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A spatially adaptive high-order meshless method for fluid-structure interactions WENXIAO PAN, WEI HU, University of Wisconsin-Madison, NATHANIEL TRASK, Sandia National Laboratories — We present a scheme implementing an a posteriori refinement strategy in the context of a high-order meshless method for problems involving point singularities and fluid-solid interfaces. The generalized moving least squares (GMLS) discretization used in this work has been previously demonstrated to provide high-order compatible discretization of the Stokes and Darcy problems, offering a high-fidelity simulation tool for problems with moving boundaries. The meshless nature of the discretization is particularly attractive for adaptive h-refinement, especially when resolving the near-field aspects of variables and point singularities governing lubrication effects in fluid-structure interactions. We demonstrate that the resulting spatially adaptive GMLS method is able to achieve optimal convergence in the presence of singularities for both the div-grad and Stokes problems. Further, we present a series of simulations for flows of colloid suspensions, in which the refinement strategy efficiently achieved highly accurate solutions, particularly for colloids with complex geometries.

Wenxiao Pan
University of Wisconsin-Madison

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