Department Of Mathematics

Applied Mathematics Seminar

Mario Micheli

Harvey Mudd College

Title: **A geometric method for image recovery through optical turbulence**

Abstract:

The phenomenon that is commonly referred to as optical "turbulence" in imaging is caused by the time and space-varying refraction index of the air which is due, among other factors, to temperature, air pressure, humidity, and wind conditions between the acquired scene and the image-capturing device. The resulting image sequence is also affected by the different and changing lighting conditions within the scene, by the actual distance between the observed objects and the camera, and by other artifacts introduced by the device itself. The above described distortion may be modeled, at least to a first approximation, as the combined effect of (i) a blur with an anisoplanatic point spread function and (ii) a time-dependent deformation of the image domain. In this talk I will describe an algorithm that, starting from this observation, first employs a geometric method for restoring the structure of the scene, and then uses variational deconvolution techniques to yields a crisp, final result. The algorithm may also be viewed as an alternate minimization procedure of a functional that includes a data matching term, a regularization term for the deformations, and a regularization term for the recovered image. The algorithm has proven very effective for the the recovery of images affected by both ground-level atmospheric blur, and by underwater turbulence caused by temperature gradients.

About the speaker:

Micheli completed his undergraduate studies in telecommunications engineering at the University of Padova (Italy), holds a M.S. degree in electrical engineering from UC Berkeley and a PhD in applied mathematics from Brown University. Before joining Harvey Mudd College he held teaching positions at several institutions of higher education, including UCLA, the University of Washington, the University of San Francisco, and Bowdoin College.

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11:00 – 12:00pm

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