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Modeling flexible wing flapping at low Reynolds number ALEXANDER ALEXEEV, Georgia Tech — Using computational modeling, we study the aerodynamics of flapping wings in hovering flight. The wings are thin, flexible structures and can extensively bend due to hydrodynamic forces and wing inertia. To capture the dynamics of oscillating flexible wings at low Reynolds number, we develop a three-dimensional computational model for fluid structure interaction that combines the lattice Boltzmann model for fluid dynamics and the lattice spring model for the micromechanics of elastic solids. We examine the unsteady forces and flows during the wing beat cycle and probe how wing bending affects the flight performance and flow structures around the flexible wings. The results could prove useful in designing micro air vehicles that employ elastic flapping wings for propulsion and flight control and in understanding the mechanics of flapping flight of small insects.

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