**ES 202 Estimation and Control of Dynamical Systems**

**Project Proposal**

**Implementation of Model Predictive Control on a Quadcopter**

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In this project, we will study and explore the use of model predictive control. Model predictive control, as its name suggest has the ability to predict the how the system evolves in the future and will optimize the control inputs accordingly. However, only the input at the current time will be applied to the system although the inputs are optimized over a finite (prediction) time horizon. After the input is applied, the system states are measured again and the control inputs are re-calculated (with the time horizon shifted one time step ahead). This iterative control process allows the system track a reference trajectory and remain robust against disturbances.

We intend to apply MPC in the context of controlling the trajectory of a quadcopter. We will set a reference trajectory and use MPC to control the quadcopter to move along the desired reference trajectory. The model of the quadcopter is represented by a system of non-linear equations as functions of its configuration and velocity. The non-linear model can then be linearized and represented as a linear state space model to be used in finding the optimal control input. The trajectory tracking will be formulated as an optimal control problem where the goal is to minimize an objective cost function subject to satisfying the dynamics of the model. Another advantage of MPC is that it allows additional constraints on the inputs and states to be implemented. In this case, we could implement limits on the torque of the quadcopter (or on the velocity etc). This implementation of the quadcopter controller will be done in Matlab.