Department of Mathematical Sciences Colloquium

Tenure-track faculty position candidate in Computational Mathematics

GUSTAAF JACOBS
Brown University

Simulation of Mixed Continuum-Discrete Physics with High-Order Methods

In the last decade, high-order multidomain methods have established themselves as effective methods for long time integration of complex high-frequency wave-dominated continuum problems. They have for example shown to be superior for simulation of electromagnetic scattering on aircraft and simulation of turbulent flows in complex geometries.

High-order methods secure their geometric flexibility by using fully unstructured grids, they can have arbitrary order of accuracy, and have excellent stability properties. I will present the development of high-order multidomain methods for the simulation of problems in the continuum-discrete framework. In this framework the governing continuum equations are solved on a static grid, while individual particles are tracked using a Lagrangian formulation. The focus is to carry over the favorable aspects of the continuum high-order method to the continuum-discrete framework, i.e. to develop efficient, high-order space and time methods for moving particles, complex particle-boundary interactions, and for coupled discrete phase and continuum phases. I will illustrate the benefits of the method through simulations of astrophysical and industrial plasma dynamics, where the electromagnetic continuum is described by the Maxwell's equations and the discrete framework consists of electrons and ions. I will also present simulations of particle-laden flows with relevance to combustors, where the Navier-Stokes equations govern the fluid continuum, and liquid fuel droplets govern the discrete framework.

Friday, March 3, 2006, at 3:00 pm in Bell Hall 143
The University of Texas at El Paso

Refreshments will be served in front of the colloquium room 15 minutes before the start of the colloquium.

For further information, please contact Dr. Pavel Šolín, Bell Hall 220. Phone: (915) 747-6770, email: `solin@utep.edu`.