

Reinterpretation and Simplified Implementation of a Discontinuous Galerkin Method for Hamilton-Jacobi Equations

Fengyan Li and Chi-Wang Shu

Abstract

In this note, we reinterpret a discontinuous Galerkin method originally developed by Hu and Shu [1] (see also [2]) for solving Hamilton-Jacobi equations. By this reinterpretation, numerical solutions will automatically satisfy the curl-free property of the exact solutions inside each element. This new reinterpretation allows a method of lines formulation, which renders a more natural framework for stability analysis. Moreover, this reinterpretation renders a significantly simplified implementation with reduced cost, as only a smaller subspace of the original solution space in [1, 2] is used and the least square procedure used in [1, 2] is completely avoided.

References

- [1] C. Hu and C.-W. Shu, *A discontinuous Galerkin finite element method for Hamilton-Jacobi equations*, SIAM Journal on Scientific Computing, v21 (1999), pp.666-690.
- [2] O. Lepsky, C. Hu and C.-W. Shu, *Analysis of the discontinuous Galerkin method for Hamilton-Jacobi equations*, Applied Numerical Mathematics, v33 (2000), pp.423-434.