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Adaptive Mesh Refinement: in the presence of discontinuities

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Classical multiresolution wavelet techniques have been used successfully to simplify the computation of PDEs by concentrating resources in places where the solution varies quickly. However, classical techniques tend to fail near solution discontinuities, as Gibbs effects contaminate the wavelet coefficients used to refine the solution. Non-linear adaptive stencil methods, such as the ENO scheme, can reconstruct the solution accurately across jumps, but possess neither the compression capabilities nor the well-understood stability properties of wavelets. Expanding on Hartens ideas, we construct an alternative to wavelets, a multiresolution method that does not suffer from Gibbs effects and has good compression properties. We will present this alternative multiresolution method and compare its performance to other methods by means of several examples.