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An Optimization-Based Lagrangian Particle Method for Navier-Stokes[1] PAUL COVINGTON, FRANK HAM, PARVIZ MOIN, CTR, Stanford University — Particle methods have recently experienced renewed interest due to their ability to more naturally handle material advection for multiphysics applications as well as complex moving boundaries. Most methods, however, lack a systematic treatment of formal accuracy. This study aims to provide a general framework for constructing Lagrangian methods that obey a bilinear form. Basis functions are defined independent of a traditional computational grid by borrowing concepts from convex optimization. The method is applied to the compressible Navier-Stokes equations and two-phase problems. Results will be presented with emphasis placed on problems with analytical solutions such as a convecting Euler vortex. Accuracy will be compared to an extensively validated Eulerian finite volume code. The applicability to 3D problems of practical interest will also be discussed with respect to algorithmic considerations and computational cost.

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