

Hierarchical reconstruction as a limiter for solving hyperbolic conservation laws



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Pickard Hall, Room 304**

Abstract:

In this talk, I will discuss some recent developments of hierarchical reconstruction (HR) [Liu et al., Central discontinuous Galerkin methods on overlapping cells with a non-oscillatory hierarchical reconstruction. *SIAM J. Numer. Anal.*, 45:2442-2467, 2007 and Xu et al., Hierarchical reconstruction for discontinuous Galerkin methods on unstructured grids with a WENO type linear reconstruction and partial neighboring cells. *J.C.P.* 228:2194-2212, 2009] for limiting solutions computed by spectral volume and RKDG methods for solving hyperbolic conservation laws. HR is applied to a piecewise quadratic polynomial on two-dimensional unstructured grids as a limiting procedure to prevent spurious oscillations in numerical solutions. The key features of the HR are that the reconstruction on each element only uses adjacent neighbors, which forms a compact stencil set, and there is no truncation of higher degree terms of the polynomial. At each HR stage, we only do a linear polynomial reconstruction. Thus the algorithm is easy to implement. We explore a WENO-type linear reconstruction on each hierarchical level for the reconstruction of high degree polynomials. We demonstrate that the hierarchical reconstruction can generate essentially non-oscillatory solutions while keeping the resolution and desired order of accuracy for smooth solutions. Numerical experiments show that HR is efficient.

The Math Department will provide refreshments 30 min. prior to the presentation.