Title: **Nondissipative and energy-stable high-order finite-difference interface schemes for 2-D patch-refined grids**

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Adaptive mesh refinement (AMR) methods are appealing for problems with a wide range of length scales. The ability to increase the resolution only where is required makes them efficient in terms of computing resources.

On domains consisting of an assembly of coarse grids and fine grids, the problem of carrying information across the different levels can be solved in two ways; dealing with the solution as it were separate problems with an additional compatibility relationship between grids or, as in the case of this work, assuming that a smooth solution for the full domain exists and it is well represented across the boundaries.

Solution for that problem was presented by the authors in [1] for 1-D domains. In there they use the summation by parts condition to ensure stability of higher order schemes. The extension to the 2-D case is not straightforward as it involves the additional complexity of having to deal with several interface geometries (where the coarse and fine patches meet) that require the analysis on different stencils. To make the analysis manageable the authors consider only those cases with a refining factor of 2 on both directions.

The schemes developed for each of the interior geometries satisfy the summation by parts condition by construction, guaranteeing stability. Numerical tests for the advecting wave and inviscid compressible vortex problems are shown.

References:

1. R.M.J. Kramer, C. Pantano and D. I. Pullin, A class of energy-stable higher-order finite-difference interface schemes suitable for adaptive mesh refinement of hyperbolic problems
J. Comput. Phys., **226**, (2007) 1458–1484.

See also my previous reviews dealing with multi-resolution schemes:

1. Review of: Tang, L. and Song, S., A multiresolution finite volume scheme for two-dimensional hyperbolic conservation laws, *Journal of Computational and Applied Mathematics* **214**, (2008)
   `http://www.surengineering.com/AMS/MR2398353.pdf`

2. Review of: Derveaux, G., Joly, P. and Rodriguez, J., Chapter 13 - Space Time Mesh Refinement - *Effective computational methods for wave propagation*, 2008
   `http://www.surengineering.com/AMS/MR2404884.pdf`