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NEW APPROACHES TO H_∞-CONTROL FOR T-S FUZZY DESCRIPTOR SYSTEMS VIA LMI [1]

Xiaodong Liu[1,2], Qingling Zhang[2] and Ming Rao[3]

[1] Department of Mathematics and Physics
Dalian Maritime University, Dalian, P. R. China, 116026
[2]College of Science
Northeastern University, Shenyang, China, 110004
[3]Department of Chemical Engineering
University of Alberta, Edmonton, Alberta T6G 2G1

Abstract. In this paper, the problem of H_∞-Control based on the state feedback for T-S fuzzy descriptor systems has been studied. First a new sufficient condition in the form of a single negative definite matrix which guarantees the existence of the state feedback H_∞ control for the T-S fuzzy descriptor systems has been proposed. The conditions in this paper are not only simple but also considering the interactions among the subsystems. Secondly based on the LMIs, the controller designing methods for the stabilization and the H_∞-Controller for the T-S fuzzy descriptor systems have been given.

Keywords. H_∞-Control, T-S fuzzy descriptor systems, Quadratic stability, State feedback H_∞-Control, Linear matrix inequalities (LMIs).

AMS (MOS) subject classification: 93A30.

1 Introduction

T-S (Takagi-Sugeno) fuzzy systems are nonlinear systems described by a set of if-then rules which gives a local linear representation of an underlying system. Such models can approximate a wide class of nonlinear systems. Cao S G, et al., have proved in [6] that the T-S fuzzy system can approximate any continuous function in R^n at any preciseness and applied the method based on linear uncertain system theory to convert the stability analysis of a fuzzy control system to the stability analysis of linear time-varying "extreme" subsystems. This allows the designer to take advantage of conventional linear system to analyze and design fuzzy control systems. Because their research did not consider the interactions among the fuzzy subsystems, their results and some results such as [5,7,13,14,15,16], tend to give very conservative conditions. Very recently, in [8,9], the relaxed stability and stabilizability conditions for fuzzy control systems were reported to release the conventional conditions by considering the interactions among fuzzy subsystems in an analytical manner based on the property of the quadratic form. The quadratic stability conditions in [10], unlike the previous works [8,9], were represented in terms of a linear matrix inequality and solve it in a numerical manner.