Invariant domain preserving limiting of time explicit and time implicit discretizations for systems of conservation laws

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Abstract. This work concerns the design and analysis of a limiting technique that allows the preservation of invariant domains for high-order numerical approximations of nonlinear hyperbolic systems of conservation laws. The method can be applied to any conservative discretization method in space as well as to a wide range of explicit and implicit time integration schemes. The method limits the high-order solution around a low-order accurate solution that is known to preserve all the invariant domains. It generalizes the flux-corrected transport limiter [1-3] to systems of conservation laws.

We will give details on the derivation of this limiting technique and show some numerical illustrations with finite volume or discontinuous Galerkin (DG) space discretizations associated to explicit or implicit Runge-Kutta methods as well as to time DG integrations.

References

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