# A Survey on Lesion Detection in Diabetic Retinopathy

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*Abstract*— Diabetic retinopathy (DR) is a complication of diabetes that can lead to impairment of vision and even blindness. It is the most common cause of blindness in the working age population. Several methods have been developed for the automatic detection of red lesions in colour fundus images. Detection of hemorrhages (HE) and microaneurysms (MA) are more difficult task because most of the false positives at the vessel segmentation step are actually lesions. A common methodology adopted for combined MA and HE detection consists in identifying all dark-colored structures in the image, mainly through a thresholding, combined with adapted preprocessing and then in removing the vessels from the resulting set of candidates. In recent years use a new set of dynamic shape features for the detection purpose. In this paper, we conduct a deep study about this problem and its solutions.

***Key words:*** Diabetic Retinopathy, Screening, Automatic Detection, Fundus Images, Blood Vessels, Optic Disk, Red Lesions, Microaneurysms, Hemorrhages, False Positive Elimination

## I. INTRODUCTION

Diabetic Retinopathy is diseases of eye can cause blindness. Blood vessels leaks protein and blood causes DR. This disease is mainly caused due to increased sugar level in blood that damages the small blood vessels of the retina. Many people are suffering from diabetic retinopathy (DR). If this disease is found at an early stage, then can be detected and prevented from turning into blindness. However, it has been seen that people are becoming blind due to of DR is increasing day by day. Fundus camera gives digital retinal images which are used to diagnose DR. Leakage of blood from vessels to the surface of retina can be observed in initial stage of diabetic retinopathy. This leakage leads to the formation of

- Microaneurysms (MA)
- Hemorrhages (HE)
- Exudates
- Cottonwool spots

Microaneurysms are small circular red spots with diameter 10 to 100 µm which are the first sign of DR. It is tiny swelling appears in the retinal capillaries as a small, round, red spot located in the inner nuclear layer of the retina. Hemorrhages are located in the middle layer of the retina. HEs are in different types.

- Dot
- Blot
- Flame

## II. DIABETIC RETINOPATHY DETECTION TECHNIQUES

Various techniques have been developed so far for the detection of diabetic retinopathy. In this section we discuss about the approaches used for the assessment of diabetic retinopathy. Most of them are based on the image processing techniques and uses retinal images. Several algorithms have been developed to automatically identify the exudates which eliminate the needs of human experts. These methods help the doctors for offering better treatment for the patients and early assessment of diabetic retinopathy.

Atsushi Mizutani propose a method for detecting microaneurysms in noncontrast images of the retinal fundus. A microaneurysm is one of the early signs of the onset of DR. It appears as a point lesion darker than the surrounding regions in retinal fundus images. The initial detection of the microaneurysms was attempted by applying the double-ring filter on the green channel of the colour images; this was followed by the elimination of lesions in the blood vessels, which were false positives. Next, the shapes of the candidate lesions for an accurate determination of their image features were examined. Finally, the candidate lesions were classified as microaneurysms or false positives by the rule-based method and by using an artificial neural network. The main limitation here is the detection is a difficult task.

Another robust and computationally efficient approach for the localization of the different features and lesions in a fundus retinal image is proposed Saiprasad Ravishankar. Since many features have common intensity properties, geometric features and correlations are used to distinguish between them. In this paper a new constraint for optic disk detection where we first detect the major blood vessels and use the intersection of these to find the approximate location of the optic disk. This is further localized using colour properties. We also show that many of the features such as the blood vessels, exudates and microaneurysms and hemorrhages can be detected quite accurately using different morphological operations applied appropriately. Extensive evaluation of the algorithm on a database of 516 images with varied contrast, illumination and disease stages yields 97.1% success rate for optic disk localization.

Lama Seoud et al proposed a method for the detection of both MAs and HEs that does not require prior vessel segmentation. A supervised classification scheme is considered to discriminate between lesions and other structures like vessel segments and background noise. After image pre-processing, candidate regions are identified. Features are extracted and used to classify each candidate. The major contribution is a new set of shape features that do not require precise segmentation of the candidates. Every regional minimum is considered as a candidate. Since the boundaries of the minima do not necessarily correspond to the edges of the structures of interest, propose to extract shape features through the process of morphological image flooding.

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