International Journal of Innovative Computing, Information and Control
Volume **6**, Number **6**, June **2010**
ICIC International ©2010 ISSN 1349-4198
pp. 2485–2495

QUANTIZED FEEDBACK STABILIZATION FOR NETWORKED CONTROL SYSTEMS WITH NONLINEAR PERTURBATION

Lei Zhou[1,2] and Guoping Lu[3]

[1]Department of Mathematics
East China Normal University
Shanghai 200062, P. R. China

[2]School of Science
[3]College of Electrical Engineering
Nantong University
Nantong 226007, P. R. China
gplu@pub.nt.jsinfo.net; lu.gp@ntu.edu.cn

Received December 2008; revised June 2009

Abstract. *This paper discusses the state feedback stabilization problem for a class of networked control systems with nonlinear perturbation and state quantization. Firstly, under consideration of both network-induced delay and the data packet dropout in the transmission, a state feedback controller is constructed without considering the state quantization. Then, based on the unified framework of networked and quantized state feedback control systems, a quantized asymptotically stabilizing sufficient condition is proposed for the obtained controller. Finally, the effectiveness of the approach is demonstrated by a numerical example.*

Keywords: Networked control system, Nonlinear perturbation, Stabilization, Quantization, Linear matrix inequality

1. **Introduction.** Feedback control systems wherein the control loops that are closed through a real-time network are called as networked control systems (NCSs) [1]. The insertion of the bandwidth constraint communication network in the feedback control loop makes the analysis and design of NCSs much more complex. During the past decades, considerable attention has been devoted to networked control systems and significant advances have been made on many topics, see for example, stabilization control [6,11], H_∞ control [10], guaranteed cost control [7], fault identification and fault-tolerant control [8].

Up to now, two different approaches have been developed in modeling the network in networked control systems. Information based approach assumes that the network is a digital communication channel. Due to the band-limited constraints only a finite number of bits can be transmitted over the network at each transmission instant. So the main issue considered in this class of networks is data quantization [2-4]. The much more popular approach is to model the network as a data bus. Then the control signals are transmitted as data packets over the network at each transmission instant. The corresponding researches mainly focus on network architecture, protocols and scheduling in order to reduce effects of network-induced delay and data packet dropout on the performance of the system, see for example, [5-14]. It should be noticed that most of the mentioned works assume that the control signals can be transmitted with infinite precision, while the digital aspect of the channel is not considered and the quantization effects are ignored.