

Space-time adaptive multiresolution methods for evolutionay PDEs

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Abstract

We present a multiresolution technique for finite volume schemes with explicit time discretization. An adaptive grid is introduced by suitable thresholding of the wavelet coefficients, which maintains the accuracy of the finite volume scheme of the regular grid. Further speed-up is obtained by local scale-dependent time stepping, *i.e.*, on large scales larger time steps can be used without violating the stability condition of the explicit scheme. Furthermore, controled time stepping can be used, by means of embedded Runge-Kutta type schemes, in order to obtain an accurate and safe integration in a whole time interval, without the requirement of a fixed time step (or CFL parameter) determined a priori. The implementation uses a dynamic tree data structure. The accuracy and efficiency of the fully adaptive method is illustrated by computations for reaction-diffusion equations and with applications for compressible Euler equations.