

## Accepted Manuscript

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PII: S0947-3580(16)30142-X  
DOI: [10.1016/j.ejcon.2017.04.003](https://doi.org/10.1016/j.ejcon.2017.04.003)  
Reference: EJCON 204



To appear in: *European Journal of Control*

Received date: 24 September 2016  
Revised date: 21 February 2017  
Accepted date: 20 April 2017

Please cite this article as: Griselda I. Zamora-Gómez, Arturo Zavala-Río, Daniela J. López-Araujo, Observer-less output-feedback global continuous control for the finite-time and exponential stabilization of mechanical systems with constrained inputs, *European Journal of Control* (2017), doi: [10.1016/j.ejcon.2017.04.003](https://doi.org/10.1016/j.ejcon.2017.04.003)

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# Observer-less output-feedback global continuous control for the finite-time and exponential stabilization of mechanical systems with constrained inputs

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## Abstract

An observer-less output-feedback global continuous control scheme for the finite-time or (local) exponential stabilization of mechanical systems with constrained inputs is proposed. The approach is formally developed within the theoretical framework of local homogeneity. The closed-loop analysis incorporates a complementary insight on the control-induced motion dissipation through an *ad hoc* feedback-system passivity theorem. The work includes a simulation implementation section where the performance difference of the proposed scheme with previous observer-based and differentiation algorithms is brought to the fore.

*Keywords:* Finite-time stabilization, local homogeneity, output feedback, mechanical systems, constrained inputs, saturation

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## 1. Introduction

The last decades have witnessed an increasing interest on stabilization with finite-time convergence through continuous feedback. Such an intriguing topic is traced back to the seminal work of Haimo in [13], where finite-time stability on second-order (*double integrator*) systems of the form

$$\ddot{x} = u \tag{1}$$

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