

Comparative Study of Retinal Vessel Segmentations

SIIT-Chiba project, October 15-22, 2015

Project Team in Retinal Group

- Project Advisor:
Asst. Prof. Dr. Pakinee Aimmanee
- Project head:
Ms. Nittaya Muangnak
(Ph.D Candidate from SIIT)
- Project members:
 - 1) Mr. Faisal Khan from SIIT
 - 2) Two Japanese students from Chiba University



Project Objective

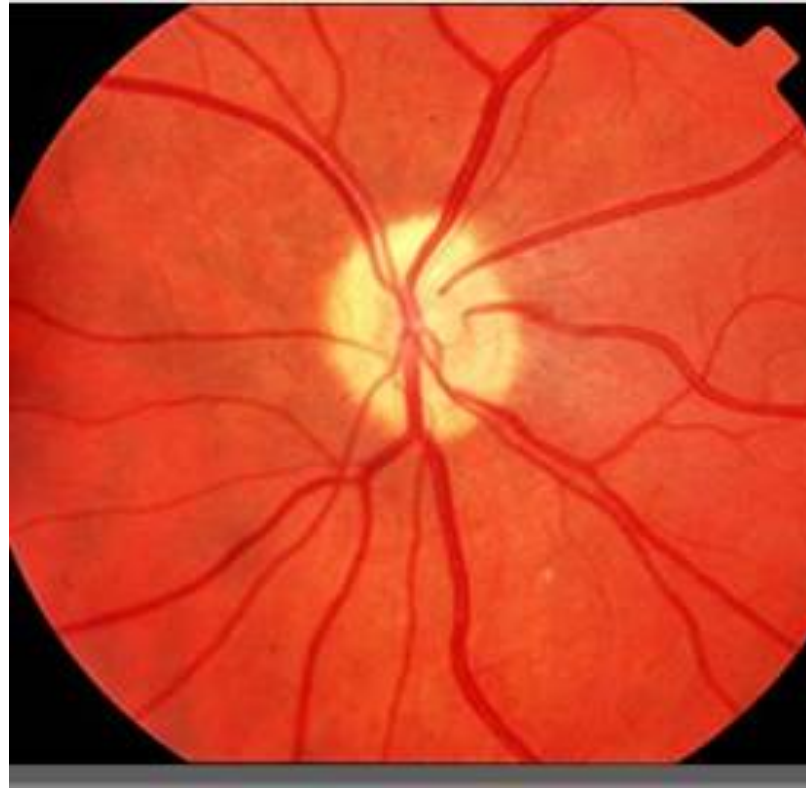
- To study existing retinal vessel segmentation techniques
- To compare performance of those retinal vessel segmentations.

