Abstract Submitted
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Understanding Flight Stabilization In Insects to Large Perturbations Using an Integrated Experimental-Numerical Approach[1] CHAO ZHANG, LINGXIAO ZHENG, The Johns Hopkins University, TY HEDRICK, The University of North Carolina, RAJAT MITTAL, The Johns Hopkins University — Insects adopt a variety of strategies to stabilize flight in the face of large-scale aerodynamic and mechanical perturbations. Linear stability analysis and simple estimation techniques such as blade-element models can only provide very limited insights into these strategies since the response is highly non-linear and far from simple equilibrium conditions. In order to tackle this problem, we have coupled a Navier-Stokes immersed boundary-based solver to a six degree-of-freedom (DOF) flight dynamics model of a Hawkmoth (Manduca Sexta) to model this stabilization process in all its complexity. The model is used to examine the response of this insect to large-scale aerodynamic and mechanical perturbations and results from this study will be presented.

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