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A hybrid Lagrangian-Eulerian scheme for two-phase flows
SOURABH APTE, Oregon State University — A hybrid Lagrangian-Eulerian scheme combining a particle-based mesh-free technique with finite-volume method is being developed for direct simulations of two-phase flows. This merges the *locally adaptive* nature of the particle-based approach for efficient representation of the interface between two media with the *relative flexibility offered by grid-based solvers* for complex flows. The pure mesh-free Lagrangian technique developed by Hieber and Koumoutsakos (JCP 2005) is first integrated with an unstructured grid-based finite volume solver. The novelty here is to make use of the background-mesh connectivity and parallel partitioning to efficiently locate and transport the Lagrangian points (LP). Once the interface location is identified on the LPs, the jump conditions across the interface are enforced by following the techniques used in level-set methods, and the resultant governing equations are solved on the background mesh. The accuracy and efficiency of the method for standard test problems commonly used in interface tracking will be presented. Direct simulations of rigid particles, droplets or bubbles dispersed in a continuum fluid of different phase are being performed. Application and extension of the scheme to problems involving fluid-particle interactions will be discussed.

Sourabh Apte
Oregon State University

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