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ROBUST RELIABLE H_∞ CONTROL FOR UNCERTAIN SYSTEMS WITH POLE CONSTRAINTS

Xiangyu Gao[1,3], Kok Lay Teo[1,2], Guang-Ren Duan[1] and Nan Wang[3]

[1]Center for Control Theory and Guidance Technology
Harbin Institute of Technology
No. 92, West Da-Zhi Street, Harbin 150001, P. R. China
g.r.duan@hit.edu.cn

[2]Department of Mathematics and Statistics
Curtin University
Perth 6845, Australia
K. L. Teo@curtin.edu.au

[3]School of Mathematical Science
Heilongjiang University
No. 74, Xuefu Road, Harbin 150080, P. R. China
gxy578@126.com; w2730826@tom.com

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Abstract. *This paper investigates the robust reliable H_∞ control for uncertain systems. The system under consideration is subject to parameter uncertainties, external disturbances, actuator faults and pole constraints. A reliable output feedback controller is designed via a Lyapunov function approach in such a way that the closed-loop system will satisfy the system design requirements. The existence conditions for the admissible controller are given in terms of linear matrix inequalities (LMIs). The controller design is thus transformed into a convex optimization problem subject to LMI constraints. Two illustrative examples are provided to show the effectiveness of the proposed control design method.*

Keywords: Reliable H_∞ control, LMIs, Uncertain systems, Actuator faults, Pole constraints

1. **Introduction.** In reality, it is impossible to construct the exact model of a system. There are many phenomena that are not fully understood, and hence could not be modelled precisely. Furthermore, for all man-made systems, such as ship motion control systems, and spacecraft control systems, their components are subject to deterioration. Thus, in the past few decades, uncertain linear systems have attracted considerable attention (see [1, 2, 3]).

In the uncertain control system design, the system stability and performance are two fundamental requirements. A stable system must have a good dynamic performance such as fast response, small overshoot and effective load rejection. In the past, much attention has been focused on the study of H_∞ control problems where the objective is to design a controller such that the closed-loop system is stable and the H_∞-norm of the corresponding closed-loop transfer function is minimized. In this way, effects of the disturbance on the system are reduced. However, for both the standard H_∞ control and robust H_∞ control problems, concerns on the transient behavior of the closed-loop systems [4, 5, 6] have not been taken into proper consideration. In many practical applications, it is clear that the importance of their transient properties should not be overlooked. A practical approach to this problem is to place the poles of the closed-loop systems in a specified