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Human Retina Optic Disc Segmentation using Statistical Region Merging

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Abstract **– Optic disc (OD) localization and segmentation are important tasks in automatic eye disease screening. In this thesis we will present a new, fast and simple iterative methodology for semi-automatic localization and segmentation of the optic disc in fundus images. Furthermore, this new method can find the area of optic disc using the statistical region merging algorithm. The proposed method uses Matlab programming languages for evaluation of algorithm. First, OD location candidates are identified using median filter and Otsu method, then apply the statistical region merging for optic disc localization. The performance of the proposed method will compare with various methods in the literature, and the results are found convincing and efficient. The obtained results indicate that this method of the segmentation of OD has good accuracy.**

Keywords **– Optic Disc, Image Segmentation, Statistical Region Merging.**

I. INTRODUCATION

Biometrics with the advancements in technology, significant improvements in the number and activity of computerized methods currently used in medical practice have been obtained. Automatic image processing and analysis, medical diagnosis and the most promising areas of the computer used in the treatment insights and visualization techniques. In this regard, it is often possible if you live high resolution images of the fundus retinal used in the clinical area and provided many features which can be used in diagnosis and treatment. Image processing improvements achieved in the field of ophthalmology because of aging, the progress of diabetic retinopathy (DR), macular deterioration of conditions for automatically identifying the most significant benefits obtained include, glaucoma, etc. and be counted. Such diseases such as DR does not cause any visual impairment of patients in their early stages because it is quite difficult to be recognized and identified. Therefore, identification of these diseases require regular eye examination. Due to examine a large number of people have been possible using traditional methods since supply concerns, this study can be done with automated systems. Any suspicion of disease control retinal images automatically controlled automatically by the system control encountered by professional doctors and cannot be identified. Doctors quickly person or retina cannot control a plurality of images at the moment because, diagnosis and accurate guidance for the treatment of disease such a situation will not be very fast. It is therefore very important to improve such automatic systems [1].

In [4] Ha Surge conversion method analysis of pyramidal with images of the retina subjected to the OD green color channels specify the location-based template matching method after Hausdorfer side of the conducted using segmentation. In this study, 93% success rate of 40 images of the retina are obtained.

In [5], first as Principal Component Analysis and then converted to gray scale images of the retina was conducted to determine the location of the OD and segmentation as well. In this study, geolocation segmentation success was obtained as OD and 86.89% Drinos database 110 retina, retinal images.

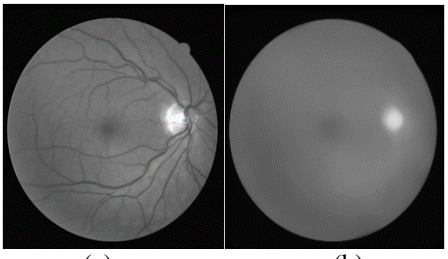
II. OPTICAL DISC GROUND FORECAST

Suitable parameters should be identify the optical disc and optical disc space for segmentation algorithm. Most of the research is a subset of the images [6, 7], they run the parameters in the literature using estimated by taking the average of the optic disc diameter. FOV and image resolution in camera (Field of View), using a new approach to calculate the optical disc sizes are formulated. MESSIDOR database images [8] obtained by a 45º FOV resulting in a retinal area.

Neighbours average filter (average filter), in contrast, median filter without blurring sharp edges of the tip retina can do this job. Basically, the median filter for pixels (x, y) value, the neighbourhood will change all pixels of the average; as in equation (1).

$$f_{med}(x,y) = median\{f(s,t)\}, \quad (s,t) \in W_{xy} \tag{1}$$

W, adjacent locations in the image center (x, y) represent. Figure 1 shows the bright intensity before and after implementation of median filter on the retinal image.



(a) (b)

Fig. 1. a) Basic retinal image (gray level image), b) image after applying the filter results.

We implemented image binaries using the Otsu method we obtained after applying these filters. Then replace the optical drive and the other phase has estimated the level set in the optical disc using the algorithm has limits. These processes are illustrated in figure 2.

