Multiobjective Constrained MPC with Simultaneous Closed Loop Identification for MIMO Processes

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Abstract
In most Model Predictive Control (MPC) configurations, the objective function is single and incorporates the different items that need to be minimized, by multiplying them with appropriate weights. In this paper an alternative multiobjective MPC approach is proposed. The method is based on the prioritization of the different control objectives, which reduces considerably the number of tuning parameters and guarantees that the solution meets at least the most desirable targets. The proposed methodology can be used for simultaneous closed loop process control and model identification, by considering the persistent excitation of the manipulated variables as an additional top priority objective. The method is illustrated through its application to a nonlinear, non-isothermal, continuous tank reactor. Simulation results illustrate the superiority of the method over traditional single-objective MPC approaches.

Keywords: Model Predictive Control, Multiobjective Optimization, Adaptive Control, MIMO systems, Closed Loop Identification