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

**Project Proposal**

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

Lauren De Meyer

Joshua Mei

In this project, we will explore and apply model predictive control for control of a quadcopter. Model predictive control, as its name suggests, uses a prediction of how the system evolves in the future to optimize the control inputs accordingly. The inputs are computed for a finite (prediction) time horizon, but only the first one (at the time of calculation) is applied to the system. After the input is applied, the system states are measured again and the following control inputs are re-calculated with the updated model. The time horizon thus shifts one time step ahead. This iterative control process allows the system track a reference trajectory and remain robust against disturbances. For linear systems, MPC only requires solving a linearly constrained quadratic optimization problem at every time step.

We intend to apply MPC in the context of controlling the trajectory of a quadcopter. We will use MPC to control the quadcopter to move along a desired reference trajectory in three-dimensional space. 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. Another advantage of MPC is that it allows additional constraints on the inputs and states to be implemented. This way, we can limit the size of the control inputs and we can define the boundaries of the quadcopter’s space. The implementation of the quadcopter controller will be done in Matlab.