Abstract Submitted for the DFD17 Meeting of The American Physical Society

Hydrodynamics of a freely movable flexible fin near the ground¹ YOUNG DAL JEONG, JAE HWA LEE, Ulsan Natl Inst of Sci Tech — In the present study, a freely movable flexible fin is numerically modelled to investigate the flapping dynamics of the fin near the ground in a Poiseuille flow. A leading edge of the fin is fixed in the streamwise direction, whereas the lateral motion is spontaneously determined by hydrodynamic interaction between the fin and surrounding fluid. When the fin is initially positioned at y_o , the fin passively migrates toward another wall-normal position for an equilibrium state by the interaction between passively flapping flexible body and ground. At the equilibrium position, the drag coefficient of the fin (C_D) significantly decreases due to decaying of the flapping and low flow velocity and the fin can swim consistently without the time-averaged lateral force. Two distinctive behavior at the transient state (flapping and non-flapping migration modes) and three distinctive behaviors at the equilibrium state (deflectedstraight, large- and small-amplitude flapping modes) are observed depending on the bending rigidity (γ) and mass ratio (μ) of the fin. The equilibrium position of the fin is investigated as a function of initial position (y_0) , bending rigidity (γ) , mass ratio (μ) and the Reynolds number (Re).

¹This research was supported by the National Research Foundation of Korea (NRF) funded by the Ministry of Education (NRF-2017R1D1A1A09000537) and the Ministry of Science, ICT Future Planning (NRF-2017R1A5A1015311).

Young Dal Jeong Ulsan Natl Inst of Sci Tech

Date submitted: 26 Jul 2017

Electronic form version 1.4