Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

**Flight simulations of a two-dimensional flapping wing by the IB-LBM** TAKAJI INAMURO, YUSUKE KIMURA, KOSUKE SUZUKI, Department of Aeronautics and Astronautics, Kyoto University — Two-dimensional symmetric flapping flight is investigated by the immersed boundary-lattice Boltzmann method. First, we investigate the effect of the Reynolds number on flows around symmetric flapping wings under no-gravity field and find that for high Reynolds numbers ($Re \geq 55$) asymmetric vortices with respect to the horizontal line appear and the time-averaged lift force is induced on the wings. Secondly, we study the motion of the model with an initial rotational disturbance and find that the motion is rotationally unstable. That is, once the model starts rotating, the rotational motion rapidly increases due to a complicated vorticity field around the wings. Finally, we propose a simple way to control the rotational and horizontal motion by bending and flapping the tip of the wing. With the control we can achieve an upward stable motion in spite of the complicated vorticity field around the wings.

Takaji Inamuro
Department of Aeronautics and Astronautics, Kyoto University

Date submitted: 02 Aug 2012 Electronic form version 1.4