

How Insects Fly and Turn

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Abstract

Insects' aerial acrobatics result from the concerted efforts of their brains, flight muscles, and flapping wings. To understand insect flight, we started from the outer scale, analyzing the unsteady aerodynamics of flapping flight, and are gradually working toward the inner scale, deducing control algorithms. In this approach, the dynamics of flight informs us about the internal control scheme for a specific behavior.

I will first describe the aerodynamic tricks that dragonflies employ to hover and fly efficiently. I will then discuss how fruit flies recover from aerial stumbles, and how they make subtle wing movements to induce sharp turns in tens of wing beats, or 40-80ms. The observed yaw maneuver can be explained by a quantitative mechanical model that connects a single control variable to the body dynamics.