the true colour Retinal images are converted to gray image and then image is enhanced using histogram equalization. This improves the efficiency of the conventional otsu's thresholding method. The proposed method of segmentation utilizes gray level thresholding for segmentation and then morphological operators and thresholding are used for extracting the optical disk and blood vessel. The method is tested on the different optical disc images. The method is less complex and efficiently recognizes the boundary of the optic disc and also evaluates the blood vessel. The optical canters are tabulated for original and fudus images.

LITURATURE SURVEY:

Diabetic retinopathy (DR) is one of the complications resulted from prolonged diabetic condition usually after ten to fifteen years of having diabetes. In the case of DR, the high glucose level or hyperglycemias causes damage to the tiny blood vessels inside the retina. These tiny blood vessels will leak blood and fluid on the retina, forming features such as micro aneurysms, haemorrhages, hard exudates, cotton wool spots, or venous loops R. Frank [1]. DR affects about 60% of patients having diabetes for 15 years or more and a percentage of these are at risk of developing blindness discussed in [2]. Despite these intimidating statistics, research indicates that at least 90% of these new cases could be reduced if there was proper and vigilant treatment and monitoring of the eyes [3]. Using screening method big blood clots called hemorrhages, Hard exudates, The bright circular region from the blood vessels called optic disk, The fovea defines the center of the retina, and is the region of highest visual acuity, exudates and microaneurysms, irregular shaped, and found in the posterior pole of the fundus can be detected. Bill Silver [3] defined a quality descriptor according to three classes, namely, out-of-focus images, motion blurred images and severely occluded images of eyelids and eyelashes. Mr. R. Vijayamadheswaran [4] proposed a quantitative quality measure using discrete wavelet decomposition.

1. INTRODUCTION

In identification of eye disease a researchers are doing analysis of retinal. Detection of the optic disc (OD) is most essential for the automatic analysis of digital colour retinal images [1, 2 and 14]. Since the optical disc is different for healthy and corrupted eyes. It facilitates the tracking of various anatomical features and also in the extraction of Exudates, Drusens and locating the macula.etc present in the retina of human eye. The fundus includes the blood vessels, the optic disc. These structures are shown in Figure 1



Retina is the largest part of the fundus which is the interior surface of the eye. The optic disk is the brightest part in the normal fundus image that can be seen as a pale, round or vertically slightly oval shape disk [7, 13]. This is the entrance area of blood vessels and optic nerves to the retina human eyes. The localization of the optic disc is critical in retinal image analysis for measuring distance and identifies other anatomical parts in retinal images. Pathology on or near the optic disc can have a more severe effect in vision. Basically any method of optical disc location is based on the three essential stages. Figure 2 shows the basic processing steps used for optical disc location. Various methods have been designed by modifying these stages. The pre processing stage is used to enhance the appearance of the retinal images. The most common way of pre-processing is to use filters for noise removal and contrast enhancement for visual quality improvement.

After enhancing the image quality desired objects are extracted using segmentation operation. Segmentation is typically associated with pattern recognition problems. Image processing stage segments the various sections of the retinal images. The third stage uses features (shape, size, brightness) of the optic disc for identification of the optic disc in a normal retinal image. The circle fitting algorithms are widely used in this context. The efficiency of the thresholding based optical disc localization technique mainly depends upon the efficiency of the enhancement stage and on the efficiency of thresholding stage. Thus it needs to improve the enhancement quality of the images. Two basic approaches used for finding the optical disk are Model based approach [11, 12] and Image feature based approach [5, 6]. In model based approaches models the geometrical directional pattern of the retinal vascular system. It implicitly embeds the information on optical disc as a point of convergence of all vessels. In order to find optical disk feature based approach uses the relative high brightness of optic disk, and the round shape of optical disc as compared to the rest of the fundus image. The problem of optic disc

detection has rarely received unique attention. In this paper proposed a robust method for locating the optical disc and its canter. Section 2 has discussedsome of the related existing works. The section 3 describes the proposed optical disk segmentation method using multilevel thresholdingand morphological operators. The next section presents the results based on proposed method. It is found that this method is computationally less complex and efficientThe proposed communication system block diagram is explained in the section 4. The LMS and RLS linear equalizers are described in the section 5. The results of performance evaluation are given in the section 6followedby the conclusion in section 7

