A discontinuous Galerkin time integration scheme for second order differential equations with applications to seismic wave propagation problems

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ABSTRACT

In this work, we present a new space-time Discontinuous Galerkin (DG) scheme for second-order hyperbolic problems. The method is a combination of a DG space discretization on polygonal grid and a DG time integration scheme for second-order differential equations. We show that the resulting discrete formulation is well-posed, stable and retains super-optimal rate of convergence with respect to the time discretization parameters, namely the time step and the polynomial approximation degree. A set of two- and three-dimensional numerical experiments confirm the theoretical bounds. Finally, we show the application of the method to realistic geophysical applications.