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# Microaneurysm Techniques for Diabetic Patients

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***Abstract:*** *Diabetic Retinopathy (DR) is a serious eye disease that originates from diabetes mellitus and is the most common cause of blindness in the developed countries. Early treatment can prevent patients to become affected from this condition or at least the progression of DR can be slowed down. The proposed system is used to detect microaneurysm (MA) in eye retinal images. An ensemble-based microaneurysm detector proved its high efficiency. The experimental results show that the proposed ensemble based MA detector outperforms the current individual approaches in MA detection. It has been also proven that the framework is high flexibility in different datasets. The selection of the appropriate threshold is also an important issue for our detector to provide sufficient sensitivity and specificity rate. The System provides a friendly environment to deal with images. An effective MA detector based on the combination of preprocessing methods and candidate extractors is used. An ensemble creation framework selects the best combination. An exhaustive quantitative analysis is also given to prove the superiority of our approach over individual algorithms. It also investigates the grading performance of this method, which is proven to be competitive with other screening system.*
***Index Terms:*** *Diabetic Retinopathy (DR) microaneurysm (MA), MA detection and Candidate extractors.*

## I. INTRODUCTION

RELIABLE microaneurysm (MA) detection in digital fundus images is still an open issue in medical image processing. MA are early signs of diabetic retinopathy. The proposed system is an ensemble-based framework (preprocessing methods, candidate extractors) which is used to improve MA detection. Microaneurysm detector can able to measure diabetic retinopathy (DR) grading. Also it helps to find different types of DR like haemorrhages, hard exudates, and cotton wool spot. This is a robust and computationally efficient approach to discover the changes in retinal images. To promising, MA detector detects the "DR/non-DR" type classification based on the presence or absence of the microaneurysms.

**Fig 1.1: Retinal Image with Microaneurysm**

EXISTING SYSTEM

The grading performance of computer-aided DR screening systems highly depends on MA detection. MA detector that provides remarkable results from both aspects. One way to ensure high reliability and raise accuracy in detectors to consider ensemble-based systems, which has been proven to be efficient in several fields. However, the usual ensemble techniques aim to combine class labels or real values that cannot be adopted in this case. In MA detection, detectors provide spatial coordinates as centers of potential MA candidates. The use of well-known ensemble techniques would require a classification of each pixel, which can be misleading in our context, since different algorithms extract MAs with different approaches and the MA centers may not coincide exactly.

DISADVANTAGES:

- Computer-aided detection (CAD) technique.
- In earlier research on combining MA detectors did not provide reassuring results.
- The low Sensitivity of MA detectors originates from the candidate extractor part.
- The existing system does not provide a friendly environment.

## II. PROPOSED SYSTEM

An effective MA detector based on the combination of preprocessing methods and candidate extractors. An ensemble creation framework selects the best combination. An exhaustive quantitative analysis is also given to prove the superiority of our approach over individual algorithms. It also investigates the grading performance of this method, which is proven to be competitive with other screening systems

The method used to implement in the following process:

i. Select the image.
ii. Convert the pixel value of an image 287×243.
iii. Apply preprocessing methods.
iv. Convert grayscale image that is black and white.
v. Apply classification methods.
vi. Scan pixel by pixel and to find dark pixel.
vii. Classify the retinal disease images.
viii. Display the result.

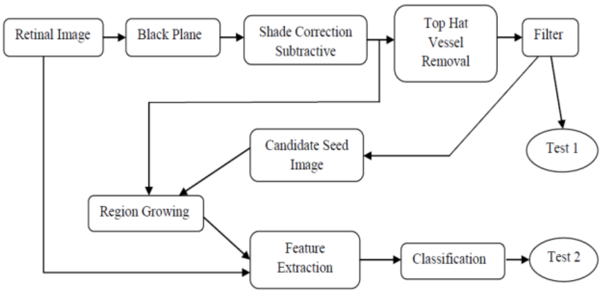


**Fig 2.1: Schematic Diagram of MA Detection**

The modules involved are:

### A. *Preprocessing method*

The preprocessing methods, which is consider to be applied before executing MA candidate extraction. The selection of the preprocessing method and candidate extractor components for this framework is a challenging task. Comparison of preprocessing methods dedicated to MA detection has not been published yet. Since preprocessing methods need to be highly interchangeable, It must select algorithms that can be used before any candidate extractor and do not change the characteristics of the original images. The system found some techniques to generate too noisy images for MA detection. Thus, it has selected methods which are well-known in medical image processing and preserve image characteristics. Naturally, the proposed system can be improved in the future with adding new methods.

### B. *MA Candidate Extractor*

Candidate extraction is a process that aims to spot any objects in the image showing MA-like characteristics. Individual MA detectors consider different principles to extract MA candidates. This technique provides a brief overview of the candidate extractors involved in this analysis. Again, just as for preprocessing methods, adding new MA candidate extractors may lead to further improvement in the future.

### C. *MA Detection*

The application evaluated the MA detection capabilities of the proposed method in the ROC competition for MA detectors, as well as on a publicly available and a private database. And provide a brief overview on these databases and on the methodology to use for the evaluation of MA detection performance of the proposed approach.