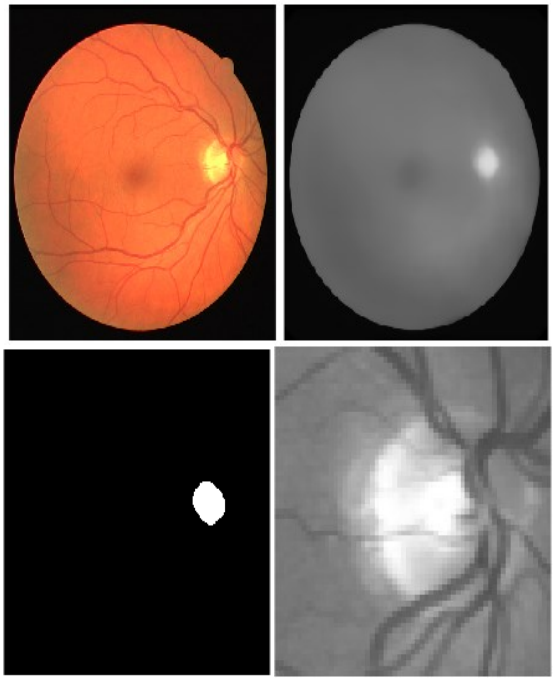


Fig. 2. a) original image retina, b) after applying the filter, c) the result of the Otsu method, d) the estimated location of the optical disc.

III. Assessment of Algorithm Parameters

To compare between ground truths segmented area and proposed method segmented area it's considered some quantitative criteria. These criteria parameter is True Positive, True Negative, False Positive, and False Negative areas.

True Positive (TP) specifies the number of pixels that algorithm has detected them fitting to optic disc. False Positive (FP) specifies the number of pixels that algorithm mistakenly has detected them fitting to the optic disc. True Negative (TN) specifies the number of pixels that algorithm has not considered them fitting in the optic disc. False Negative (FN) specifies the number of pixels that algorithm considers them as the background but these pixels belong to the optic disc.

These parameter is shown in figure 3. In this figure left shape is ground truth that segmented manually by expert man. Right shape is automatically optic disc segmented.

With the true positives, true negative, false positives, false negatives areas the accuracy is get as equation 7.

$$Acc = \frac{TP + TN}{TP + FN + TN + FP} \qquad (7)$$

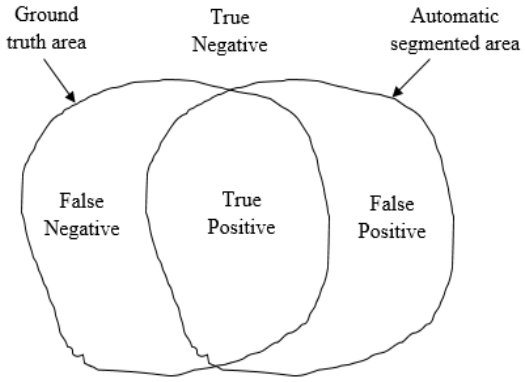


Fig. 3. True Positive, True Negative, False Positive, and False Negative areas used to calculate the accuracy measure.

IV. Result and Discussion

In this paper.

