COLUMBIA | ENGINEERING
The Fu Foundation School of Engineering and Applied Science

Distinguished Colloquium Series in Interdisciplinary & Applied Mathematics

Peter Schroeder

Professor of Computer Science and Applied and Computational Mathematics
California Institute of Technology

Discrete Differential Geometry: From Geometry to Computation

Many of the mathematical descriptions of the world around us are expressed in the language of differential geometry. Physics, in a sense, is geometry and our computations should reflect this. But do they? Traditionally numerical analysis has focused on recovering relationships between measurable variables in the infinitesimal limit, i.e., when using ever finer discretizations of some smooth problem statement. Instead I advocate that essential structure of the underlying equations should be captured even at finite resolution. I will illustrate my arguments with examples from recent research. 1) What is the smoothest direction field on a curved surface? (Can't comb a sphere without a cow lick someplace...) 2) Current flowing through a wire causes a magnetic field; given only the field, can you find the wire(s)? These two examples use the same machinery albeit in different dimensions (surfaces and volumes respectively). You'll learn about line bundles, connections, curvature, and ground states of Schrödinger operators. Come to the talk to find out what these terms mean and how they all connect!

Joint work with Felix Knöppel, Keenan Crane, Steffen Weißmann, and Ulrich Pinkall

Peter Schröder is professor of computing and mathematical sciences at Caltech where he has been a member of the faculty for the past 19 years. His research area is computer graphics and more specifically efficient numerical methods for Digital Geometry Processing, a research area he helped co-found. This work has been honored with the ACM SIGGRAPH Computer Graphics Achievement award as well as other recognitions among them a Packard Fellowship, the Humboldt Prize, and a Hans Fischer Senior Fellowship. His current work centers on Discrete Differential Geometry, which aims to develop discrete theories and algorithms which parallel the smooth setup of classical Differential Geometry.

Thursday, January 29, 2015 - 5:00pm

750 CEPSR (Shapiro Center)

Refreshments served at 4:30pm in 200 SW Mudd

Organizing Committee:
Don Goldfarb (IEOR)
Eitan Grinspun (Computer Science / APAM)
Ioannis Karatzas (Mathematics)
Michael I. Weinstein (APAM / Mathematics)

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