

CONSYS: Control Optimization for Non-minimum Phase System via Series Cascade Structure

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Abstract

This work elucidates the control of integrating non-minimum phase system via series cascade scheme with fractional-order P.I. (Proportional-Integral) plus D (Derivative) controller. The traditional Internal Model Control (IMC) is adopted for inner loop controller design. The feedback D controller is synthesized with the outer loop process model, which shows the work's universality. The outer loop controller is suggested in the IMC framework after accountability of fractional-filter and inverse response compensator. This combination is revealed to enhance performance without compromising the robustness. The Riemann sheet principle is explored to compute the stability of the suggested controller. The sensitivity analysis has asserted the robustness. More importantly, the optimal value of controller settings is achieved via the Teaching Learning Based Optimization (TLBO) algorithm. This TLBO algorithm uses an objective function that minimizes Integral Square Error (ISE). Two illustrative problems are utilized to examine the recommended control structure's virtue.

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