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Algorithmic improvements for accurate force prediction in diffusive-interface direct-forcing immersed boundary method[1] XING ZHANG, XIAOJUE ZHU, GUOWEI HE, LNM, Institute of Mechanics, Chinese Academy of Sciences — We detail some algorithmic modifications to the diffusive-interface direct-forcing immersed boundary method of Ulhmann (JCP 209(2005) 448-476). The prediction of local hydrodynamic force can be improved by the following two measures taken. First, by using a "force correction" strategy, the fluid penetration near the immersed boundary is significantly reduced. However, the "force correction" method also leads to large spurious oscillation in the Lagrangian force. This is problematic since the Lagrangian force also represents the local hydrodynamic surface force in some fluid-structure-interaction (FSI) simulations. By perform an additional filtering (smoothing) step to the Lagrangian force, it is found that the oscillation can be largely suppressed. Accurate prediction of local surface force by the proposed method is demonstrated using the case of 2D flow over a circular cylinder.

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