ROC is a worldwide competition dedicated to measure the accuracy of MA detectors. The ROC database consists of 50 training and 50 test images with different resolutions (7688*576, 1058* 1061 and 1389*1383), 45◦ FOV and JPEG compression. There are 13 and 10 images of the training and test sets, where no MAs are marked by the experts. The database contains 28 lossless compressed training and 61 test images with a 1500*1152 resolutions and 50◦ FOV. There are 15 and 39 images of the training and test sets, where no MAs are marked by the experts. For each database, to provide the free-response receiver operating characteristic (FROC) curves, this plots the sensitivity against the average number of false positives per image. To measure the sensitivity at different average false positive per image levels, then threshold the output set of the MA detector based on the confidence values assigned to each candidate. For the ROC dataset, it also provides the current ranking of the competition along with the CPM values that serves as the basis for the ranking. The empirical AUC calculated this way is likely to underestimate the true AUC. However, the uncertainty for the partial AUCs may be quite high due to the low number of images.

### *D. DR Grading*

An ensemble-based approach to see its grading performance to recognize DR. For this aim, to determined the image-level classification rate of the ensemble on the messidor dataset containing large number of images. That is, the presence of any MA means that the image contains signs of DR, while the absence of MAs indicates a healthy case. In other words, a pure yes or no decision of the system has been tested. Since microaneurysm detection is decisive in diabetic retinopathy (DR) grading, and also tested the micro aneurysms, haemorrhages, hard exudates, and cotton wool spot. These techniques used to measure the sensitivity, specificity, and accuracy of the detector at different levels. A multi-level ensemble-based system for detecting microaneurysms in fundus images. These methods consider more algorithms at these different functionality levels to be able to compose an ensemble-based system.

## III. Results & Implementation

### *A. Selection Process*

User starts the application and selects the eye retinal image. The retinal image should be taken by fundoscopy camera. The image file should be jpg, jpeg, gif, bmp, png etc. The system neglects other formats. If the user select the image the software become activated else deactivated the process. The application set the image size and convert to grayscale image shown in Fig 3.1

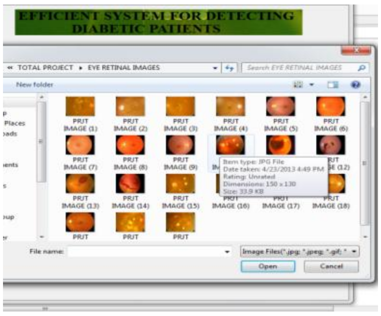


**Fig 3.1 Retinal Image Selection Process**

### *B. Scanning Process*

This process scans the whole image pixel by pixel horizontally or vertically and also scan width and height. Then detecting colors and bad pixel positions. It extract and classify the image to detect whether it is patient eye or good healthy eye. This process uses several algorithm techniques. It gives the clear elaborated of application. The techniques involved in preprocessing methods are Gray Level Transformation, Histogram Equilazation, Vessel Removal, Vignette Correction. The techniques belongs to the classification methods are Diameter Closing, Top Hat Transformation, Circular Hough Transformation, Gaussian Masks, Cross-Section Profile Analysis.

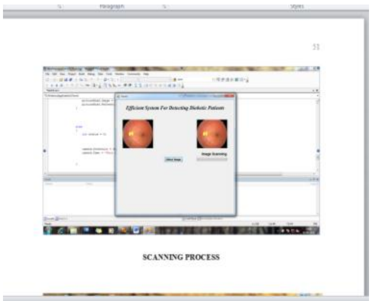


**Fig 3.2 Scanning Process**

### *C. Noise Removal Process*

The application investigate the effect of processing images with the complete vessel system being removed. The missing parts to fill in the holes caused by the removal using the in painting algorithm. MAs appearing near vessels become more easily detectable in this way. The dark points and different colors are detected by this process. This process is noise removal process. Unwanted image places and pure black are removed. Then find to take eye retinal place separately.

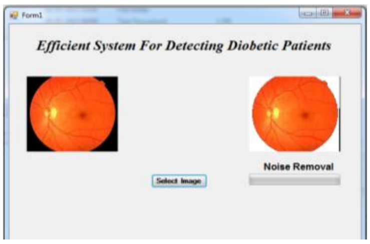


**Fig 3.3 Noise Removal Process**

### *D. Analysis Process*

An ensemble-based approach to see its grading performance to recognize DR. For this aim, to determine the image-level classification rate of the ensemble on the messidor dataset containing large number of images. Since microaneurysm detection is decisive in diabetic retinopathy (DR) grading, and also tested the micro aneurysms, haemorrhages, hard exudates, cotton wool spot.


**Fig 3.4 Analysis process**

### *E. Microaneurysms*

DR is a micro vascular complication of diabetes key lesion is microaneurysms. Retinal microaneurysms are focal dilatations of retinal capillaries, 10 to 100 microns in diameter, and appear as red dots. They are usually seen at the posterior pole, especially temporal to the fovea. Beginning as dilatations in areas in the capillary wall where pericytes are absent, microaneurysms are initially thin walled. Later, endothelial cells proliferate and lay down layers of basement membrane material around themselves. Fibrin and erythrocytes may accumulate within the aneurysm. Despite multiple layers of basement membrane, they are permeable to water and large shown in Fig 3.5


**Fig 3.5 Result Process (Microaneurysms)**

## IV. CONCLUSION

An ensemble-based MA detector that has proved its high efficiency. The unique framework on a set of (preprocessing method, candidate extractor) pairs, from which a search algorithm selects an optimal combination. Since this approach is modular, it expects further improvements by adding more preprocessing methods and candidate extractors. It has also evaluated the grading performance of this detector in the large number of images of the messidor database. However, a proper screening system should contain other components, which is expected to increase the performance of this approach.

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