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Hovering and targeting flight simulations of a dragonfly-like flapping wing-body model by IB-LBM[1] TAKAJI INAMURO, KENSUKE HIROHASHI, Dept. Aeronautics and Astronautics, Kyoto University — Hovering and targeting flights of the dragonfly-like flapping wing-body model are numerically investigated by using the immersed boundary-lattice Boltzmann method (IB-LBM). The governing parameters of the problem are the Reynolds number Re, the Froude number Fr, and the non-dimensional mass m. We set the parameters at $Re = 200$, $Fr = 15$, and $m = 51$. First, we simulate free flights of the model for various values of the phase difference angle ϕ between the forewing and the hindwing motions and for various values of the stroke angle β between the stroke plane and the horizontal plane. We find that the vertical motion of the model depends on the phase difference angle ϕ, and the horizontal motion of the model depends on the stroke angle β. Secondly, using the above results we try to simulate the hovering flight by dynamically changing the phase difference angle ϕ and the stroke angle β. The hovering flight can be successfully simulated by a simple proportional controlleres of the phase difference angle and the stroke angle. Finally, we simualte targeting flight by dynamically changing the stroke angle β.

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