Propagating Hyperbolic Solutions Through Unstructured Tents

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Abstract

Discontinuous Galerkin methods based on an unstructured partitioning of a spacetime domain into tent-shaped regions are considered. The tents provide an easy mechanism to respect causality while enabling the use of widely varying spatial mesh sizes and temporal step sizes, even in the (spatiotemporal) higher order context. Provided that an approximate solution is available at the tent bottom, the equation can be locally evolved up to the top of the tent. By mapping tents to a domain which is a tensor product of a spatial domain with a time interval, it is possible to construct a fully explicit scheme that advances the solution through unstructured meshes. Specialized time stepping schemes, named SAT (Structure-Aware Taylor) and SARK (Structure-Aware Runge-Kutta) schemes are advocated for explicit time stepping within a tent. Recent progress in understanding the stability of such methods will be presented.

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