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The effect of density estimation on the conservativeness in Smoothed Particle Hydrodynamics PRANAV SURESH, S.S.PRASANNA KUMAR, B.S.V. PATNAIK, Indian Inst of Tech-Madras — Smoothed Particle Hydrodynamics (SPH) is a popular mesh-free method for solving a wide range of problems that involve interfaces. In SPH, the Lagrangian nature of the method enables mass conservation to be naturally satisfied. However, satisfying the conservation of momentum and energy are indeed formulation dependent. One major aspect of ensuring conservativeness comes from the density estimation. There are two distinct types of density estimation approaches, namely continuity density approach and summation density approach. Both approaches are indeed popular with single and multi-phase flow communities. In the present study, we assess the role of density evaluation on the conservativeness, using several representative numerical examples. In particular, we have simulated the RayleighTaylor instability problem, Non-Boussinesq lock exchange problem, bubble rise in water column etc. Although for shorter time scales of simulation, both methods have similar conservative properties, we observe that for longer time scales, summation-density approach is better. For free surface detection and normal vector computations, efficient computational procedures have been devised.

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