Flying Animal Maneuverability and Adaptability: Lessons for UAV Design

Christina Harvey
University of Michigan

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It is challenging to operate uncrewed aerial vehicles (UAVs) in cluttered or unpredictable environments. In contrast, flying animals regularly accomplish an impressive array of in-flight transitions, from maneuvering through cities, evading predators or gliding in gusty conditions. Many biological flyers rapidly adapt and maneuver in these variable flight conditions by actively or passively adjusting their wing or tail shape in flight, known as morphing. Here I highlight my analysis of characteristics of biological flight that are associated with maneuverability and adaptability. My goal is to identify which of these biological traits surpass modern aircraft flight performance, stability, and control capabilities and determine how these traits can be incorporated into UAV designs. In this way, my work both enhances our understanding of biological flight and advances the design of highly maneuverable and adaptable UAVs.

Christina Harvey studies how, when, and why flying animals adjust to their environment with the goal of improving the maneuverability and adaptability of future uncrewed aerial vehicles (UAVs) as well as advancing our fundamental understanding of biological flight. Her research integrates both an aeronautical and biological perspective leveraging computational, analytical, and experimental techniques. She is a PhD candidate in Aerospace Engineering at the University of Michigan and has a M.Sc. in Zoology from the University of British Columbia and a B.Eng. in Mechanical Engineering from McGill University. Christina is a 2021 Zonta International Amelia Earhart Fellow and a FXB Fellow.

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