

Parallel Computation of the Improved Pressure Correction-Volume Of Fluid Method for Simulation of Multiphase Fluid-Solid Interaction Problem

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Key Words: OpenMP, Pressure Correction Method, VOF, IB, Fluid-Solid Interaction

A pressure correction-volume of fluid (VOF) method is improved to accelerate multiphase flow computation. Momentum interpolation method (MIM) is used to avoid the pressure check-board field on non-staggered grid system, transpose-free quasi-minimal residual method (TFQMR) is applied to solve Poisson equation, immersed boundary (IB) method is applied to treat solid-wall boundary condition, and OpenMP is used to reduce computing time. Two physical problems, dam-break and water wave impact on a tall structure, are simulated and compared with known data. The accelerating ratio of the improved scheme with OpenMP using six cores could be forty times speedup at least than original numerical scheme.

Keywords: Pressure correction method, Volume of fluid, Momentum interpolation method, Transpose-free quasi-minimal residual method, Immersed boundary method