Project Plan

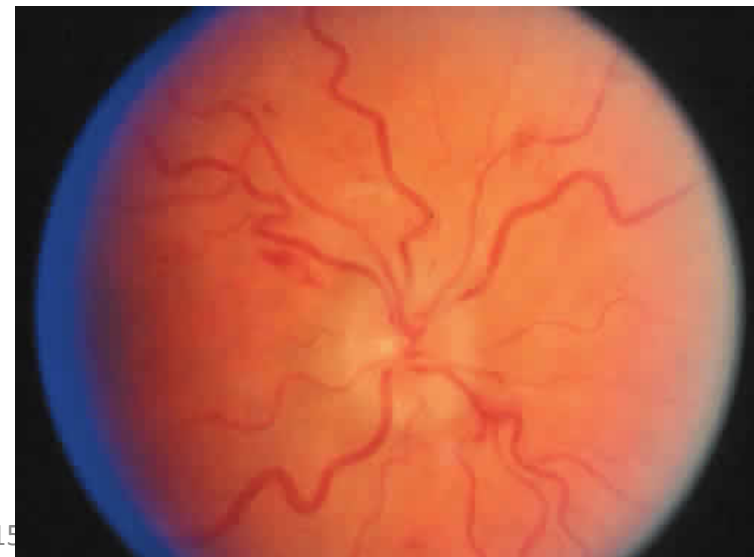
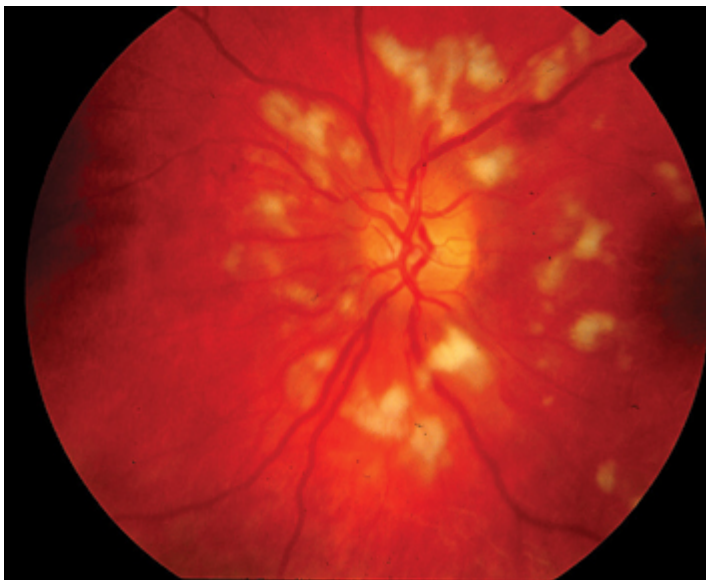
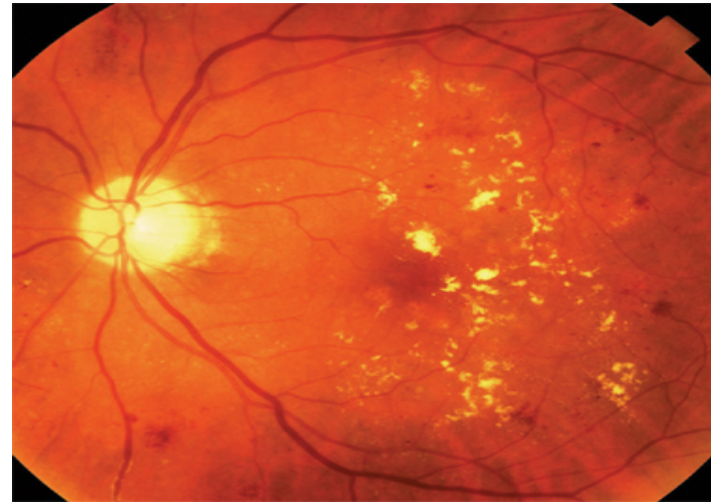
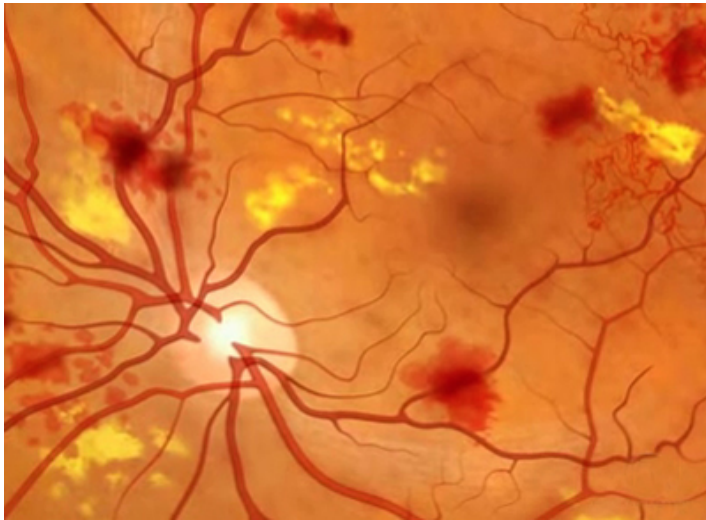
- **Day 1:** Introduction to the project
- **Day 2:** Review papers and some tutorials
- **Day 3-4:** Do experiments and evaluate the performances on selected approaches through demo applications
- **Day 5:** Discuss and present the results

Some Introduction to Vessel Segmentation Project

Retina Image of a normal eye



Retina Images of Abnormal Eyes



Retinal Component Segmentation and its applications

- Optic Disc (OD) → to diagnose glaucoma
- Hemorrhages → to diagnose eye disorder
- Exudate → to diagnose retinal diabetics
- Fovea → to diagnose visual conditions
- Vessels → for what?

Vessel Segmentation and its Applications

- To detect Retinopathy of prematurity (ROP) in infants, arteriosclerosis, and choroidal neovascularization
- To use vessels as clues to detect other components such as
Optic Disc.
 - Ex. Nittaya's work tries to detect and segment OD from the vascular networks from poor images



Challenges in Vessel Segmentation

- Some components look a lot like vessels.
- Some vessels cross each other.
- Some vessels are too thin, too short, or, too faint.

