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Reduced-order model of fish-like swimming due to shedding of unsteady point vortices PHANINDRA TALLAPRAGADA, Clemson University — Reduced order models of biomimetic swimming in an ideal fluid, relying on the shedding of point vortices at short intervals of time, are useful to illuminate the essential underlying dynamics of locomotion in fluids. However these reduced order models still possess a state space that is very high dimensional, thus presenting challenges to develop control algorithms. A two-dimensional model that fully couples the motion of the solid boundary and the fluid containing singular distributions of vorticity is presented. The model relies on the shedding of unsteady point vortices, from the tip of a fish-like hydrofoil, in place of many steady point vortices. The subsequent reduction in the dimension of the state space makes the model more amenable to control algorithms. A simple case of the heading-angle control of a fish-like body will be illustrated. The model also has the advantage of being computationally significantly less demanding. More interestingly from a theoretical point of view, the reduced order model illustrates the connection between vortex shedding and velocity constraints encountered in rigid body mechanics.

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