



Fall 2009 CIS Colloquium Series

Object Models for Boundary Extraction with Application to Medical Image Analysis

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Abstract: Object boundary extraction is an important task in computer vision and medical image analysis. It remains a challenging problem due to the common presence of cluttered objects, object texture, image noise and various other conditions. To address these difficulties, model-based methods, such as active contour models and active shape models, have been widely used with considerable success because of their ability to integrate high-level knowledge with information from low-level image processing. This talk will present a new object modeling framework which allows multiple properties to be attached to an object model in order to build in redundancy for robust image interpretation. In particular, we demonstrate the integration of constraints from shape, appearance, and spatial context, in a deformable object model, which we term “Active Volume Models.” If we think traditional deformable models as “active contours” or “evolving curve fronts”, the active volume models are “deforming disks or volumes” that have not only boundary shape but also interior appearance. As a model’s shape deforms, its interior intensity or texture appearance statistics are learned online adaptively. The model also has an embedded Bayesian classifier that separates object from background based on current feature information. When applied to object segmentation and tracking, the model alternates between two basic operations: deform according to current object prediction, and predict according to current appearance statistics of the model. The model is implemented in 2D and 3D, and also extended to incorporate spatial constraints between multiple interacting surfaces for simultaneously segmenting multiple objects. Applications will be shown for heart modeling and wall motion analysis from MRI and CT images.

Bio: Xiaolei Huang received her doctorate and masters degree in computer science from Rutgers, the State University of New Jersey, USA, and her bachelors degree in computer science from Tsinghua University, China. She is currently an Assistant Professor in the Computer Science and Engineering department at Lehigh University, Bethlehem, Pennsylvania, directing the Image Data Emulation and Analysis (IDEA) lab. Dr. Huang's research interests are in the areas of biomedical image analysis and computer vision. She focuses on developing novel and robust algorithms for modeling deformable (i.e. non-rigid) objects, segmentation, registration, tracking and pattern recognition, with application to analyzing biomedical images. In these areas she has published numerous journal articles, book chapters, and conference proceedings papers. She serves on the program committees of several international conferences on computer vision and biomedical image computing, and is a reviewer for journals including TPAMI, IJCV, MedIA and TIP. Her research is funded by NSF, NIH, and the Pennsylvania state. The homepage of Dr. Huang is at <http://www.cse.lehigh.edu/~huang>.

Refreshments will be served!