

Syllabus for a Graduate Course in

Image Analysis

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COURSE OUTLINE

- Differential Geometry of Curves and Surfaces
- Calculus of Variations
- Level Sets and Curve Evolutions
- Edge Preserving Smoothing of Curves and Surfaces
- Edge and Corner Detection
- Edge Integration and Segmentation
- Planar Shape Description and Analysis
- Invariant Recognition of Planar Shapes
- Shape from Shading and Photometric Stereo
- Depth from Stereo and Epipolar Geometry
- Optic Flow and Shape from Motion
- Grid Geometry and Numerics
- Fun Topics: Autostereograms, Space Fiducials, Visual Navigation

LITERATURE

The following books are recommended:

- 1) G. Sapiro : Geometric Partial Differential Equations
- 2) R. Kimmel : Numerical Geometry of Images
- 3) V. Nalwa : A Guided Tour of Computer Vision
- 4) Paragios et al : Handbook of Mathematical Models in Computer Vision
- 5) Bruckstein: Lecture Notes in Image Analysis

REQUIRED BACKGROUND

Basic knowledge in numerical methods, partial differential equations and analysis.

ASSIGNMENTS

Questions for book chapter, and assignments from class.

FINAL EXAM

Final examination on topics covered.

SHORT BIO

Professor Alfred M. Bruckstein received the BSc (honors) and the MSc in Electrical Engineering from the Technion – Israel Institute of Technology, and the PhD in Electrical Engineering from Stanford University, in 1977, 1980 and 1984, respectively.

Since 1985, he has been a faculty member at the Technion – Israel Institute of Technology, Israel where he currently a full professor, holding the Ollendorff chair in Science. From October 2002 till Jan. 2006 Professor Bruckstein was the Dean of the Technion Graduate School, and today he is the Head of Technion's Excellence Program.

During the summers, from 1986 to 1995 and from 1998 to 2000 Professor Bruckstein was a visiting scientist at Bell Laboratories, while from 1995 to 1998 he was on a sabbatical there. Professor Bruckstein also held, during 2002-2003 a visiting chaired Professorship at Tsing-Hua University in Beijing, China.

Prof. Bruckstein was on the editorial boards of the Pattern Recognition Journal, Imaging Systems and Technology Journal, and the Circuits Systems and Signal Processing Journal. He served as a member of program committees of over 40 conferences and workshops. He is a member of SIAM, AMS and MAA.

His research interests are in Image and Signal processing, Image analysis (a.k.a. Computer vision), Computer Graphics, Pattern Recognition, Robotics, especially Ant Robotics, Applied Geometry, Estimation Theory and Inverse Scattering, and Neuronal Encoding Models.

Prof. Bruckstein was awarded the Rothschild Fellowship for Studies at Stanford, the Taub Award, a Theeman Grant for a scientific Tour of Australian Universities, and the Hershel Rich Technion