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DECENTRALIZED H_∞ CONTROL AND RELIABILITY ANALYSIS FOR SYMMETRIC COMPOSITE SYSTEMS: DYNAMIC OUTPUT FEEDBACK CASE

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Abstract. The dynamic output feedback decentralized H_∞ control and the reliability of the designed system (the maximal number of control-channel outages when the performance is still acceptable) is studied for symmetric composite systems. It is shown that the decentralized H_∞ control problem can be simplified to a simultaneous H_∞ control problem for two modified subsystems. A design method based on the simultaneous H_∞ control method is given. Simple methods for testing the reliablity are presented using the special structure of symmetric composite systems.

Keywords. Symmetric composite systems, output feedback, decentralized control, fault tolerant control, reliability.

1 Introduction

Symmetric composite systems are those composed of identical subsystems which are symmetrically interconnected. The motivation for studying this class of systems is due to its very diverse application areas, such as in electric power systems, industrial manipulators, computer networks [7, 10, 12].

In recent years there has been a great interest in studying symmetric composite systems. It is shown that many analyses and synthesis problems for symmetric composite systems can be simplified because of their special structure. Lunze [10] first proposed the state-space model of symmetric composite systems, and investigated some fundamental properties of the systems. For centralized control problems, Liu [9] treated the output regulation for symmetric composite systems. The model reduction problem was considered by Lam and Yang [11]. H_2 and H_∞ optimal control were studied in [7]. Yang