# Chapter 24 Segmentation of Optic Disc From Fundus Image Based on Morphology and SVM Classifier

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### ABSTRACT

Color fundus image is the most basic way to diagnose diabetic retinopathy, papillary edema, and glaucoma. In particular, since observing the morphological changes of the optic disc is conducive to the diagnosis of related diseases, accurate and effective positioning and segmentation of the optic disc is an important process. Optic disc segmentation algorithms are mainly based on template matching, deformable model and learning. According to the character that the shape of the optic disc is approximately circular, this proposed research work uses Kirsch operator to get the edge of the green channel fundus image through morphological operation, and then detects the optic disc by HOUGH circle transformation. In addition, supervised learning in machine learning is also applied in this chapter. First, the vascular mask is obtained by morphological operation for vascular erasure, and then the SVM classifier is segmented by HU moment invariant feature and gray level feature. The test results on the DRIONS fundus image database with expert-labeled optic disc contour show that the two methods have good results and high accuracy in optic disc segmentation. Even though seven different assessment parameters (sensitivity [Se], specificity [Sp], accuracy [Acc], positive predicted value [Ppv], and negative predicted value [Npv]) are used for performance assessment of the algorithm. Accuracy is considered as the criterion of judgment in this chapter. The average accuracy achieved for the nine random test set is 97.7%, which is better than any other classifiers used for segmenting Optical Disc from Fundus Images.

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### 1. INTRODUCTION

### 1.1 Research Background and Significance

Diabetic retinopathy, hypertension, glaucoma and macular degeneration are the most common causes of visual impairment and blindness (Mariotti,S.P. and Pascolini,D. 2012). The basis for diagnosis of ophthalmic diseases is color fundus image. Through fundus images, experts can directly observe the structure and direction of arteriovenous vessels, the proportion and change of optic disc and cup. This can help doctors to detect the above-mentioned ophthalmic diseases as early as possible, and provide more accurate diagnostic results for patients (Beiji. Z. et al, 2015). Usually, more than 80% of global visual impairment cases can be avoided in advance.

The optic disc is a basic anatomical structure in the fundus of the eye. In color fundus images, it is usually light yellow bright spots similar to circular or elliptic shapes. The gray level of the pixels is higher than other structures. The retinal vessels converge in the center of the optic disc and enter the optic nerve. Hypertension, glaucoma and other diseases can cause optic disc depression and then pathological changes. Analysis of the morphological changes of the optic disc is helpful to the diagnosis of related diseases. Therefore, the location and segmentation of the optic disc has been one of the hot topics of research. However, due to the interference of fundus diseases, non-uniform illumination and contrast, accurate segmentation of the optic disc region is very challenging (Xiaomei . X. et al., 2017).



Figure 1. Fundus structure sketch

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