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A Parallel Dynamic Overset Grid Framework for Incompressible Flow Simulations[1] MOHAMMADALI HEDAYAT, IMAN BORAZJANI, Texas A&M University — The overset grid technique enables the flow solvers to handle unsteady moving grid simulations. However, the task of overset grid assembly in parallel for partitioned grid remains challenging. In this study, a new efficient parallel grid assembly and interpolation framework is developed to perform overset grid assembly for structured meshes in a distributed computing environment. This framework is integrated with a sharp interface curvilinear immersed boundary (CURVIB) flow solver to handle multiple overlapping flow domains. To achieve a good parallel performance several steps are implemented in our framework: 1) using oriented bounding boxes (OBB) instead of axis-aligned bounding boxes; 2) using a walking strategy for donor search; 3) directly integrating grid assembly to the flow solver; 4) efficient vectorized implementation for velocity interpolation; and 5) using a general non-inertial frame of reference flow solver to prevent the recomputation of curvilinear grid. The framework verified and validated against experimental and numerical benchmarks. Our results show a good scalability and accuracy for this new framework. In addition, its capabilities are demonstrated by simulating a school of aquatic swimmers in a diamond shape.

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