

A Discontinuous Galerkin method for nonlinear hyperbolic PDEs on embedded surface

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Abstract

Solving partial differential equations (PDEs) on surfaces presents significant challenges, which can be addressed using a variety of numerical methods. This work focuses on the *embedded surface method*, where a background mesh embedding the surface is used, rather than relying on an explicit surface discretization. Specifically, we investigate the combination of the discontinuous Galerkin (DG) method with the embedded surface approach for solving nonlinear hyperbolic systems on surfaces, such as the shallow-water equations. A critical component of this approach is the choice of tangential projector in the gradient formulation, which directly affects the method's accuracy. Several test cases in both two and three dimensions are presented to demonstrate the effectiveness and validity of the proposed method.