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TRANSFORMATION METHODS FOR MIXED $\mathcal{H}_2/\mathcal{H}_\infty$ CONTROL OF JUMPING TIME-DELAY SYSTEMS

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Abstract. This paper introduces a new transformation method for the mixed $\mathcal{H}_2/\mathcal{H}_\infty$ control of a class of uncertain systems. In these systems, there are jumping parameters modelled by a continuous-time, discrete-state Markov process and the uncertainties are assumed to be real, time-varying and norm-bounded. A main portion of the system dynamics is a state-delay with constant delay factor. Through this method, the delay-dependence dynamics is naturally brought up in the design procedure. A state-feedback control is derived for both the nominal and uncertain systems such that the $\mathcal{H}_2$-performance measure is minimized while guaranteeing a prescribed $\mathcal{H}_\infty$-norm bound on the controlled system. All the developed results are cast in the format of linear matrix inequalities (LMIs) and numerical examples are presented.

Keywords. Mixed $\mathcal{H}_2/\mathcal{H}_\infty$ Control, Time-delay systems, Markovian jump parameters, State-feedback , Uncertain parameters.

AMS (MOS) subject classification: This is optional. But please supply them whenever possible.

1 Introduction

Considerable discussions on delays and their stabilization/destabilization effects in control systems have commanded the interests of numerous investigators in recent years, see [13,14,15] and their references. There are various sources for delays including finite capabilities of information processing among different parts of the system, inherent phenomena like mass transport flow and recycling and/or by product of computational delays [3]. In applications, parameter shifting, component and interconnection failures which are frequently occurring and therefore the design objectives have to reflect these impact. One direction of investigation has been through piecewise deterministic systems or Markovian jump dynamical systems [16,17] in which the underlying dynamics are governed by different forms depending on the value of an associated finite-state Markov process thus offer a base model of combined continuous and discrete states. Research into this class of systems and their applications extend over several decades[2,6]. On the other