1.2 PROPOSED SEGMENTATION OF OPTICAL DISC: In this paper a post image processing method is proposed in which firstly the input image is equalized and then histogram based multilevel thresholding is applied on it. In the next stage the morphological operator's erosion and dilation are used for the optical disk identification.

2. THRESHOLDING BASE SEGMENTATION

For gray images, separation of darker background from brighter foreground is thresholding. Optical images do not have such simple histograms hence thresholding require some other techniques. The coordinates of pixels with the maximum brightness are identified in the enhanced image. Then the row and columns are selected as; where, is the gray level value of the equalized image. The threshold is set to 251 in this paper. Now the segmentation is perfumed based on the selected threshold and the segmented image is given,

$$I_T(x, y) = \begin{cases} 1 & for\ I(x,y) \geq T \\ 0 & for\ I(x,y) \angle\ T \end{cases}$$

Where, is a logical segmented image, then the optical disc boundary is extracted using sequential morphological operations.

LOCATING OPTICAL DISC

A boundary extraction method using morphological operators is used here to locate the disc. Boundary extraction method includes two fundamental processes Dilation and Erosion. Erosion is used to smoothen the image to erode the outer unwanted pixel in the retina. After the process of erosion some pixel in the optic disc will also get eroded so we are going for the process dilation to reconstruct the image and also it is used in the process of edge detection.

3. THRESHOLDING

The Otsu's thresholding technique is applied to the image to detect the desire area.

Equations of Otsu algorithm are

$$\sigma^2_{Between}(T) = w_B(T) w_o(T) [\mu_B(T) - \mu_o(T)]^2$$

$$w_B(T) = \sum_{i=0}^{T-1} p(i) \quad , \mu_B = \sum_{i=0}^{T-1} \left(\frac{ip(i)}{p(i)}\right)$$

$$w_0(T) = \sum_{i=T}^{L-1} p(i) \quad , \mu_O = \sum_{i=T}^{L-1} \left(\frac{ip(i)}{p(i)}\right)$$

- $\sigma^2_{Between}(T)$= Between-class variance
- w=weight, B=background of the image, o=object of image
- μ= combined mean, T= threshold value

The optic disc is the largest and brightest region of the image. The optic disc detection is useful because it can reduce the false positive detection of the exudates. Fig.5 shows the general flow chart of the optic disc detection.

