

# Department Seminars

## 3-D Analysis of Retinal OCT Images

**Milan Sonka, PhD**

The Iowa Institute for Biomedical Imaging  
University of Iowa



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### Abstract:

Recent addition of spectral domain optical coherence tomography (OCT) to the routinely available options of ophthalmologic retinal imaging has facilitated truly three-dimensional analysis of retinal properties. Consequently, several manufacturers now offer devices that scan the retina in 1-2 seconds and provide exquisite detail of retinal morphology. Typically, 3-D retinal OCT image (200x200x1000 voxels) covers area of about 6x6mm at in-plane resolution of 3 $\mu$ m and vertical resolution of 2 $\mu$ m and is usually focused on the macula or the optic nerve head.

We have developed a suite of OCT analysis methods for multi-layer retinal segmentation of macula and optic nerve head, optic nerve head cup and rim detection, vessel segmentation in OCT-projection and 3-D OCT images, and for mutual OCT-OCT and OCT-fundus photography image registration. This set of methods is built around our method for multi-surface multi-object graph based image segmentation that guarantees solution optimality and is directly applicable to n-D problems. The functionality and performance of the methods will be demonstrated on OCT images from patients suffering from frequent retinal diseases like diabetic retinopathy and glaucoma. We will show that our quantitative results from disease subjects – when compared to the normal subjects and visual field testing – show that different diseases affect specific retinal layers rather than the total retinal thickness and suggest a relationship between retinal layer morphology visual function.

### Short bio:

Milan Sonka received his Ph.D. degree in 1983 from Czech Technical University in Prague, Czech Republic. He is Professor of Electrical & Computer Engineering, Ophthalmology & Visual Sciences, and Radiation Oncology at the University of Iowa. He is chairman of the Department of Electrical and Computer Engineering at Iowa, Co-director of the Iowa Institute for Biomedical Imaging, IEEE Fellow, and AIMBE Fellow. His research interests include medical imaging and knowledge-based image analysis. He is the first author of 3 editions of Image Processing, Analysis and Machine Vision book (1993, 1998, 2008) and co-authored or co-edited 17 other books/proceedings. He has published more than 90 journal papers and over 270 other publications. He is Editor-in-Chief of the IEEE Transactions on Medical Imaging and member of the Editorial Board of the *Medical Image Analysis* journal. Dr. Sonka is co-founder of VIDA Diagnostics, a start-up company developing novel image-analysis tools for comprehensive quantitative assessment of pulmonary morphology and function and co-founder of Medical Imaging Applications, LLC, a company that develops and markets cardiovascular ultrasound image analysis research and clinical-care software.

**Monday,**

**April 13, 2009**

**5275 MSC**

**12:00-1:00 p.m.**

