Abstract Submitted
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Stability of Passive Locomotion in a Perfect Fluid[1] FANGXU JING, EVA KANSO, University of Southern California — We investigate the effect of body elasticity on the stability of locomotion in a perfect fluid. Our motivation is to study fish swimming. Actual fish seem to alternate between actively flapping and passively responding to the surrounding fluid, referred to as *Burst and Coast* cycle. We study the stability of the coast (passive) phase. It's well known that the passive motion of a single elongated rigid body along its major axis of symmetry is unstable. The question is: can passive shape changes mediated by body elasticity stabilize the motion? The answer is yes. We consider an articulated body with finite number of rigid links, connected by hinge joints with torsional springs at the joints to emulate the elasticity of fish. The motion of the articulated body with constant velocity along its major axis of symmetry is a relative equilibrium. Upon analyzing the stability of this equilibrium, we discover that passive shape changes do *stabilize* the motion for appropriate combination of body geometry and spring elasticity. We plot the region of stability in aspect ratio - spring stiffness parameter space.

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