Asymmetric motion of a two-dimensional symmetric flapping model

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Received 5 November 2003; received in revised form 15 June 2004; accepted 10 July 2004

Communicated by S. Kida

Abstract

A two-dimensional symmetric flapping model is studied in terms of the bifurcation using discrete vortex method. This model consists of two wings attached together at a hinge, and the flapping motion of the wings is symmetric with respect to the horizontal line. The center of mass of this model can move according to the hydrodynamic force generated by an interaction of the wing and vortices separated from boundary layer. The bifurcation parameter is a time scale of the dissipation, which is simplified to contrast the transition of the type of the motion. Bifurcation diagram shows that steady motion of zero-mean velocity (with symmetric flapping) is unstable in a parameter region, and that there is another region where two types of a steady stable flapping motion coexist. We illustrate these types of the motion.

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Keywords: Biofluid mechanics; Interaction of vortex with body; Vortex motion; Separation vortex

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doi:10.1016/j.fluiddyn.2004.07.005