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DECENTRALIZED ROBUST H-INFINITY CONTROL FOR DISCRETE-TIME SINGULAR LARGE-SCALE SYSTEMS WITH PARAMETER UNCERTAINTY

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Abstract. The decentralized robust H-infinity control problem for discrete-time singular large-scale systems with uncertainty in state and control matrices is considered. The uncertainty is elementary value bounded but not necessarily satisfies the so-called matching conditions. Based on the bounded real lemma of discrete-time singular systems, A sufficient condition for existence of decentralized robust H-infinity controller of uncertain discrete-time singular large-scale systems is presented in terms of matrix inequalities, and the feasible solutions to the corresponding matrix inequalities provide a parameterized representation of a set of decentralized robust H-infinity controller.

Keywords. Discrete-time system, singular large-scale system, robust control, H-infinity control, decentralized control.

1 Introduction

It is well known that singular systems (also known as descriptor systems, implicit systems, generalized state-space systems, differential-algebraic systems) can naturally describe the dynamics of many practical systems such as power systems, economical systems, robotic systems and chemical processes, etc. During the past years, the problems of robust stable and robust stabilization for singular systems with parameter uncertainties have attracted a lot of attention and significant advances have been made on these topics; see, e.g. [1]. Recently, much attention has been attracted to the stabilization and H-infinity control of singular systems. For instance, to solve the singular H-infinity control problem the J-spectral factorization and (J,J')-spectral factorization had been extended to the singular systems in [2] and [3] respectively, and a necessary and sufficient condition based on two generalized algebraic Riccatti equations and linear matrix inequality were given in [4] and [5-8, 20] respectively. It should be pointed out that the robust stability problem for singular systems is much complicated than that for state-space