

APPLICATION OF MULTIREOLUTION SMOOTHNESS DETECTION IN THE BLOCK-BASED ADAPTIVE MESH REFINEMENT METHOD: PRELIMINARY RESULTS

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ABSTRACT. As is well known, the MR technique improves the performance of the standard finite volumes (FV) methods in space, introducing an adaptive grid which is less refined in the regions where the solution is smoother, instead of using a uniform, regular grid everywhere. In time, an explicit integration either with or without local time-stepping is used. Here, we present an approach, tailored for high performance computing, in which the wavelet-based multiresolution (MR) technique [3] is combined with the block-based adaptive mesh refinement (AMR) method [2]. In detail, the MR smoothness detector is incorporated as a mesh adaptation criterion in the block-based and fully parallelized mesh refinement software AMROC [1]. Standard hydrodynamics test cases are considered and analysed in terms of total computational time, accuracy and required memory. The accuracy is evaluated by comparing the results of the adaptive computations with those obtained with the corresponding finite volume scheme using a regular fine mesh.

Keywords: adaptive numerical methods, conservation laws, Euler equations, multiresolution, local time stepping, mesh refinement

Mathematics Subject Classifications (2010): 65M50, 65Y20, 76M12

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