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Truncated predictor feedback for linear systems with long time-varying input delays â˜†

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Abstract

In this paper we study the problem of stabilizing a linear system with a single long time-varying delay in the input. Under the assumption that the open-loop system is stabilizable and not exponentially unstable, a finite dimensional static time-varying linear state feedback controller is obtained by truncating the predictor based controller and by adopting the parametric Lyapunov equation based controller design approach. As long as the time-varying delay is exactly known and bounded, an explicit condition is provided to guarantee the stability of the closed-loop system. It is also shown that the proposed controller achieves semi-global stabilization of the system if its actuator is subject to either magnitude saturation or energy constraints. Numerical examples show the effectiveness of the proposed approach.

Keywords

Time-varying delay; Truncated predictor feedback; Stabilization; Actuator saturation; Energy constraints; Semi-global stabilization

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