Temple University Mathematics Colloquium

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MIT

will speak on

Benefits and challenges of particle methods

ABSTRACT: *Panta rhei* – everything flows. While advection is a fundamental aspect in fluid flows, traffic modeling, and conservation laws, its numerical treatment is still subject to improvement. Particles can solve advection exactly, by moving with the flow. This benefit comes at a price: Regular data structures are lost. Three strategies to address this challenge are presented.

Global remeshing: A gradient–augmented level set approach is derived from the method of characteristics in combination with a global Hermite interpolation. The presence of gradients allows the representation of subgrid structures.

Local remeshing: A particle method for scalar conservation laws is presented, that uses characteristic particles, and resolves shocks by purely local particle merges.

No remeshing: In truly meshfree particle methods for incompressible flows, the Poisson equation has to be solved on an unstructured cloud of points. A new approach, based on linear optimization, guarantees optimally sparse, positive stencils.

Wednesday, 4 February 2009
Lecture at 4:00 pm
Coffee, tea, and refreshments from 3–5 pm
Room 617, Wachman Building
Department of Mathematics