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Discontinuous Petrov-Galerkin Methods for the Time-dependent Maxwell Equations

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Discontinuous Petrov Galerkin (DPG) methods are made easily implementable using "broken" test spaces, i.e., spaces of functions with no continuity constraints across mesh element interfaces. Broken spaces derivable from a standard exact sequence of first order (unbroken) Sobolev spaces are of particular interest. A characterization of interface spaces that connect the broken spaces to their unbroken counterparts is provided. We introduce and analyze a family of DPG methods for the time-dependent Maxwell equations. The schemes are based on the backward Euler time-stepping and use a primal variational formulation at each time-step. Preliminary results yield a method with optimal energy-norm error estimates for general Lipschitz polyhedral domains. Numerical experiments are reported to support the theoretical results.

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