Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Towards a predictive vortex model for 2D non-linear aerodynamics[1] DARWIN DARAKANANDA, JEFF D. ELDREDGE, University of California, Los Angeles — In previous work (Hemati et al 2014), we presented a framework in which a low-order point vortex model can be optimized to capture the non-linear aerodynamics of a wing undergoing arbitrary rigid body motion. Rather than determine the time-varying vortex strengths with the Kutta condition, these strengths were chosen to minimize the difference between the force predicted by the model and pre-existing empirical data. Here, we present ongoing extensions of this model. With the help of tools from dynamical systems theory, we develop a means to incrementally optimize the model against new data. This opens the possibility for using the model in a dynamic estimator context. Self-sustained vortex shedding from wings is achieved using a criterion based on the leading edge suction parameter. We demonstrate the model on a variety of canonical problems, including pitch-up, oscillatory heaving and pitching, and impulsive translation of a plate at various angles of attack.

[1]This work has been supported by AFOSR, under award FA9550-11-1-0098.

Darwin Darakananda
University of California, Los Angeles

Date submitted: 01 Aug 2014 Electronic form version 1.4