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Observer-based model predictive control for a class of well-posed linear systems

We consider observer-based model predictive control (MPC) for well-posed linear systems that are exponentially stabilizable and detectable using distributed state feedback and output injection. The proposed MPC controller is motivated by classical output MPC designs for finite-dimensional systems and comprises of dynamic output feedback and open-loop MPC. The dynamic output feedback will be obtained as an output of a Luenberger-type observer, and the open-loop MPC will be solved based on a nominal system which is essentially a copy of the actual plant. The proposed MPC design is applicable to any well-posed system satisfying the stabilability and detectability assumptions, which includes various reaction-convection-diffusion equations with boundary controls and observations as well as all exponentially stable well-posed linear systems. A one-dimensional diffusion equation will be considered as an illustrative example. Moreover, we will comment on possible extensions to more general classes of systems, e.g., if the assumptions on distributed state feedback and output injection are lifted.