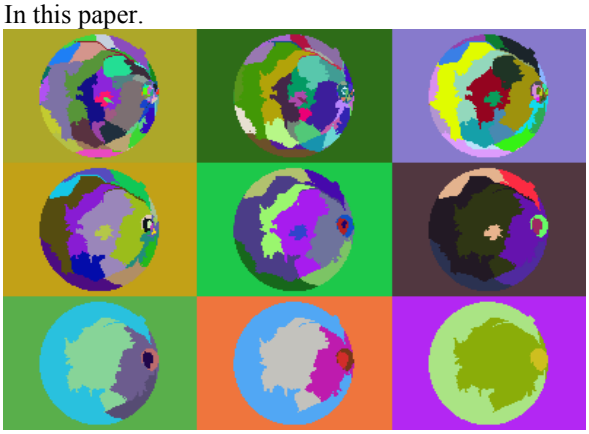


Fig. 4. Result of the SRM in colored

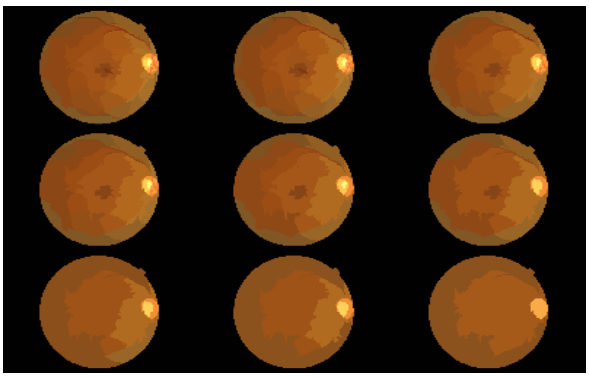


Fig. 5. Result of the SRM in other colored

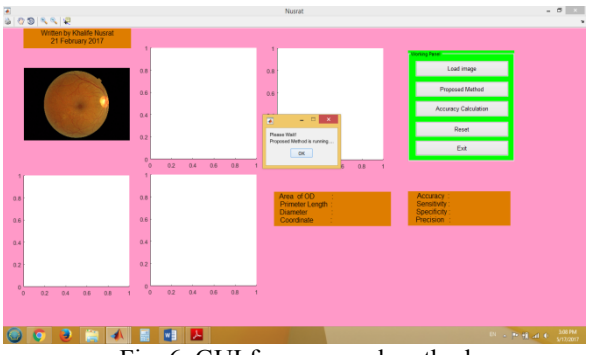


Fig. 6. GUI for proposed method

Table 1. The performance analyzing

Image number	Sensitivity	Specificity	Accuracy
1	0.972973	0.999239	0.986106
2	0.958023	0.999776	0.9789
3	0.908194	0.999927	0.954061
4	0.515937	0.999757	0.757847
5	0.943145	0.994969	0.969057

The percentage of detection vs number is shown in figure 7.

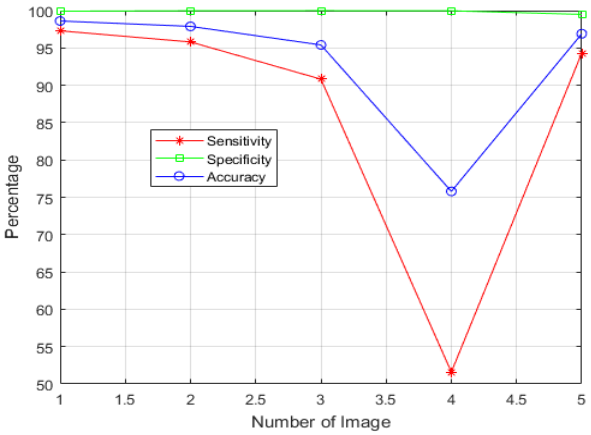


Fig. 7. Percentage of detection vs number of image

Table 2. Comparsion table

Localization methods	Accuracy (%)
Sinthanayothin et al. (1999)	50
Rashid Qureshi et al. (2012)	94.02
Hung-Kuei Hsiao et al. (2012)	90
Carla Pereira et al. (2013)	93.25
Proposed method	**95**

V. Conclusion

The segmentation and extraction of the optical disc in retinal image is the important tasks in automatic eye disease screening. In this paper, a fast-fully automatic optic disc localization and segmentation was developed.

At first, OD location candidates are identified using median filter and Otsu method. After finding the optic disc location the statistical region merging method is applied on this location.

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Khalifa Nusrat Received BSc in computer science department faculty of science in Tripoli university (Libya) in 1988, then in 1989 he joined to work in Libya insurance company as senior programmer until 2006, in 2002 he received MSc in Information Technology from university of Malaya - Malaysia. From 2007 he is staff member in computer depart--ment in Zawia University.

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