Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **11 (2004)** 817-824

RELIABLE FUZZY H_∞ CONTROL OF UNCERTAIN SYSTEMS WITH TIME-VARYING DELAY

Bing Chen

Department of Mathematics
Jinzhou Teacher's College, Jinzhou 121003

Abstract. This paper proposes the reliable fuzzy control design problem for fuzzy control systems. Based on Linear Matrix Inequality (LMIs) approach, a method for the design of reliable fuzzy control systems is presented. The resulting fuzzy control systems are reliable in the sense that they provide guaranteed asymptotic stability not only when all control components are operating well, but also in the case of outage for some components within a prespecified subset of control components.
Keywords. Actuator fault, reliable control, fuzzy dynamic system, linear matrix inequality.

1 Introduction

In traditional T-S fuzzy models, there is no delays in the state. On the other hand, time-delays often occur in many dynamic systems such as rolling mill systems, biological systems, metallurgical processing systems and network systems, and so on. Then, it is shown that the existence of delays usually becomes the source of instabililty and deteriorates performance of systems. In recent years, some authors have paid their attention to control of nonlinear systems with time-delays by using T-S fuzzy models. Cao [1] considered stability analysis and synthesis of nonlinear systems with time-delay via linear T-S fuzzy models, and a fuzzy controller design scheme was proposed in terms of LMIs. In [4], the problem of output feedback robust H_∞ control of fuzzy dynamic systems with time-delay was discussed. A sufficient condition for the existence of H_∞ controller is given by means of matrix inequalities.

All the aforementioned results are under a full reliability assumption that all control components of the systems are in good working conditions. However, in practical situations, failure of actuators often occurs. Thus, from a safety as well as performance point of view, an important requirement is to have a reliable controller design such that the stability and performance of the closed-loop system can tolerate actuator failure. Since the early work by MacFarlane [5], much related work for linear systems has been reported (see, e.g., [7], [9], [14], [3], [12], [13], [6]). Although it is an important problem to design a reliable controller against the failure of some control components, it