

ENHANCED CONTROL OF SECOND ORDER UNSTABLE TIME DELAY SYSTEMS USING A GENERALIZED SMITH PREDICTOR BASED CONTROL STRATEGY

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Abstract

Second order unstable systems with time delay possess a challenging problem as far as a control scenario is considered. This work is centered on the control of unstable time delay second order systems. The control structure is developed as a combination of a stabilising output feedback controller for the delay free system and a predictor structure leading to a disturbance rejection controller for the delayed system. A set point filter is included to minimise the overshoot and to smooth the tracking performance. Predictor structure deals with time delay and disturbance rejection and there is only a single parameter to be tuned in the predictor to reach a trade-off between disturbance rejection capabilities and robustness, while the set point tracking controller can be tuned using conventional delay-free techniques. The method can be applicable to stable/unstable, non-minimum/ minimum phase systems. The structure is implemented in discrete domain. Different examples of second order time delay unstable systems are considered and the closed loop performances are compared with two of the methods reported in the literature. Quantitative comparison is carried out using integral error criterion and total variation. The proposed design provided enhanced closed loop performances.

References:

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