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On the Optimal Dynamic Camber Formation in Insect Flight YAN REN, HAIBO DONG, Wright State University — It is widely thought that wing flexibility and wing deformation could significantly affect aerodynamic force productions over completely rigid wings in insect flights. However, there is a lack of quantitative discussion of dynamic formation of wing camber and its effect on wing's aerodynamic performance. In this work, a deformable wing is used to model the wing camber and its dynamic formation. A Direct Numerical Simulation (DNS) based computational optimization frame has been developed to obtain the optimal dynamic camber formation of dragonfly in takeoff and cruising flight. Comparative study is then performed between the optimized flexible wing and real dragonfly wing. Results have shown the maximum camber happens around 30% (downstroke) and 80% (upstroke) of one wing beat. Force production and unsteady flows of the flexible wing are also discussed.

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