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Dual domain material point method for multiphase flows[1] DUAN ZHANG, Los Alamos National Laboratory — Although the particle-in-cell method was first invented in the 60's for fluid computations, one of its later versions, the material point method, is mostly used for solid calculations. Recent development of the multi-velocity formulations for multiphase flows and fluid-structure interactions requires the Lagrangian capability of the method be combined with Eulerian calculations for fluids. Because of different numerical representations of the materials, additional numerical schemes are needed to ensure continuity of the materials. New applications of the method to compute fluid motions have revealed numerical difficulties in various versions of the method. To resolve these difficulties, the dual domain material point method is introduced and improved. Unlike other particle based methods, the material point method uses both Lagrangian particles and Eulerian mesh, therefore it avoids direct communication between particles. With this unique property and the Lagrangian capability of the method, it is shown that a multiscale numerical scheme can be efficiently built based on the dual domain material point method. In this talk, the theoretical foundation of the method will be introduced. Numerical examples will be shown.

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