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Role of Fundus and OCT images in Diabetic Retinopathy for detection of Exudates & Glaucoma by image processing techniques

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Abstract: The Retinopathy is a vascular disease and it shows the effect on retina, in this Diabetic retinopathy (DR) is most chronic one, another is hypertensive retinopathy (HR). The DR will be result basically due to Hypertension, which may leads to spoil the sensitive blood vessel in the eye.

Diabetic retinopathy is one type of blindness which occurs in the human being at the age of 35 years on wards, now a days lot of techniques and methods are there to identify this DR, in this context the role of Fundus and OCT(Optical Coherence Tomography) images helps to identify DR, these images will be used with different algorithms, techniques. DR causes the hard exudates and hemorrhages. In this paper approached a method to detect automatically these exudates and hemorrhages by using the Fundus and OCT images are pre-processed via local, contrast enhancement by using adaptive method. The Glaucoma is caused due to hypertension in diabetic patients. Both DR and glaucoma affects the vision loss in diabetic patients. Here histogram methodology is used to identify the intensity in the Fundus images, this can be done with pre processing of Fundus images to identify the exudates the method is contrast standardization, it can be accessed by Fundus and OCT images.

Keywords: Diabetic Retinopathy, Vascular, Fundus images, hypertension, OCT images.

I.INTRODUCTION

Diabetic retinopathy is now -a -days going to become major cause for blindness in people at the early age. There are two types of Diabetic Retinopathy which can be seen in human beings as type1 and type2. The type1 DR is in the early age of around 21 years to 22 years. This may lead complete blindness in coming future. This can be identified at early stages of humans.

Segmentation based on edge base involves with the identification of borders of infected areas in the fundus images, here the image noise may not make the perfect detection, here each pixel has to consider as region, which can be further identified with region growing. After this the histogram technique is applied to classify the pattern images. In this process the optic disc area or surface can be identified.

The OCT images are the 3D objects. These are important, because these provide the non-invasive diagnostic images, this is the difference between the X-ray images and MRI images.

OCT imaging technology is used in obtaining high resolution images of Retina and internal segmentation of the eye. And glaucoma can be increased due to pressure, and it may cause damage the optic nerve.

Whenever the trabecular meshwork of eye becomes inefficient eye becomes dry, by this eye pressure will be raises and it is called as IOP (intraocular pressure). By this raised pressure the optic nerve will be damaged. but it is not early symptom at early ages, the eye pressure will be expressed in millimetre Of Mercury (mmHg). So, in this paper we had adopted the methodology by which we can determine the Diabetic Retinopathy at early stages.

II.PROPOSED WORK

The Fundus image quality depends on procedure of acquisition and under which operators using and the quality again depends upon the exclusion criteria which applied on the images.

In proposed method image pre-processing will be done, here the colour image contrast can be increased by median filter and then it can be converted into black and white image, then histogram technique will be applied.

The conversion of colour image into black and white image then moat operator is applied,

Finding Contrast:

It is a measurement of intensity contrast between a Pixel and its neighbourhood pixels in the whole image

$$\text{Contrast} = \sum_{i,j} |i-j|^2 p(i,j)$$

In this paper we used the method of standardization of colours based on the contrast. Because to eliminate the confusion between the pathology colours in the Fundus images, here we have to use set of 40 Fundus images of different age group people. Again we have to go for recursive region growing segmentation algorithm for the detection of exudates.

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Based on the sensitivity the image will be classified and further it will be sent for the histogram, and here we can evaluate the Sensitivity, Specificity, and Accuracy by using the standard methodology

Sensitivity =
$$\frac{TP + FN}{TP + FN} * 100$$

Specificity = $\frac{TN}{FP + TN} * 100$

тр

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN} * 100$$



Fig: (a, b, c, d) After preprocessing the images

Moat Operator

The image sharpening can be done within the frequency domain using high-pass filter, the transitions of edges and sharp in the grey levels of the images represent to the high-frequency components by that the attenuation of low-frequency components will be done in the Fourier Transform, without disturbing the high-frequency information.

This can be done by multiplying the filter spectrum $\mathcal{G}(u, v) = \mathcal{H}(u, v) \mathcal{F}(u, v)$

H(u, v) is the image spectrum

 $F((\mathbf{u}, \mathbf{v}))$ in Fourier space,

Where $\mathcal{F}(u, v)$ is the Fourier Transform of Image f(x, y)

The Histogram technique is applied to the images, p'(a) is the probability of finding a pixel with the value a in the image. Area₁ is the area or number

of pixels in the image and H1 (a) is the histogram of the image

$$p_1(a) = \frac{1}{Area_1}H_1(a)$$

$$f(a) = D_m \frac{1}{Area_1}\sum_{i=0}^a H_c(i)$$

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Here Edge based segmentation is widely used, it is difficult that if there is no border and at the border, due to damage of image noise. It is used to identify various regions of image in segmentation which further involves the region growing.

By the fundus photography the retinal image quality can be obtained, the colour image is colour normalization is required to analyse the image. The histogram specification₁₈ approach is used in it to normalize the colour of retinal images. By this we can make equalize the intensity of original image changing intensities. After generating the histogram then the optic disc is inside of the nasal, and it is insensitive to light so it can be called as the blind spot. So, this portion can be known as image noise during analysis

Detection of Optic disc:

The recognition of the optic disc can be done by the different variations in the intensity of adjacent pixels. Here the optic disc blood vessels can be clearly detected.

III.RESULTS

The reliable determination, the relationship between the average retinal vessel diameter and the distance from the optic disc and the width of blood vessel shows monotonic decrease by taking the distance into account of the optic disc to the centre.



Fig: fundus image with microaneurysmsy Shown by dark dot.



Fig: Retinal Bleedings shown as dark areas, exudates shown by bright white areas shown by dark dots

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Fig: Shows optic nerve area with dark gray areas.



Fig: Detection of exudates



Fig: Morphological processed image

The Vessel pixels near the centre of optic disc and the width of blood vessel shows the Monotonic decrease with centre. If the blood vessel volume to be not changed then no need of branching, and Exudates are general lesions, we can find this by patches of leaking vascular. If there is sight threatening, then it will be present of exudates, it is known as diabetic maculopathy. Optic cup area can find by number of white pixels obtained in the binary image. The eye fundus images classification can be done by Support Vector Machine classifier,

Here automatic classification of nonlinearity clusters will happen, and we can find the glaucomatous. The methodology can be shown by two levels in the below block diagrams





Pre processing of images



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Fig: Optic disk , blood vessel .



After analysing the images, in this paper the Histogram process used for fundus images for colour normalization, here it is required that the uniform intensity should spread along with the image, and remaining the optic disc area can be generally not classified and it is called as noise. The optic disc can be removed by edge base detection.





Fig:The identification of blood vessel

After detection of blood vessels by edge detection, further the morphological filter algorithm operation is used for segmentation.

IV. CONCLUSION

In this paper we had discussed the different methods to detect the Diabetic Retinopathy by using the methods. And further these can be carried out to by using other techniques and algorithms like SVM classifier etc.

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BIOGRAPHY



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