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CENTRALIZED DESIGN OF DECENTRALIZED CONTROLLERS FOR INTERCONNECTED DESCRIPTOR SYSTEMS

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Abstract. This paper considers a decentralized stabilization problem for large-scale linear descriptor systems composed of a number of interconnected subsystems. The information structure constraint is compatible with the subsystems. The decentralized controller design is carried out in a centralized way. The design problem is reduced to feasibility of a bilinear matrix inequality (BMI). To solve the BMI, the idea of the homotopy method is applied, where the interconnections between subsystems are increased gradually from zeros to the given magnitudes. The case where polytopic perturbations exist in the interconnections is also dealt with.

Keywords. large-scale system, interconnected system, decentralized control, feedback stabilization, descriptor system, bilinear matrix inequality, homotopy method, polytopic perturbation.

AMS (MOS) subject classification: 93A14, 93A15, 93B40, 93B51, 93B52, 93C05, 93C15, 93C35, 93D15, 93D30

1 Introduction

Traditionally, design of decentralized stabilizing controllers for large-scale interconnected systems has been carried out in a hierarchical way [2], [6]. That is, a set of local stabilizing controllers for subsystems is considered first. Then, interconnections between subsystems are taken into account to find appropriate local controllers in the set, which stabilize the overall system as well. To show stability of the overall system, a combination of Lyapunov functions for subsystems has been used extensively. In this sense, not only