Andrew R. Teel (teel@ece.ucsb.edu), Department of Electrical and Computer Engineering, University of California-Santa Barbara, Santa Barbara, CA 93106-9560, *Discrete Time Receding Horizon Optimal Control: Is the Stability Robust?*

Receding horizon or model predictive control is an optimization-based paradigm for stabilizing nonlinear systems. It is especially well-suited for systems that are subject to input and/or state constraints. Model predictive control is commonly used in industry, especially the chemical processing industry where the driving time scales are sufficiently slow. In engineering circles, it is most frequently presented in discrete time, which will be the focus of this talk. Frequently the feedback algorithm derived from model predictive control is discontinuous. While this doesn't necessarily cause problems, some discontinuous feedback algorithms have absolutely no robustness. That is to say, arbitrarily small disturbances can keep the trajectories a fixed distance from the equilibrium point that presumably was stabilized. We will show that, for certain systems with certain state constraints, model predictive control has this unfortunate feature. After this, we will show how some problems that involve state constraints can be recast so that robust stability is guaranteed. Along the way, we will show how the typical requirements on the components of the underlying optimization problem in model predictive control can be relaxed. If time permits, we will conclude with a discussion relating robustness to the existence of a continuous (in fact, smooth) Lyapunov function.