Vessel Segmentation Approaches

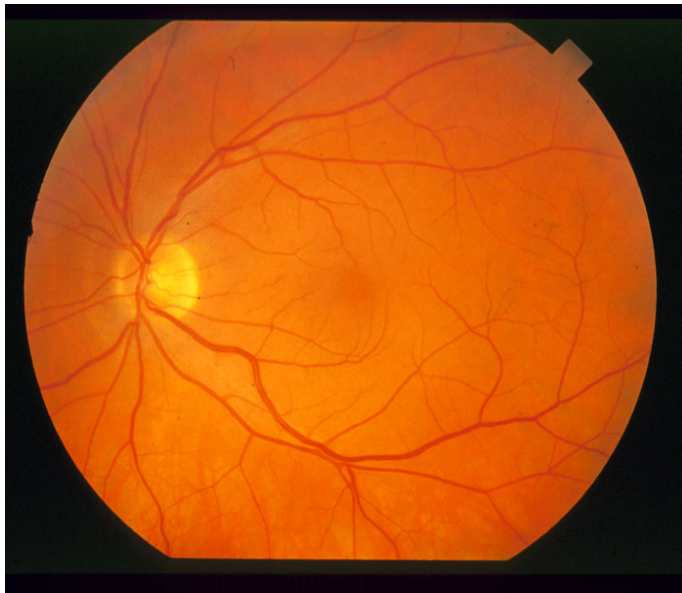
- Pixel processing-based methods: matched filtering
- Morphological processing
- Tracing/Tracking methods
- Pattern classification and machine learning: supervised and unsupervised methods
- Model-based approaches: vessel profile and deformable (active contour) models

Project Description

- To understand retinal vessel segmentations through following approaches:
 - 1) Local entropy thresholding
 - 2) Piecewise threshold probing
 - 3) Gradient orientation analysis
 - 4) Wavelets and edge location refinement

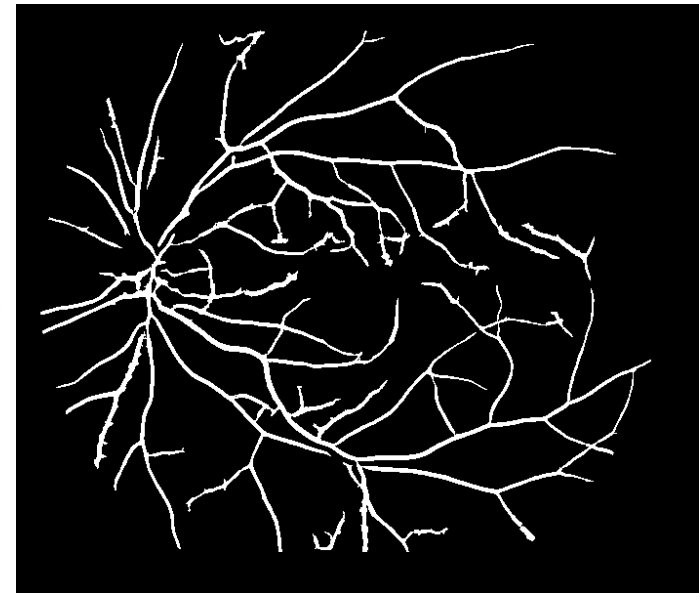
Plans

Input Image

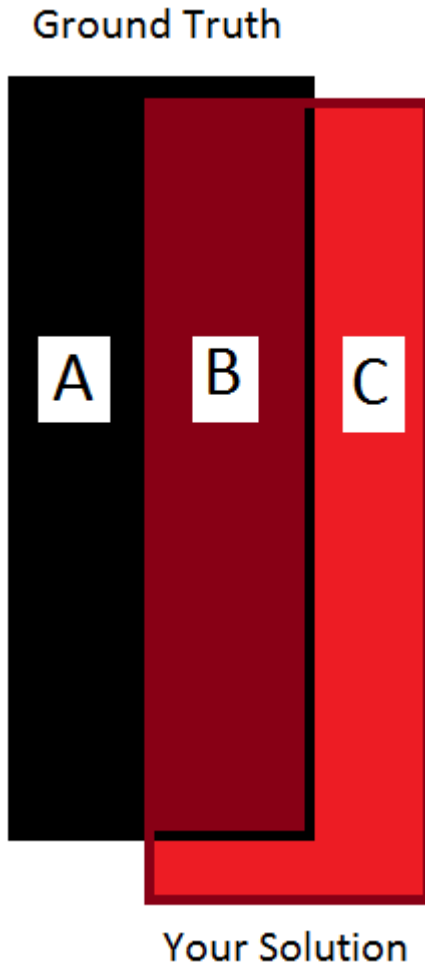


segmentation
approaches

Output Image



Performance Measures



Measurements	Description
Recall (Sensitivity)	$B/(A+B)$
Precision (Positive Predictive Value)	$B/(B+C)$

Thank you

