Abstract Submitted
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A finite-difference formulation for incompressible viscous flow with adaptive mesh refinements[1] PATRICK RABENOLD, Dept. of Applied Mathematics, University of Maryland, College Park, MD, 20742, ELIAS BALARAS, Dept. Mechanical Engineering, University of Maryland, College Park, MD 20742 — We propose an adaptive mesh refinement (AMR) strategy, where the computational grid is dynamically refined and derefined in local regions of the computational domain as determined by the local nature and requirements of the flow. In our AMR approach a single-block Cartesian grid solver is employed on a hierarchy of sub-grids with varying spatial resolution. Each of these sub-grid blocks has a structured Cartesian topology, and is part of a tree data structure that covers the entire computational domain. The tree data-structure is implemented using the Paramesh toolkit. We use an explicit second-order projection method on a staggered grid, and the resulting Poisson equation is solved with an iterative multigrid solver. Boundary conditions at the interior boundaries of the sub-grid blocks are enforced using layers of ghost cells which are filled using the solution data from neighboring sub-grid blocks. We will present results that demonstrate that the solver is second order accurate both space and time. Computations of several standard test problems are also in excellent agreement with results in the literature.

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