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A Simple and Efficient Sharp Interface Immersed Boundary Method for Fluid-Structure Interaction with Complex Rigid Bodies[1]

JIANMING YANG, FREDERICK STERN, University of Iowa — A sharp interface immersed boundary method is presented for the simple and efficient simulation of fluid-structure interaction with complex three-dimensional rigid bodies. The previous formulation by Yang and Balaras (An Embedded-Boundary Formulation for Large-Eddy Simulation of Turbulent Flows Interacting with Moving Boundaries, J. Comput. Phys. 215 (2006) 12-40) is greatly simplified without sacrificing the overall accuracy. In addition, a novel, highly efficient non-iterative coupling scheme is developed for the simulation of a viscous flow interacting with multiple bodies. Several cases are examined to demonstrate the accuracy, simplicity and efficiency of the new method.

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