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Rigid particle-laden flows computations with a distributed Lagrange multipliers/fictitious-domain method on an adaptive quad/oc-tree grid CAN SELCUK, Department of Mathematics, University of British Columbia, STEPHANE POPINET, Institut Jean le Rond d'Alembert Universit Pierre et Marie Curie, ANTHONY WACHS, Department of Mathematics, department of Chemical & Biological Engineering, University of British Columbia — Modeling rigid particle-laden flows requires an accurate description of the flow field in the close-vicinity of the particles (i.e. in the boundary layers). One of the numerical difficulties lies on the extremely fine grid necessary to fully capture the flow dynamic near the particle boundary (as e.g. lubrication force). In such scenario, fixed Cartesian grids are prohibitive as the required number of computational cells becomes impractical. To overcome this difficulty, we combine an adaptive mesh refinement (AMR) technique with a distributed Lagrange multipliers/fictitious-domain method (DLM/FD) (Glowinski et al. 1999). The solver is implemented within the code Basilisk (Popinet, 2015) which provides a set of adaptive-multigrid solvers on quad/oc-trees. The method is validated against various test cases involving spherical particles in different flow regimes: from Stokes flow to highly inertial flows. To compute flows laden with non-spherical particles, we couple our AMR-DLM/FD solver to the granular solver Grains3D (Wachs et al. 2012). With this numerical tool, the dynamics of multiple particles of complex shape freely moving in a fluid on adaptive quad/oc-tree becomes accessible. As an illustration, we present the case of 600 free falling cubes in a large container.

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