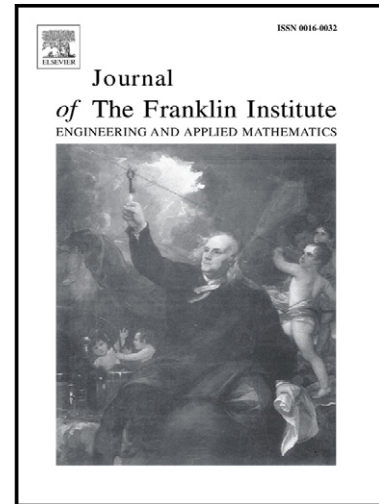


Author's Accepted Manuscript

Optimal control for linear and nonlinear semistabilization

Andrea L'Afflitto, Wassim M. Haddad, Qing Hui



www.elsevier.com/locate/jfranklin

PII: S0016-0032(14)00331-7
DOI: <http://dx.doi.org/10.1016/j.jfranklin.2014.11.015>
Reference: FI2173

To appear in: *Journal of the Franklin Institute*

Received date: 21 February 2014
Revised date: 2 October 2014
Accepted date: 20 November 2014

Cite this article as: Andrea L'Afflitto, Wassim M. Haddad, Qing Hui, Optimal control for linear and nonlinear semistabilization, *Journal of the Franklin Institute*, <http://dx.doi.org/10.1016/j.jfranklin.2014.11.015>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

November 27, 2014

Optimal Control for Linear and Nonlinear Semistabilization

by

Andrea L'Afflitto*, Wassim M. Haddad[†], and Qing Hui[‡]

Abstract

The state feedback linear-quadratic optimal control problem for asymptotic stabilization has been extensively studied in the literature. In this paper, the optimal linear and nonlinear control problem is extended to address a weaker version of closed-loop stability, namely, semistability, which involves convergent trajectories and Lyapunov stable equilibria and which is of paramount importance for consensus control of network dynamical systems. Specifically, we show that the optimal semistable state-feedback controller can be solved using a form of the Hamilton-Jacobi-Bellman conditions that does not require the cost-to-go function to be sign definite. This result is then used to solve the optimal linear-quadratic regulator problem using a Riccati equation approach. Finally, two numerical examples are presented to demonstrate the efficacy of the proposed linear and nonlinear semistabilization framework.

Key Words: Optimal control, nonlinear control, semistabilization, semicontrollability, semiobservability, Hamilton-Jacobi-Bellman theory, least squares Riccati solutions

Running Title: Optimal Control for Semistabilization

This work was supported in part by the Air Force Office of Scientific Research under Grant FA9550-12-1-0192, the Domenica Rea D'Onofrio Fellowship, and the Defense Threat Reduction Agency under Grants HDTRA1-10-1-0090 and HDTRA1-13-1-0048.

*Andrea L'Afflitto is with the School of Aerospace Engineering, Georgia Institute of Technology, Atlanta, GA 30332-0150, USA (a.lafflitto@gatech.edu).

[†]Wassim M. Haddad is with the School of Aerospace Engineering, Georgia Institute of Technology, Atlanta, GA 30332-0150, USA (wm.haddad@aerospace.gatech.edu).

[‡]Qing Hui is with the Department of Mechanical Engineering, Texas Tech University, Lubbock, TX 79409-1021, USA (qing.hui@ttu.edu).

Download English Version:

<https://daneshyari.com/en/article/4974560>

Download Persian Version:

<https://daneshyari.com/article/4974560>

[Daneshyari.com](https://daneshyari.com)