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COMP9517 Individual Component Report

1.Introduction and Background
Segmenting the optic disc (OD) is an important and essential step in creating a frame of reference for diagnosing optic nerve head pathologies such as glaucoma.[1] And in this project, it can help the following group task. A good OD segmentation method can be helpful when segment lesions and blood vessels.

2.Method
After reading the paper provided in the project description, I realised that green channel has the greatest influence when segment optic disc. [2] So every process I made is based on the green channel. In the paper they mentioned histogram match method to locate the centre of optic disc, but I cannot recover the region after locating the centre. So, I directly find the region of optic disc (roi), apply threshold to make binary image and remove all the noise outside the roi.
In order to remove small objects to reduce the influence they made, I applied grayscale opening on the pre-processing and get roi step.

3.Experiment
The following image is got by applying threshold to the grayscale of original image. From this we can make sure that optic disc has the highest intensity. That makes the problem easier.

Based on that, I use cv2.minMaxLoc to find the optic disc region (roi). But when I use my roi function, the result is always disturbed by the noise. Inspired by the method used in paper [1], I resized the image and got a relatively good result.

4.Result and Discussion
After resize the result is good for some images. For instance:
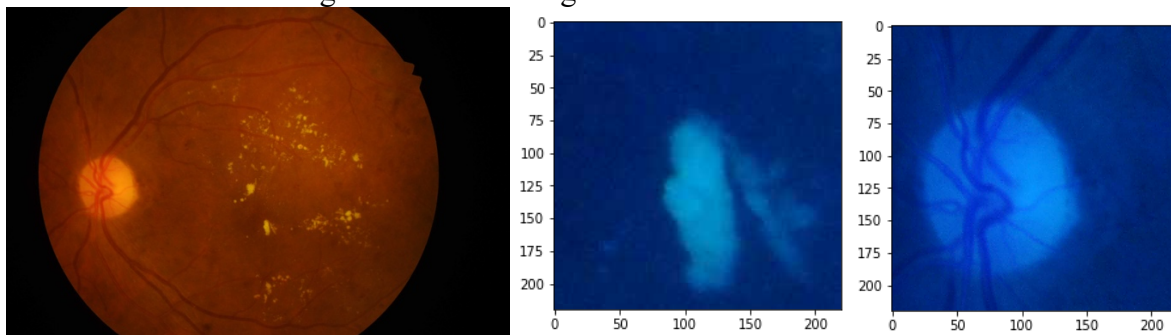

(From left to right: IDRiD_11.jpg, roi before resize, roi after resize)
Clearly we can see that the roi is much better than not resize. And here is the result after make it binary and remove any pixel not black out of roi:

There are some flaws in this method, I need to adjust the threshold and roi size based on different images. It cannot used as an universal method, because it's not easy to use. but it indeed gives the best result.

I tried another method, apply GaussianBlur, cv2.addWeighted and cv2.equalizeHist to make the optic disc has larger weight, so that it would be easier to segment. I tried many times and found in cv2.addWeighted, gray*1.5 - gray_blur*0.5 has the best result. After applying threshold the result is shown below:
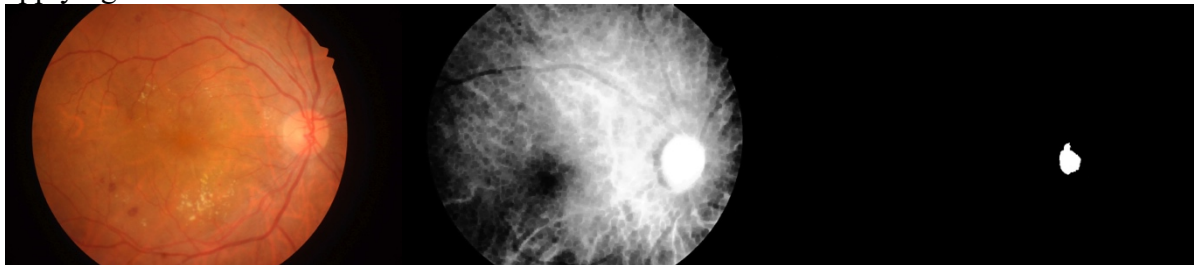
We can see that despite it segment the right area, the shape is unsatisfying. So I still use the original method.

5.Reference
[1] Almazroa A, Sun W, Alodhayb S, Raahemifar K, Lakshminarayanan V. Optic disc segmentation for glaucoma screening system using fundus images. Clin Ophthalmol. 2017;15:2017–29.
[2] Dehghani, Amin, Hamid Abrishami Moghaddam, and Mohammad-Shahram Moin. "Optic disc localization in retinal images using histogram matching." EURASIP Journal on Image and Video Processing 2012, no. 1 (2012): 19.