

SSY281 - Model Predictive Control

MA3_09

Lucas Rath

January 31, 2019

Question 1 *Why in the constraint Linear Quadratic MPC, the control input is calculated online? Why do not we use Dynamic Programming to find an explicit controller?*

As explained in the lecture notes, the Bellman's equation for the constrained receding horizon control can in principle be solved, but this is an intractable task for the LQ case with constraints. In short, we cannot expect to be able to derive an explicit control law that is valid for all x . It is important to perceive that the set of allowed control sequences in general will depend on the initial state x_0 .

Question 2 *Assume a constraint Linear Quadratic MPC is implemented with $x(N) \in X_f$ as the terminal constraint and there is no uncertainty in the system. Can you claim that after N sample times, the system state is contained by X_f ?*

In the formulated MPC optimization problem, not all control sequences are allowed or feasible, due to the constraints. Therefore, if we say that an optimal control sequence is feasible at some point, then it meets the control and state constraints and will make the state trajectory reach the set X_f in the last step of the horizon.