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Exploration of the Relationship Between Wake Vortex Parameters and Thrust Force on Oscillating Airfoils Using a Vortex Array Model[1]
AHMED NAGUIB, MANOOCHEHR KOOCHESFAHANI, Michigan State University — Recently, we demonstrated the ability of a simple model, based on an array of finite-core Gaussian vortices, to accurately reproduce the unsteady velocity field in the wake of, and drag/thrust force acting on harmonically/non-harmonically pitching airfoils. In the present work, this model is employed to explore how the thrust force varies with wake vortex parameters; i.e. circulation, core radius and streamwise/cross-flow spacing of the vortices. Insight from this investigation will be helpful to draw links between trailing-edge flexibility and the detailed process of generation of wake vortices. Such links may have the potential for providing a path towards a rational, yet efficient, approach for tailoring trailing-edge flexibility to obtain desirable force characteristics for flapping-wings Micro Air Vehicles.

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