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Development of a GPU and multi-CPU accelerated non-isothermal, multiphase, incompressible Navier-Stokes solver with phase-change[1] CHRISTOPHER J. FORSTER, ARI GLEZER, MARC K. SMITH, Georgia Institute of Technology — Accurate 3D boiling simulations often use excessive computational resources – in many cases taking several weeks or months to solve. To alleviate this problem, a parallelized, multiphase fluid solver using a particle level-set (PLS) method was implemented. The PLS method offers increased accuracy in interface location tracking, the ability to capture sharp interfacial features with minimal numerical diffusion, and significantly improved mass conservation. The independent nature of the particles is amenable to parallelization using graphics processing unit (GPU) and multi-CPU implementations, since each particle can be updated simultaneously. The present work will explore the speedup provided by GPU and multi-CPU implementations and determine the effectiveness of PLS for accurately capturing sharp interfacial features. The numerical model will be validated by comparison to experimental data for vibration-induced droplet atomization. Further development will add the physics of boiling in the presence of acoustic fields. It is hoped that the resultant boiling simulations will be sufficiently improved to allow for optimization studies of various boiling configurations to be performed in a timely manner.

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