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OUTPUT FEEDBACK $\mathcal{H}_\infty$ CONTROL OF A CLASS OF STOCHASTIC HYBRID SYSTEMS WITH WIENER PROCESS VIA CONVEX ANALYSIS

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Abstract. *This paper deals with the problem of $\mathcal{H}_\infty$ control, via static output feedback, of continuous time Active Fault Tolerant Control Systems with Markovian Parameters (AFTCSMP) with Wiener process. The above problematic is addressed under a convex programming approach. Indeed, the fundamental tool in the analysis is an LMI (Linear Matrix Inequalities) characterization of output feedback compensators that* stochastically stabilize *the closed loop system and ensure $\mathcal{H}_\infty$ performances. A numerical example is presented to illustrate the theoretical results.*

Keywords: Active fault tolerant control, Stochastic hybrid systems, Markovian jumping parameters, $\mathcal{H}_\infty$ control, Output feedback, Lyapunov stability - LMI

1. **Introduction.** Fault Tolerant Control Systems (FTCS) have been developed in order to achieve high levels of reliability and performance in situations where the controlled system can have potentially damaging effects on the environment if failures of its components take place. FTCS have been a subject of great practical importance, which have attracted a lot of interest for the last three decades. A bibliographical review on reconfigurable fault tolerant control systems can be found in [24].

Active fault tolerant control systems are feedback control systems that reconfigure the control law in real time based on the response from an automatic Fault Detection and Identification (FDI) scheme. The dynamic behaviour of this class of systems is governed by stochastic differential equations and can be viewed as a general stochastic hybrid system [23]. In the literature, there are two major classes of stochastic hybrid systems: jump linear systems (JLS) and Active Fault Tolerant Control Systems with Markovian Parameters (AFTCSMP). In JLS, a single jump process is used to describe the random variations affecting the system parameters. This process is represented by a finite state Markov chain and is called the plant regime mode. The theory of stability, optimal control and $\mathcal{H}_2/\mathcal{H}_\infty$ control, as well as important applications of such systems, can be found in several papers in the current literature, for instance in [5-7,9-11,14,15,20].

The AFTCSMP model allows to study the impact of time delays and errors in the decisions of the FDI process. That is, it does not assume instantaneous and perfect failure detection. In this class of hybrid systems, two random processes are defined: the first random process represents system components failures and the second random process