Special Guest Lectures

A Preconditioned Scheme for Nonsymmetric Saddle-point Problems

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Abstract:
In this talk, we present an effective preconditioning technique for solving nonsymmetric saddle-point problems. In particular, we consider those saddle-point problems that arise in the numerical simulation of particulate flows -- flow of solid particles in incompressible fluids, using mixed finite element discretization of the Navier-Stokes equations. These indefinite linear systems are solved using a preconditioned Krylov subspace method with an indefinite preconditioner. This creates an inner-outer iteration, in which the inner iteration is handled via a preconditioned Richardson scheme. We provide an analysis of our approach that relates the convergence properties of the inner to the outer iterations. Also "optimal" approaches are proposed for the implicit construction of the Richardson's iteration preconditioner. The analysis is validated by numerical experiments that demonstrate the robustness of our scheme, its lack of sensitivity to changes in the fluid-particles system, and its "scalability".

Speaker's Bio:
Dr. Abdelkader Baggag obtained his Ph.D. from the University of Minnesota in Computer Science. Dr. Baggag's research interests are parallel numerical algorithms for large scale engineering applications, and their efficient implementation on massively parallel computers.

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