Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **17 (2010)** 909-934
 http://www.watam.org

OUTPUT-FEEDBACK CONTROL OF NONLINEAR DELAYED SYSTEMS: A DYNAMIC HIGH-GAIN SCALING APPROACH

P.Krishnamurthy[1] and F. Khorrami[1]

[1]Control/Robotics Research Laboratory (CRRL), Dept. of ECE
Polytechnic Institute of NYU, Brooklyn NY 11201, USA
Corresponding author email: khorrami@smart.poly.edu

Abstract. The output-feedback control problem for nonlinear systems with state and input delays is addressed. Both state and input delays are allowed to be time-varying and uncertain. The class of systems considered consists of a nominal system of strict-feedback form as well as appended dynamics and inverse dynamics. A delay-independent robust adaptive feedback is designed based on our recent results on dual dynamic high-gain scaling based control designs for strict-feedback systems.

Keywords. Output-feedback, Delay, High-gain control, Scaling, Nonlinear systems.

AMS (MOS) subject classification: 93B52.

1 Introduction

Delay is a common phenomenon in applications and has attracted significant research interest in the literature (see [1–12] and the references therein) for a variety of classes of nonlinear systems. Control Lyapunov-Razumikhin functions and control Lyapunov-Krasovskii functions have been considered to provide constructive tools for control design [1, 2, 4] for delayed systems. A domination redesign approach based on control Lyapunov-Razumikhin functions and backstepping based design yielding delay-independent feedback were proposed in [5]. Adaptive backstepping based on a LaSalle-Razumikhin approach using a Lyapunov-Razumikhin function was proposed in [6]. Robust backstepping of time delayed systems has also been considered in [8]. The case of input delays (or equivalently measurement delays) has been addressed in [7, 10–12]. Time delay issues in the context of hybrid or sampled-data systems have also been studied [13–17]. Fuzzy tracking control of strict-feedback nonlinear systems with time delays has also been addressed in [36]. In this paper, we address a general class of nonlinear systems with time delays and leverage our recent results on a dual dynamic high-gain scaling based design technique [18, 19] which provides a flexible control design approach. Specifically, we address the global asymptotic output-feedback stabilization problem