ESC794: Selected Topics in Engineering Science
Model Predictive Control

Homework 6. Due: 12/04/18. Matlab code and report as a pdf must be received by email by 5 PM.

1 The application of serial distributed MPC for a traffic intersection with autonomous vehicles has been discussed in class and the centralized solution posted on the course website. Obtain a serial MPC implementation for the same example, with any suitable sequence. Feel free to redefine the collision-avoidance constraint formulation. Time the centralized solution vs. the serial distributed case in order to make a meaningful comparison.

2 Write a function that simulates a dual decomposition MPC controller for the system

$$x^+ = Ax + Bu$$

with `A=[1 1 1;0 0 -1;1 0 0];B=[2 0;0 1;1 0]`. The objective is regulation to the origin under an LQR cost, where Q and R are chosen block-diagonal compatibly with your chosen system partition. Include a terminal equilibrium constraint and unit box constraints for the control vector. Tune the system for good performance by varying Q, R, the prediction horizon and the convergence rate of the steepest ascent Lagrangian iteration.