Two-grid Algorithms for Solution of Difference Equations of Compressible Fluid Flow

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We propose two-grid algorithms for solving 1D and 2D compressible flow systems of equations on a bounded domain. In the first step, the nonlinear boundary value problem is discretized on a coarse grid of size H. In the second step, the nonlinear problem is linearized around an interpolant of the computed solution at the first step. Then, the linear problem is solved on a fine mesh of size h, $h < H$. On this base, we develop two-grid iteration algorithms, that achieve optimal accuracy as long as the mesh size satisfies $h = (H^{2^r})$, $r = 1, 2, \ldots$, where r is the r-th Newton's iteration for the linearized differential problem. Numerical experiments are discussed