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Investigation of Energy Harvesting Using Flapping Foils AMIN MIVEHCHI, AMANDA PERSICHETTI, BRANDON DUNHAM, JASON M. DAHL, Department of Ocean Engineering , University of Rhode Island — When harvesting kinetic energy using a flapping foil, the separation of coherent structures in the wake is crucial for determining forces on the body. Applications for utilizing energy harvesting with a flapping foil include powering of local, low power equipment and recharging AUV batteries that use flapping foils for propulsion and maneuvering. In each of these cases, it is critical to accurately predict the physical behavior and location of vortices in relation to the motion of the body in order to maximize energy output. A two-dimensional open source boundary data immersion method (LilyPad) is used for simulating the flapping motion of a foil for energy harvesting in a current. Forced motion of the flapping body indicates theoretical efficiencies for energy harvesting near 43 percent under specific flapping conditions. A simple control scheme based on pressure sensing on the surface of the foil is developed to control pitch of the foil while energy harvesting occurs in the heave direction. The control scheme is tested through real time numerical simulation. Comparisons are made with physical laboratory experiments, demonstrating high efficiencies in energy harvesting.

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