

# Diabetic Retinopathy Exudate Detection

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**Abstract.** The Diabetic Retinopathy is major cause of vision loss now days. High sugar levels in blood can damage the blood vessels that feed the retina of the eye. It contains two types Non-proliferative and Proliferative, which results in blurred vision at first and permanent vision loss later. Early detection of Diabetic Retinopathy is helpful to prevent vision loss. Manually detection is laborious process and takes great deal of time for analysis & diagnosis, also it includes chemical dilation which has negative side effects. Amongst all the symptoms like Microaneurysms (small swelling that forms in the walls of tiny blood vessels, which may break & allow blood to leak into nearby tissue.), Hemorrhages (internal bleeding), Exudates (lipid leaks & mark the existence of retinal oedema; known cause for the blindness) is most prevalent symptom, hence will go for detection of exudates.

**Keywords:** Exudates, fundus images, morphological operations, pre-processing, optical disc

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## I. Introduction

Diabetic Retinopathy can be detected earlier and can be cured in primary stages. The in-time screening is crucial factor in this process. There are previous methods for screening like, Pure splitting [1] where artifacts having similar features as that of exudates are detected as exudates, Morphological fine tuning [2] which detects bright artifacts as exudates, Artificial neural network [3] in which accurate detection in an uneven illumination is not possible, Mathematical morphology [4] where occur misclassified portion for images without exudates and Three neural network & SVM classifiers which occasionally miss faint exudates. To overcome the lacunas of previous screening methods, proposed method can be used. For this retinal blood vessels are considered, because the Exudates are nothing but lipid leaks from retinal blood vessels. So, by knowing about the blood vessels exact location of Exudates can be determined.

Fundus Photographic images of retina [5] are used for this purpose and are as given next:

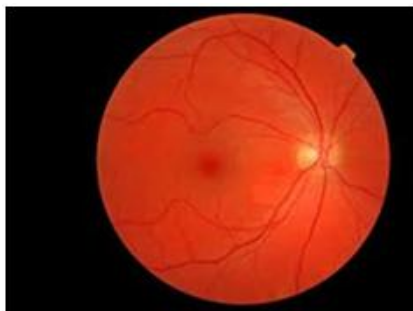


Fig. 1: Healthy Retina (Source: DIARETDB1) [6]



Fig.2: Affected Retina (Source: DIARETDB1) [6]

## II. Methodology

**Acquisition:** As said earlier fundus photographs are used for the method which are captured using fundoscope for physical examination. Here used the images from standard databases of Diabetic Retinopathy available; DIARETDB1 [6] & DIARETDB0 [7].



Fig.3 Input image

**Pre-processing:** Due to variability while acquisition and physical features of individuals like skin color, iris color; there might be uneven illumination and complexities in retinal images so intensity adjustment is necessary. Also, green channel of image is used as exudates appear in more contrast form in green channel. Image will also be resized in order to apply the method to different databases. The output will be as follows:

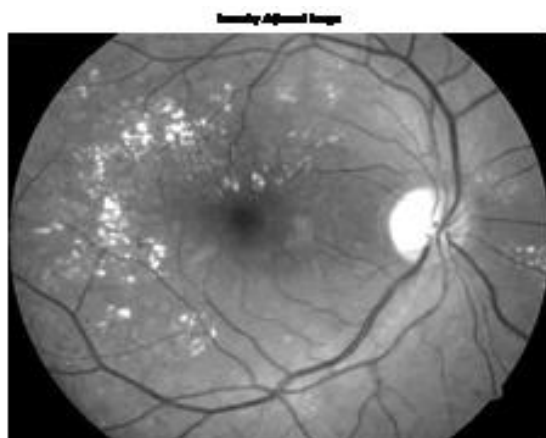


Fig.4 Pre-Processed image

**Optical disc removal:** It is observed that the Optical disc in retina has the same intensity levels as that of Exudates, so it is necessary to eliminate it in order to perform further operations. At first the blood vessels can be removed by using morphological operations. Then a mask is drawn using the "Circular fitting method" exact of the size and intensity of optical disc. Then this mask is can be subtracted from processed image which will give the following output:

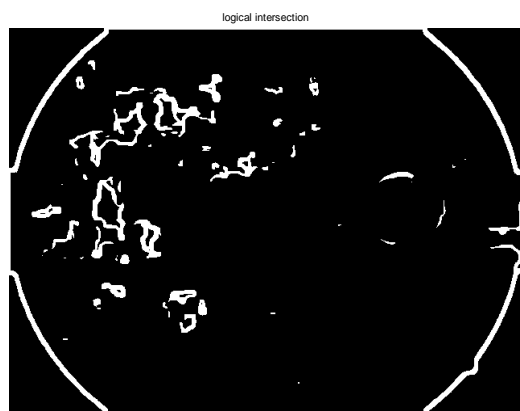


Fig. 5 Optical disc removal

**Exudate detection:** For the final Exudates detection, the circular and rectangular borders can be removed from image, then the morphological operation "Closing" is used for expanding the area. Then the contrast of image is enhanced using "Histogram Equalization". Logical operations "complement" & "AND" used to locate the Exudates.

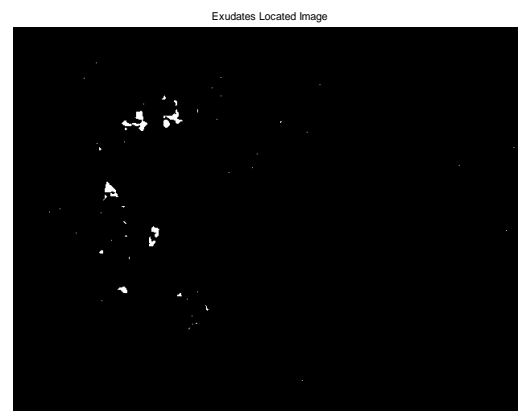


Fig.6 Final Exudate detection

### III. Conclusion:

The retinal images are complex as like the other medical images, hence pre-processing is used in order to lessen the complexities. Exudates are detected using the knowledge of retinal blood vessels. The work is extended to determine the False positives, False negatives, True positives, True negatives and in turn the Sensitivity, Specificity, Precision and Accuracy values of the proposed method. Also, there will be ensemble based approach using Microaneurysms analysis to decide the grade of Diabetic Retinopathy.

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