A Sparse Grid Discontinuous Galerkin Method for High-Dimensional Transport Equations

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In this talk, we present a sparse grid discontinuous Galerkin (DG) scheme for transport equations and applied it to kinetic simulations. The method uses the weak formulations of traditional Runge-Kutta DG schemes for hyperbolic problems and is proven to be L^2 stable and convergent. A major advantage of the scheme lies in its low computational and storage cost due to the employed sparse finite element approximation space. This attractive feature is explored in simulating Vlasov and Boltzmann transport equations. Good performance in accuracy and conservation is verified by numerical tests in up to four dimensions.