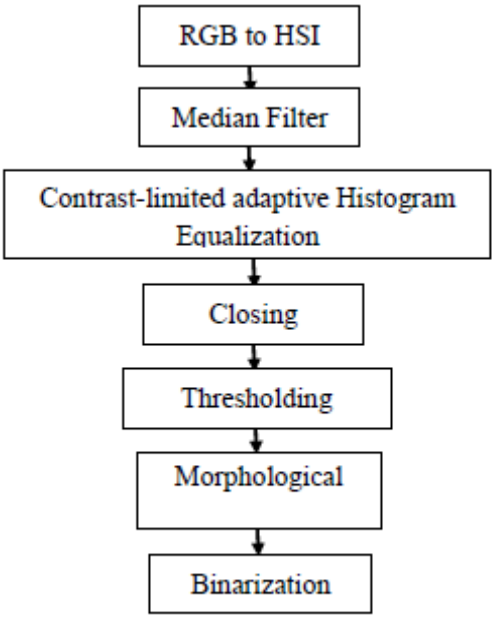


Fig-5: Flow Chart of Optic disc Detection

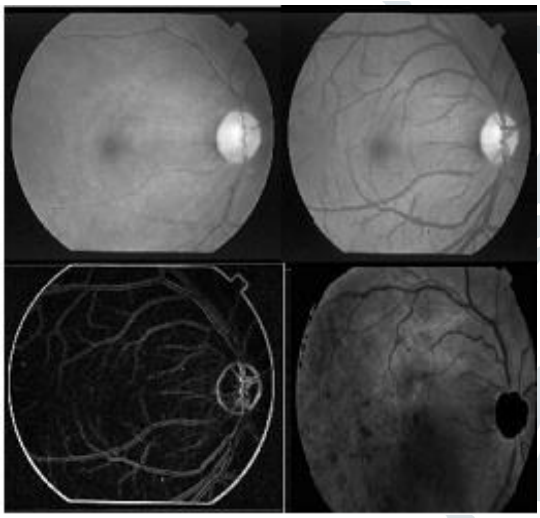


Fig-6: (a) Closing (b) Thresholding (c) Filling (d) Reconstruction (e) Detected Optic disc

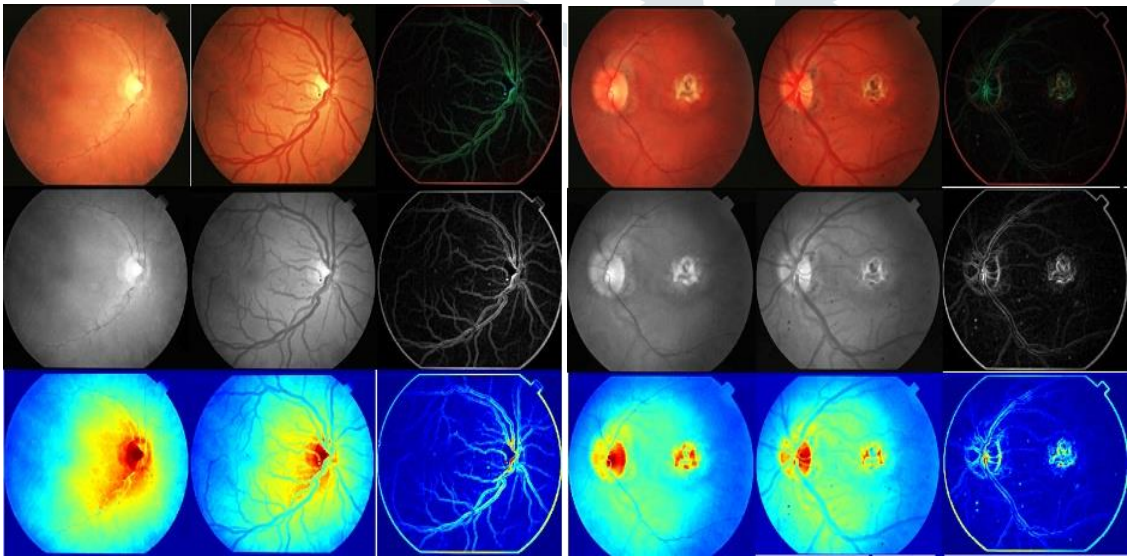


Fig. Vessel and Optic disk detection by applied Thresholding

The results of the optic disc detection are shown in Fig.6 (a), (b), (c), (d) and (e). Fig.6 (a) shows the result of the closing operator. To remove the vessels, the closing (morphology) operator is applied. When the closing operator is used, the choice of structuring element is important. The closing is a dilation followed by an erosion that joins the very close objects together.Then, the result image is binarized by thresholding using Otsu algorithm [16]. The result image is shown in Fig.6 (b).The filling operator is applied to fill the holes in the image and the result image is shown in Fig.6 (c). The result image is reconstructed by using the morphology reconstruction and is shown in Fig.6 (d). To detect the optic disc region, the Otsu algorithm is applied on the difference between the original image and the reconstructed image. The optic disc detected area is shown in Fig.6 (e).

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