Controlling of Plate and Ball System with a Nonlinear RHC Approach with a Compromised Length of Time Subintervals

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Abstract:

Receding Horizon Control (RHC) or model pre-dictive control (MPC) is an attractive control method which can treat large number of nonlinear state and control variables at same time in a certain system. In nonlinear RH C, we solve a nonlinear programming (NLP) problem that is resulted from dividing a predefined prediction horizon, of the formulated nonlinear optimal control problem, into an equal finite time subintervals. However, one of the RHC problems is to determine this finite number of the subintervals. This work will use a recently-developed off-line tester for choosing the size of the time subintervals of the optimal control problem of the nonlinear plate and ball system. This tool will ease this problem by choosing a 'compromise' number of time subintervals, or a length of each subinterval, with a needed of objective cost of the optimal problem, accuracy of the state and control profiles, number of iterations of the used nonlinear programming solver as well as the computational expense. Results that indicate the effectiveness of applying this tool to the solution of optimal control problem of plate and ball system is presented which was done using C++ as well as Matlab frameworks.

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