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Project Proposal

Autonomous navigation and control of micro-aerial vehicles (MAVs) is an increasingly popular subject of academic research, with several key advances occurring over the last ten years. Small, four-rotor craft (*quadrotors*) are desirable platforms for this kind of robotics research due to their ability to carry large sensor payloads and maintain stability in the hover regime. There is significant interest, however, in having these types of vehicles execute aggressive trajectories far from the hover state (e.g. flying quickly through cluttered environments such as buildings and forests).

My project will focus on the implementation of a modern, nonlinear controller for stabilizing the 3D position and yaw angle of a quadrotor far from the hover regime (Lee, Taeyoung, M. Leoky, and N. Harris McClamroch. "Geometric tracking control of a quadrotor UAV on SE (3)." Decision and Control (CDC), 2010 49th IEEE Conference on. IEEE, 2010.). I will implement the controller in Python and validate the algorithm in simulation using the hector_quadrotor simulator (http://wiki.ros.org/hector_quadrotor) – a software package that simulates the dynamics of a quadrotor using the Robot Operating System (ROS) and the Gazebo robot simulation toolkit. I hope to be able to demonstrate that the controller allows the quadrotor to perform aggressive maneuvers at high linear and angular velocities.

This project will be useful to my own research in the autonomous navigation and control of MAVs and will give me a taste of modern nonlinear control on manifolds, as well as additional experience with ROS and Gazebo that I hope to apply to other projects.