

Pattern Recognition

Project : Vessel Detection in Retinal Images

Instructor: Wei-Yang Lin

Due date : January 16, 2009

Introduction

Blood vessel appearance is an important indicator for many diagnoses, including diabetes, hypertension, and arteriosclerosis. Vessels and arteries have many observable features, including diameter, color, tortuosity (relative curvature), and opacity (reflectivity). An accurate delineation of the boundaries of blood vessels makes precise measurements of these features possible. These measurements may then be applied to a variety of tasks, including diagnosis, treatment evaluation, and clinical study.

The goal of this project is to provide a hand-on experience in building a vessel detection algorithm. By doing so, you can learn how to apply the techniques studied in class.

Procedure

There are many methods for detecting retinal blood vessel reported in the literature, *e.g.*, [1, 2, 3]. Each group will need to implement one of these methods. Of course, you are more than welcome to choose another paper or design a novel approach.

The project procedure is briefly described below.

1. Download retinal images and hand-labeled ground truth from the following FTP server:

ftp://140.123.103.203/

Account:pr

Password:pr

2. Perform vessel detection by using one of the existing techniques, *e.g.*, [1, 2, 3].
3. Conduct an in-depth empirical evaluation and analysis of the chosen technique.
4. Plot the ROC curves of your vessel detection results. ROC analysis will be employed to assess performances of different implementations.

References

- [1] A. Hoover, V. Kouznetsova, M. Goldbaum, "Locating blood vessels in retinal images by piecewise threshold probing of a matched filter response", IEEE Transactions on Medical Imaging, (2000)
- [2] J.J. Staal, M.D. Abramoff, M. Niemeijer, M.A. Viergever, B. van Ginneken, "Ridge based vessel segmentation in color images of the retina", IEEE Transactions on Medical Imaging, (2004)
- [3] M. Sofka, C. V. Stewart, "Retinal vessel centerline extraction using multiscale matched filters, confidence and edge measures", IEEE Transactions on Medical Imaging, (2006)
- [4] <http://www.isi.uu.nl/Research/Databases/DRIVE/>