An Adaptive Flight Controller for a Bird-Like Flapping Wing Aircraft

Balaji Kartikeyan Chandrasekaran*
Faculty: James E. Steck
Department of Aerospace Engineering, College of Engineering

In the present age of increased demand for unmanned aerial vehicles, flapping wing unmanned aerial vehicle applications have become of interest. While a lot of research has been focused on conventional UAV configurations, less attention has been given to flapping wing aircraft. This work explores new territory through the development of an adaptive flight controller for a bird-like flapping wing aircraft, using modified strip theory to model the aircraft's aerodynamics and Newtonian equations of motion for the flight dynamics. The model was validated using existing data from the Slow Hawk Ornithopter, and an Adaptive Neural Network based Inverse Control, was utilized to govern the longitudinal flight characteristics of the aircraft. Initial results have shown that the flight model can be well controlled in pitch, and further research will be carried out to expand the controller's capabilities for the lateral control, take-off, hover, and perching maneuvers.