DPG FOR VLASOV: TWO FORMULATIONS AND SELECTED RESULTS

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ABSTRACT

Efficient solution of the Vlasov equation, which can be up to six-dimensional, is key to the simulation of many difficult problems in plasma physics. The discontinuous Petrov-Galerkin (DPG) finite element methodology provides a framework for the development of stable (in the sense of LBB conditions) finite element formulations, with built-in mechanisms for adaptivity. We present two DPG-based formulations for Vlasov: a time-marching, backward-Euler formulation, and a space-time formulation, with an ultimate target of solving problems in the full seven-dimensional setting. For this purpose, we employ tensor-product data representations supported by recent additions to the Intrepid2 package within Trilinos, as well as corresponding developments within Camellia, a finite element library designed to facilitate rapid development of computationally efficient, hp-adaptive finite element solvers, starting with support for DPG. In this talk, we discuss our progress to date, including adaptive results from 1D1V time-marching and space-time Vlasov-Poisson problems.

References

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