



Fall 2009 CIS Colloquium Series

# Geometric Context in 3D Computer Vision

**Gang Li**

(Siemens Corporate Research)

*11am-12pm, Wednesday, October 28*

*4<sup>th</sup> Floor Conference Room (Wachman Hall, CC 447)*

**Abstract:** Central to 3D computer vision are tasks such as stereo reconstruction, 3D tracking, Structure and Motion, etc. Although there exist solutions to these problems, they tend to use context either heuristically or incorrectly when applied to scenes with rich, natural structures. Therefore, a rigorous study of the geometric context is crucial. The key message in this talk is such an analysis based on differential geometry. And it is demonstrated within powerful inference algorithms. In the first part I describe a frame based geometric analysis for stereo vision, and propose a set of differential geometric constraints for both curve matching and surface dense stereo. The derived differential geometric consistency in effect exploits the correct geometric context for stereo, and has resulted in much improved feature-based and surface dense stereo algorithms for complex natural scenes. In the second part I study geometric context for 3D edge-based tracking, and propose a unified representation for both fixed model edges and occluding contours. This immediately advances state-of-the-art edge-based 3D tracking algorithms to handle occluding contours. Finally, in the third part, the geometric context is studied for the problem of motion estimation (in the form of affine epipolar geometry). Once again, it reveals that critical information is actually available and suggests a novel, globally optimal solution. Although shown with specific problems in 3D computer vision, the underlying analysis of geometric context is also applicable to related fields such as computer graphics, human-computer interaction, and medical image analysis.

**Bio:** Gang Li received the PhD degree in computer science from Yale University in 2006. Before that he received the BS degree from Xi'an Jiaotong University in 1997 and the MS degree from Tsinghua University in 2000, also in computer science. Since October 2006, he has been with Siemens Corporate Research in Princeton, New Jersey, where he is a research scientist. His current research interests are in 3D computer vision for reconstruction, tracking, and recognition; in computer graphics for geometry processing; and in human-computer interaction for augmented reality. More details can be found at: <http://www.cs.yale.edu/~li-gang>

*Refreshments will be served!*