CONSTRAINED MECHANICS AND IDEALIZED MODELS FOR AQUATIC LOCOMOTION VIA VORTEX SHEDDING

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A mature formalism exists for the realization of reduced-order models for the dynamics of mechanical systems that exhibit symmetries. In the context of finite-dimensional systems, this formalism encompasses the treatment of systems subject to integrable and nonintegrable velocity constraints [1]. In the context of fluid-body interactions, localized velocity constraints can be used to represent the physics underlying vortex shedding in an simplified way. The application of such constraints discontinuously in time leads to models in which discrete distributions of vorticity interact with free bodies according to noncanonical Hamiltonian equations like those documented in [2, 3, 4]. This talk will describe idealized models for several problems concerning the self-propulsion of deformable bodies in fluids, highlighting the role played by symmetry-breaking constraints.

References

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