Matrix Computations & Scientific Computing Seminar

Organizer(s): James Demmel & Ming Gu

Wednesday, 11:00am–12:00pm, 380 Soda

March 17 **Avi Robinson-Mosher**, Stanford University

A symmetric positive definite method for fluid-structure interaction

Fluid-structure interaction is a well studied problem with many applications in fields such as aeronautics, biomedical technology and computer graphics. It poses the challenge of trying to couple two fundamentally different domains in a physical and accurate way. Use of more accurate constitutive models requires that structures be simulated on a Lagrangian mesh and fluid simulated on an Eulerian mesh, but this presents the difficulty of dealing with non-aligning meshes, making it hard to conserve momentum. Explicit and partitioned methods for coupling impose strict time step restrictions and have stability and accuracy issues. I will present a method for fluid-structure interaction which handles the problem of non-aligning meshes, treats the coupled system in an implicit manner making it stable for arbitrary time steps, large density ratios, etc., and allows for general interface boundary conditions. The method works for both volumetric objects and thin shells, which may be either rigid or deformable. While earlier versions of the method resulted in an indefinite linear system, we recently discovered a factoring trick that allows the system to become positive definite.