Special Guest Lectures

Dual-Mixed Finite Element Methods for Fluids

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Abstract:
Accurate and efficient numerical methods to approximate fluid flows are important to researchers in many fields, including mechanical, materials, and biomedical engineering. In many applications within these fields, it is of paramount importance to accurately predict fluid stresses. However, in most existing numerical schemes for fluids, the primary unknown of interest is the fluid velocity. This motivates the development of dual-mixed finite element methods for fluids, in which the stress is a primary unknown of interest, and the study of inf-sup conditions for single and twofold saddle point problems is an important component of the construction of these methods. This study has led to results that give equivalent sets of inf-sup conditions for twofold saddle point problems, yielding new tools for proofs of well-posedness and finite element compatibility. These tools, together with a macroelement technique, show compatibility of a new dual-mixed method for fluids employing Arnold-Winther symmetric tensor finite elements for stress.

Speaker's Bio:
Jason Howell is a Postdoctoral Associate in the Center for Nonlinear Analysis and the Department of Mathematical Sciences at Carnegie Mellon University. He earned a PhD in Mathematical Sciences at Clemson University in 2007 with a specialty in numerical analysis and computational mathematics. During 2004-2006, he had three appointments as a summer scholar with the Center for Applied Scientific Computing at Lawrence Livermore National Laboratory. He also holds an MS in Mathematical Sciences from Clemson and a BS in Mathematics from the College of Charleston. His research interests lie at the intersection of analysis, computation, and applications, and he currently works on projects in finite element methods for fluid and solid mechanics, numerical methods for non-Newtonian fluids, and numerical methods for fluid/fluid and fluid/structure interaction problems.

Refreshments will be served.
This lecture has a reception.

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