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Time-domain performance based non-linear state feedback control of constrained linear systems.

Summary: This article describes a method to design a non-linear state feedback controller that meets a set of time-domain specifications not attainable by linear state feedback. Using a constrained polynomial interpolation technique, an input signal is computed that satisfies the desired time-domain constraints on the input and state-trajectories. The computed input is constructed by non-linear combinations of the states, such that a non-linear state feedback law is obtained. Stability of the resulting closed-loop polynomial system is analysed using sum-of-squares techniques. An illustrative example is presented, showing that the proposed non-linear controller outperforms the best linear static state feedback. To validate the proposed method, experiments on a fourth-order motion system have been carried out.

Keywords: nonlinear state feedback; constrained systems; polynomial approach; sum-of-squares
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