Data-driven distributed MPC of dynamically coupled linear systems

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We present a data-driven distributed model predictive control (MPC) scheme to stabilise the origin of dynamically coupled discrete-time linear systems subject to decoupled input constraints. The local optimisation problems solved by the subsystems rely on a distributed adaptation of the Fundamental Lemma by Willems et al. [1], allowing to parametrise system trajectories using only measured input-output data without explicit model knowledge. For the local predictions, the subsystems rely on communicated assumed trajectories of neighbours. Each subsystem guarantees a small deviation from these trajectories via a consistency constraint. In our preliminary work, we provide a theoretical analysis of the resulting non-iterative distributed MPC scheme, including proofs of recursive feasibility and (practical) stability [2]. Moreover, the approach is successfully applied to a numerical example. In [2], several strong conditions on the system were required. Our ongoing work concerns data-based estimation of these system parameters as well as data-based sufficient conditions for our scheme.

References

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