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Multisymplectic HDG methods

For Hamiltonian ODEs, symplectic numerical integrators exhibit superior numerical performance in a global sense. For Hamiltonian PDEs, a suitable numerical method should be "multisymplectic" — but what does this mean? We answer this question using the "unified framework" of Cockburn et al. for hybridizable discontinuous Galerkin (HDG) methods, which turns out to be particularly well-suited to this problem. Specifically, we give necessary and sufficient conditions for an HDG method to be multisymplectic, and we examine these criteria for several popular methods.

(Joint work with Robert McLachlan, Massey University, New Zealand.)