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Computational design of flapping kinematics of a flexible finite-span foil[1] SEUNGPYO HONG, Department of Mechanical Engineering, Pohang University of Science and Technology, JINMO LEE, DONGHYUN YOU, Department of Mechanical Engineering, Carnegie Mellon University — While many of the effects of chordwise flexibility of a two-dimensional plate or a foil under pitching motions are revealed in recent computational and experimental research, the effects of flexibility of a three-dimensional foil on the manipulation of wing-tip vortices as well as leading-/trailing-edge vortices are rarely understood. The present study aims at identifying flow physics associated with flapping motions of flexible finite-span foils and the effects of the flapping kinematics and flexibility of the foil on the propulsive performance. The propulsive performance and fluid dynamics of wing-tip vortices leading-edge and trailing-edge vortices associated with the thrust generation are investigated in detail by conducting numerical simulations of flow over a flapping foil with different span-to-chord aspect ratios and bending stiffness using a recently developed coupled immersed boundary method and computational structural dynamics.

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