KEYNOTE TALK Monday, November 26, 2007 9AM-10AM

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Bringing Geometry Back into Computations

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Abstract

Since its inception, computer graphics has thrived by borrowing from mathematical and physical models and by making inroads into computational science---be it in radiosity, surface processing, or fluid simulation. However, it is routinely observed that the passage from differential modeling to discrete implementation often lacks the necessary safeguards to guarantee the preservation of important continuous properties in the resulting discrete algorithms, leading to classical flaws such as numerical viscosity and energy blowups. In this talk, we will argue for a more geometric approach to computations. We will show that a discrete geometry-driven calculus can indeed leverage the mature geometric understanding of differential calculus on manifolds (going back to Cartan) on which most physical theories are based. The resulting properties like symmetries and invariants, but also clarify abstract concepts of algebraic topology. We will demonstrate these properties in a number of graphics and simulation contexts, including medical and geometric modeling applications.



Speaker Bio-Sketch: Mathieu Desbrun is an Associate Professor at the California Institute of Technology (Caltech). After receiving his Ph.D. from the National Polytechnic Institute of Grenoble (INPG), he spent a year as a post-doctoral researcher at Caltech in the Multires Modeling Group before joining the faculty of the Computer Science department at the University of Southern California from 2000 to 2004. He now leads the Applied Geometry lab at Caltech, focusing on *discrete differential modeling*—the development of differential, yet readily discretizable foundations for computational modeling—and a wide spectrum of applications, ranging from discrete geometry processing to solid and fluid mechanics and field theory. Desbrun is as an Associate Editor for the ACM Transactions on Graphics, and regularly serves on program committees of international graphics venues He is the recipient of an ACM

SIGGRAPH New Significant Researcher award, and of a NSF CAREER award. http://www.cs.caltech.edu/~mathieu