MS17: Numerical Approximation of Partial Differential Equations II

Darcy Fluid Flow with Deposition

Javier Ruiz-Ramirez, *Clemson University*

In this talk we consider a Darcy flow problem coupled with a deposition function. Our model arises in the context of filtration, where a fluid carrying some particulate flows through some porous medium. As the particulate deposits, the porosity of the filter changes, modifying the flow conditions. In the talk we will motivate the model, discuss the existence and uniquess of our problem, provide an a priori error analysis and show some computational results.

A Multi-Domain Spectral IPDG Method for the Helmholtz Equation

Lunji Song, *Lanzhou University*

We present a multi-domain spectral method, based on an interior penalty discontinuous Galerkin (IPDG) formulation, for the exterior Helmholtz problem truncated via an exact circular Dirichlet-to-Neumann (DtN) boundary condition. An effective iterative approach is proposed to localize the global DtN boundary condition and is given in three specific cases. Under a discontinuous Galerkin formulation, the proposed method allows to derive explicit wave number dependence estimates of the spectral scheme.

Multilevel Sampling with Adaptive Mesh Refinement

Hans-Werner van Wyk, *Florida State University*

Adaptive mesh refinement has become an invaluable tool in numerical simulations of systems governed by partial differential equations (PDEs), leading to considerable reductions in computational work. For PDEs with stochastic parameters, however, spatial adaptivity is complicated by the presence of multiple realizations, each with potentially different local error estimates. This talk discusses how adaptive mesh refinement can be naturally incorporated into the framework of multilevel sampling methods. Numerical illustrations accompany our theoretical results throughout.

Error Estimation for Quasi-Newtonian Fluid-Structure Interaction Problems

Shuhan Xu, *Clemson University*

We consider a monolithic scheme for fluid-structure interaction problems involving an incompressible quasi-Newtonian fluid. The monolithic formulation is obtained based on the Arbitrary Lagrangian Eulerian method (ALE) with the matching conditions at the interface. The stability and error analysis are performed for the finite element approximation and fully discretized scheme. Some numerical experiments that confirm the theoretical analysis are presented.