Adaptive multiresolution methods for evolutive PDEs

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ABSTRACT

Adaptive multiresolution strategies in space [1] and time [2] allow considerable speedup of second-order finite volume schemes for multidimensional evolutive partial differencial equation in Cartesian geometry, while controlling the accuracy of the discretization. This strategy is based in a multiresolution technique for finite volume schemes with explicit time discretization using a local scale-dependent time stepping with control techniques like Embebbed Runge-Kutta [**?**]. 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. On the finest scale the size of the time step is imposed by the stability condition of the explicit scheme. On larger scales, the time step can be increased without violating the stability requirement of the explicit scheme. The implementation uses a dynamic tree data structure. The accuracy and efficiency of this fully adaptive method is illustrated with new applications in one, two and three space dimensions for some test cases illustrating the additional speed-up of these techinique compared to both multiresolution scheme with global time stepping and finite volume scheme on a regular grid.

Referências

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