SSY281 - Model Predictive Control

MA2_09

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Question 1 *Describe the closed-loop stability properties of an infinite-time LQ controller and a finite-time LQ controller in receding horizon.*

If the pair (A, B) is controllable and Q, R ≥ 0, then the solution to the infinite horizon LQ control problem gives a stable closed-loop system.

On the other hand, stability of the closed-loop system is not guaranteed for the finite-time LQ controller in receding horizon since it is based on optimality over a finite horizon (optimality does not guarantee stability)

Question 2 *How can stability of a finite-time LQ controller in receding horizon be enforced?*

It is possible to enforce stability of a finite-time LQ controller in receding horizon by increasing the time-horizon to infinity. In practice, it can be increased until the solution converges to the solution of the infinite case.

Question 3 *Explain the main advantage of a DP solution of a finite-time LQ problem vs. the batch solution.*

Regardless of which version of the receding horizon controller we choosethe two solutions are of course identical, however, the DP solution might be less computational expensive. Mainly, if the time-horizon is long enough, then the controller gain may converge to a constant value.