International Journal of Innovative Computing, Information and Control
Volume **7**, Number **3**, March **2011**

ICIC International ©2011 ISSN 1349-4198
pp. **1299–1310**

H_∞ FILTERING FOR MARKOVIAN JUMP SYSTEMS WITH TIME-VARYING DELAYS

Jinliang Liu[1], Zhou Gu[2] and Songlin Hu[3]

[1]College of Information Science and Technology
Donghua University
No. 2999, Renmin North Road, Songjiang District, Shanghai 201620, P. R. China
liujinliang@vip.163.com

[2]College of Power Engineering
Nanjing Normal University
No. 78, Bancang Road, Nanjing 210042, P. R. China
guzhouok@yahoo.com.cn

[3]Department of Control Science and Engineering
Huazhong University of Science and Technology
No. 1037, Luoyu Road, Wuhan 430074, P. R. China
songlin621@126.com

Received November 2009; revised March 2010

Abstract. *This paper proposes a class of H_∞ filter design for Markovian jump systems with time-varying delays. Firstly, by exploiting a new Lyapunov function and using the convexity property of the matrix inequality, new criteria is derived for the H_∞ performance analysis of the filtering-error systems, which can lead to much less conservative analysis results. Secondly, based on the obtained conditions, the gain of filter can be obtained in terms of linear matrix inequalities (LMIs). Finally, numerical examples are given to demonstrate the effectiveness and the merit of the proposed method.*
Keywords: Time-delay systems, H_∞ filter, Markovian jump systems

1. **Introduction.** During the past few decades, Markovian Jump Systems (MJSs) have been attracted much attention [1, 2, 3, 4, 5, 6], which can be regarded as a special class of hybrid systems with finite operation modes whose structures are subject to random abrupt changes. The system parameters usually jump among finite modes, and the mode switching is governed by a Markov process. MJSs have many applications, such as failure prone manufacturing systems, power systems and economics, etc. A great number of results on estimation and control problems related to such systems have been reported in the literature [7, 8, 9, 10, 11].

Recently, the problem of H_∞ filtering of linear/nonlinear time-delay systems has also received much attention due to the fact that for many practical filtering applications, time-delays cannot be neglected in the procedure of filter design and their existence usually results in a poor performance [12, 13, 14]. Some nice results on H_∞ filtering for time-delay systems [15, 16] have been reported in the literature and there are two kinds of results, namely delay-independent filtering [17] and delay-dependent [18, 19, 20, 21, 22, 23]. The delay-dependent results are usually less conservative, especially when the time-delay is small. The main objective of the delay-dependent H_∞ filtering is to obtain a filter such that the filtering error system allows a maximum delay bound for a fixed H_∞ performance or achieves a minimum H_∞ performance for a given delay bound.