Abstract

Flapping flight is ubiquitous among agile natural flyers. Taking inspiration from biological flappers, we develop a robot capable of insect-like flight, and then go beyond biological capabilities by demonstrating multi-phase locomotion and impulsive water-to-air transition. In this talk, I will present our recent research on developing a hybrid aerial-aquatic microrobot. I will start by describing experimental and computational studies of flapping wing aerodynamics that aim to quantify fluid-wing interactions and ultimately to distill scaling rules for robotic design. Comparative studies of fluid-wing interactions in air and water show remarkable similarities, which allow a flapping wing, aerial microrobot to also swim underwater. In addition to discussing the robot underwater stability properties, I will describe the challenges and benefits imposed by water surface tension. By developing an impulsive mechanism that utilizes electrochemical reactions, we further enable the robot to take off from the water surface. I will conclude by outlining the challenges and opportunities in our current microrobotic research.
About the Speaker

Kevin Chen is a post-doctoral fellow at Harvard School of Engineering and Applied Sciences. He completed his Ph.D. degree from Harvard University and his B.S. degree from Cornell University. He is broadly interested in investigating various topics in microrobotics, fluid mechanics, and biomechanics. Recently he is working on developing a biologically inspired, hybrid aerial-aquatic, flapping wing microrobot. He is the recipient of the Best Student Paper award of the 2015 IEEE International Conference on Intelligent Robots and Systems, Harvard Teaching Excellence Award, and multiple competitive fellowships.

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All are Welcome!

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