AN LMI APPROACH TO STATIC OUTPUT FEEDBACK STABILIZATION FOR LINEAR CONTINUOUS-TIME SYSTEMS WITH PARAMETER PERTURBATIONS

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Abstract. This paper investigates the design of a robust static output feedback controller for a class of linear continuous-time systems with norm-bounded time-varying parameter perturbations. A descriptor type model transformation and the utilization of free weighting matrices approach are taken into consideration. A linear matrix inequality approach is proposed to develop some sufficient conditions for the existence of a static output feedback controller. Numerical examples are used to demonstrate the effectiveness and applicability of the proposed methodology.

Keywords. Static output feedback, descriptor approach, norm-bounded uncertainty, linear matrix inequalities.

AMS (MOS) subject classification: 34D05, 34D10, 34D20, 34D23, 34H15, 93B05, 93B07, 93B52, 93C05, 93C15

1 Introduction

The static output feedback control problem is a significantly active research area [2], [6], [8]. The primary feature of designing a stabilizing static output feedback controller is its strong dependence on solving a bilinear matrix inequality. In other words, finding a static output feedback gain to stabilize a given system is not as easy as in the case of synthesizing a state feedback controller. As the full state information of a system may be quite often unavailable, the use of output feedback remains to be inevitable. The static output feedback control problem has received a considerable amount of interest. On the basis of minimizing a certain bound on a linear quadratic guaranteed cost function, a Riccati equation approach is presented in (Petersen, 1995) [9] for the output feedback quadratic stabilization of an uncertain system. The problem of optimal guaranteed cost control of an uncertain system via dynamic output feedback is investigated in (Savkin, and Petersen, 1997) [3] where some necessary and sufficient conditions are derived in terms of the existence of appropriate solutions to an algebraic Riccati equation. A review