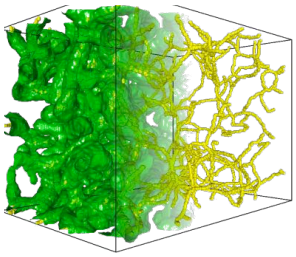
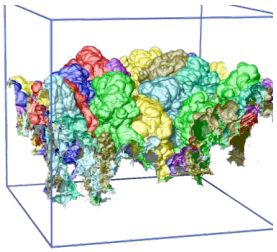


Multi-Scale Morse Theory for Science Discovery



Lunedì 28 Novembre 2016 ORE 16:00 -- COLLOQUIUM
Dipartimento di Matematica e Fisica Università degli Studi Roma Tre
Aula F, primo piano, edificio Aule - Largo San Leonardo Murialdo,1

Valerio Pascucci
Director, Center for Extreme Data Management Analysis and Visualization (CEDMAV)
Faculty, Scientific Computing and Imaging Institute
Professor, School of Computing, University of Utah
CEO, ViSUS LLC

ABSTRACT

Advanced techniques for analyzing and understanding Big Data models are a crucial ingredient for the success of any supercomputing center and data intensive scientific investigation. Such techniques involve a number of major challenges such as developing scalable algorithms that run efficiently on the simulation data generated on the largest supercomputers in the world or incorporating robust methods are provably correct and complete in their extraction of features from the data.

In this talk, I will present the application of a discrete topological framework for the representation and analysis of large scale scientific data. Due to the combinatorial nature of this framework, we can implement the core constructs of Morse theory without the approximations and instabilities of classical numerical techniques. The inherent robustness of the combinatorial algorithms allows us to address the high complexity of the feature extraction problem for high resolution scientific data.

Our approach has enabled the successful quantitative analysis for several massively parallel simulations including the study turbulent hydrodynamic instabilities, porous material under stress and failure, the energy transport of eddies in ocean data used for climate modeling, and lifted flames that lead to clean energy production.

During the talk, I will provide a live demonstration of the effectiveness of some software tools developed at the Center for Extreme Data Management Analysis and Visualization (CEDMAV) and discuss the deployment strategies in an increasing heterogeneous computing environment including DOE parallel supercomputers such as Titan or Mira.

BIOGRAPHY

Valerio Pascucci is the founding Director of the Center for Extreme Data Management Analysis and Visualization (CEDMAV) of the University of Utah. Valerio is also a Faculty of the Scientific Computing and Imaging Institute, a Professor of the School of Computing, University of Utah, and the CEO of ViSUS LLC (visus.net). Valerio was named Laboratory Fellow at PNNL and was recently a visiting professor in KAUST University. Before joining the University of Utah, Valerio was the Data Analysis Group Leader of the Center for Applied Scientific Computing at Lawrence Livermore National Laboratory, and an Adjunct Professor of Computer Science at the University of California Davis. Valerio's research interests include Big Data management and analytics, progressive multi-resolution techniques in scientific visualization, discrete topology, geometric compression, computer graphics, computational geometry, geometric programming, and solid modeling. Valerio is the coauthor of more than two hundred refereed journal and conference papers and book chapters and is an Associate Editor of the IEEE Transactions on Visualization and Computer Graphics.