Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Optimization of the airfoil stroke in a high Reynolds number flow for energy harvesting XINJUN GUO, SHREYAS MANDRE, Brown University — We investigate the heaving and pitching stroke of an airfoil for maximum energy extraction from the flow of the ambient fluid. This analysis is targeted towards optimization of oscillating airfoil or hydrofoils for wind and hydrokinetic energy conversion respectively. The goal is to study the influence of unsteady aerodynamic effects like leading edge vortex, unsteady boundary layer separation, vortex recapture, etc. We are inspired by the mechanics of insect and bird flight, which are believed to use unsteady aerodynamics for enhanced performance. Our airfoil has two degrees of freedom, heaving and pitching, and these degrees of freedom are actuated independently. We employ a variational framework for optimizing the transient stroke of the airfoil with the objective function being the time-averaged harvested power.

Xinjun Guo
Brown University

Date submitted: 03 Aug 2012 Electronic form version 1.4