Applied Mathematics

Construction and Analysis of Hybridized discontinuous Galerkin methods for incompressible magnetohydrodynamics equations

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The magnetohydrodynamics (MHD) equation is a large-scale system coupling Maxwell and Navier-Stokes equations. In this talk, we systematically construct and rigorously analyze an upwind hybridized discontinuous Galerkin method (HDG) for linearized incompressible MHD equations. It is an implicit high order discontinuous Galerkin (DG) method with the unique property that the coupled unknowns reside on the mesh skeleton, i.e., the faces, hence computational costs are substantially less compared to classical DG methods. Furthermore, once the traces are solved for, volume unknowns can be recovered element-by-element completely in parallel. It is therefore well-suited contemporary and future high-performance computing systems.

This is a joint work with Stephen Shannon (University of Texas at Austin, US), Tan Bui-Thanh (University of Texas at Austin, US), and John Shadid (Sandia Research Laboratory, US) .