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Superconvergence and Error Estimation for DG Methods on Unstructured Grids

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ABSTRACT

The discontinuous Galerkin method (DGM) uses discontinuous finite element basis functions which simplify hp adaptivity and lead to a simple communication pattern across faces that makes them attractive for parallel and adaptive computations. In order for the DGM to be useful in an adaptive setting, techniques for estimating the discretization errors should be available both to guide adaptive enrichment and to provide a stopping criteria for the solution process. We will present new superconvergence results and show how to construct effective estimates of the finite element discretization error using superconvergence of DG solutions. We present superconvergence results for first-order transient hyperbolic problems and discuss efficient *a posteriori* error estimation techniques for transient linear and nonlinear problems on structured and unstructured meshes.