

Abstract Submitted
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A GPU-accelerated semi-implicit ADI method for incompressible and compressible Navier-Stokes equations¹ SANGHYUN HA, DONGHYUN YOU, Pohang Univ of Sci & Tech — Utility of the computational power of Graphics Processing Units (GPUs) is elaborated for solutions of both incompressible and compressible Navier-Stokes equations. A semi-implicit ADI finite-volume method (J. Comp. Phys. V. 230 (2011), pp. 7400-7417) for integration of the incompressible and compressible Navier-Stokes equations, which are discretized on a structured arbitrary grid, is parallelized for GPU computations using CUDA (Compute Unified Device Architecture). In the semi-implicit ADI finite-volume method, the nonlinear convection terms and the linear diffusion terms are integrated in time using a combination of an explicit scheme and an ADI scheme. Inversion of multiple tri-diagonal matrices is found to be the major challenge in GPU computations of the present method. Some of the algorithms for solving tri-diagonal matrices on GPUs are evaluated and optimized for GPU-acceleration of the present semi-implicit ADI computations of incompressible and compressible Navier-Stokes equations.

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