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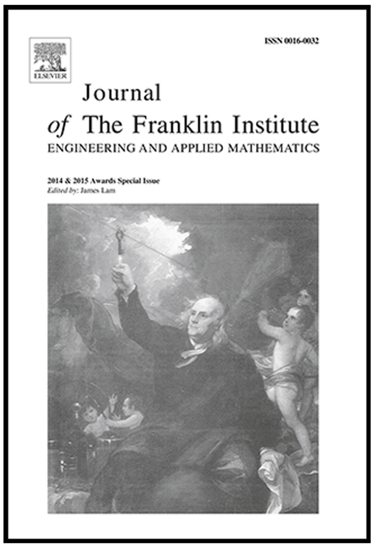

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Nonfragile Robust Model Predictive Control for Uncertain Constrained Time-delayed System with Compensations

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Abstract: This paper concerns the nonfragile robust model predictive control problem for discrete uncertain linear time-delayed systems subjected to input constraint and controller gain perturbation. By using the Lyapunov-Krasovskii stability theory and linear matrix inequality approach, sufficient conditions for nonfragile robust model predictive control with delayed state compensation are derived to asymptomatically stabilize the closed-loop system with guaranteed H_∞ and H_2 performance index for all admissible polytopic uncertainties, external disturbance, single state and input delay, and additive or multiplicative gain perturbation. Furthermore, the input constraint and the recursive feasibility are handled via additional constrainted conditions. Finally, two numerical examples are given to illustrate the effectiveness of the proposed approach.

Key words: Model predictive control; Compensation; Nonfragile; Linear matrix inequality

1. Introduction

Model predictive control (MPC), also known as receding horizon control (RHC), is an online control scheme rooted in optimal control and obtained through minimization or mini-maximization of some performance criteria either for a fixed finite horizon or for an infinite horizon. It has attracted on-going interests from both the industrial and academic communities for its broad application prospect. Compared with other robust controllers, the most appealing trait of RMPC is its ability to explicitly handle control problems subject to physical constraints. The study of robust MPC (RMPC) algorithms investigating the plant uncertainties and disturbances together with guaranteeing an adequate level of performance has been an important topic (see the survey papers [1-4] and references therein).

Aside from plant model uncertainties, the inherent time delays from either states or actuators are frequently encountered in practical systems and might also deteriorate the