

Similarities of Model Predictive Control and Constrained Direct Inverse

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Abstract

To reach an acceptable controller strategy and tuning it is important to state what is considered “good”. To do so one can set up a closed-loop specification or formulate an optimal control problem. It is an interesting question, if the two can be equivalent or not.

In this article two controller strategies, model predictive control (MPC) and constrained direct inversion (CDI) are compared in controlling the model of a pilot-scale water heater. Simulation experiments show that the two methods are similar, if the manipulator movements are not punished much in MPC, and they act practically the same when a filtered reference signal is applied. Even if the same model is used, it is still important to choose tuning parameters appropriately to achieve similar results in both strategies.

CDI uses an analytic approach, while MPC uses numeric optimization, thus CDI is more computationally efficient, and can be used either as a standalone controller or to supplement numeric optimization.

Keywords: model predictive control; inverse control; objective function; closed-loop specification; heat transfer