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A Formal Sensitivity Analysis for Laguerre Based Predictive Functional Control

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Abstract

A Laguerre Predictive Functional Control (LPFC) is a simple input shaping method, which can improve the prediction consistency and closed-loop performance of the conventional approach (PFC). However, it is well-known that an input shaping method, in general, will affect the loop sensitivity of a system. Hence, this paper presents a formal sensitivity analysis of LPFC by considering the effect of noise, unmeasured disturbance and parameter uncertainty. Sensitivity plots from bode diagrams and closed-loop simulation are used to illustrate the controller robustness and indicate that although LPFC often provides a better closed-loop tracking response and disturbance rejection, this may involve some trade-off with the sensitivity to noise and parameter uncertainty. Finally, to validate the practicality of the results, the sensitivity of the LPFC control law is illustrated on real-time laboratory hardware.

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