Computational Mathematics Seminar Series

Overcoming the added-mass instability for coupling incompressible flows and elastic beams

Longfei Li, University of Louisiana at Lafayette

Assistant Professor

Digital Media Center 1034
April 17, 2018 - 03:30 pm

Abstract:

A new partitioned algorithm is described for solving fluid-structure interaction (FSI) problems coupling incompressible flows with elastic structures undergoing finite deformations. The new algorithm, referred to as the Added-Mass Partitioned (AMP) scheme, overcomes the added-mass instability that has for decades plagued partitioned FSI simulations of incompressible flows coupled to light structures. Within a Finite-Difference framework, the AMP scheme achieves fully second-order accuracy and remains stable, without sub-time-step iterations, even for very light structures when added-mass effects are strong. The stability and accuracy of the AMP scheme is validated through mode analysis and numerical experiments. Aiming to extend the AMP scheme to an Finite-Element framework, we also develop an accurate and efficient Finite-Element Method for solving the Incompressible Navier-Stokes Equations with high-order accuracy up-to the boundary.

Speaker's Bio:

Dr. Li received his Ph.D. in Applied Mathematics from the University of Delaware under the supervision of Professor Richard Braun in 2014. Dr. Li was subsequently appointed the Margaret A. Darrin Postdoctoral Fellow at Rensselaer Polytechnic Institute (RPI) working with Professor Henshaw, before joining the faculty in the Department of Mathematics at the University of Louisiana at Lafayette as an assistant professor in August, 2017. Dr. Li's research interests broadly lie in the development, analysis and implementation of high-performance computational algorithms to solve partial differential equations (PDEs) and the formulation of mathematical models for multi-physics problems.

This lecture has refreshments @ 03:00 pm

Center for Computation & Technology
2003 Digital Media Center • Telephone: +1 225/578-5890 • Fax: +1 225/578-8957