

KEYNOTE TALK
Wednesday, December 3, 2008
1:30 PM – 2:30 PM

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**Computer Vision in Medicine and Neuroscience:
Image guided neurosurgery and computational neuroanatomy**

W. Eric L. Grimson
Dept. of Electrical Engineering and Computer Science
Massachusetts Institute of Technology

Abstract

Algorithmic methods from computer vision and machine learning are dramatically changing the practice of health care and the exploration of fundamental issues in neuroscience. By coupling knowledge of tissue response, atlases of normal anatomy, and statistical models of shape variation, these methods are used to build detailed, patient-specific reconstructions of neuroanatomical structure from MRI imagery. Such structural models can be automatically augmented with information about function (using fMRI), and about connectivity (using DT-MRI) to create detailed models of a patient's brain. These models are routinely used for surgical planning – how to reach the target tumor with minimal damage to nearby critical structures; and for surgical navigation – guiding the surgeon to the target site rapidly and safely. By combining with statistical models of population variation, these methods can also be used to investigate basic neuroscience questions – how different are the shapes of subcortical structures between normal subjects and patients with a specific disease (such as schizophrenia or Alzheimer's); how do these shapes change with development in children, or with administration of pharmaceuticals; how do physiological properties differ between populations (such as the local structure of fiber orientation in white matter tracts). These computational methods provide a toolkit for exploring the structure and connectivity of neuroanatomical structures, in normal subjects and in diseased patients.



Speaker Bio-Sketch: Eric Grimson is the Bernard Gordon Professor of Medical Engineering in the Department of Electrical Engineering and Computer Science, at the Massachusetts Institute of Technology. He is also the Head of the EECS Department, and is a Lecturer on Radiology at Harvard Medical School. Professor Grimson received his B.Sc. from University of Regina and his Ph.D. from MIT. He has over thirty years experience as a researcher in computer vision and medical image analysis, having published two books, nearly 200 refereed articles, and six patents in this area. In recognition of these contributions, he was elected a Fellow of the American Association of Artificial Intelligence, and a Fellow of the IEEE. He has also won the Bose Award for Excellence in Teaching at MIT. Professor Grimson's research activities in computer vision have included stereovision, shape reconstruction, object recognition, image databases, and activity detection and recognition. For the past twelve years he has also been very active in the field of medical image analysis, especially in image guided surgery, multimodal registration, and segmentation of medical imagery. He has supervised more than 40 doctoral theses in these areas. Professor Grimson has served as General Chair or Program Chair for numerous international conferences including ICCV, CVPR, and MICCAI, and has participated on numerous government panels for DARPA, NSF, and NIH.