

Accepted Manuscript

Exponential Stabilization of Cascade ODE-Linearized KdV System by
Boundary Dirichlet Actuation

Habib Ayadi

PII: S0947-3580(17)30457-0
DOI: [10.1016/j.ejcon.2018.05.005](https://doi.org/10.1016/j.ejcon.2018.05.005)
Reference: EJCON 272

To appear in: *European Journal of Control*

Received date: 28 November 2017
Revised date: 9 April 2018
Accepted date: 22 May 2018

Please cite this article as: Habib Ayadi, Exponential Stabilization of Cascade ODE-Linearized KdV System by Boundary Dirichlet Actuation, *European Journal of Control* (2018), doi: [10.1016/j.ejcon.2018.05.005](https://doi.org/10.1016/j.ejcon.2018.05.005)



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 proof before it is published in its final 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.

Exponential Stabilization of Cascade ODE-Linearized KdV System by Boundary Dirichlet Actuation

Habib Ayadi

Université de Kairouan. Institut Supérieur des Mathématiques Appliquées et de l'Informatique, Avenue Assad Iben Fourat - 3100 Kairouan, Tunisia

Abstract

In this paper, we solve the problem of exponential stabilization for a class of cascade ODE-PDE systems governed by a linear ordinary differential equation and the $1 - d$ linearized Korteweg-de Vries equation (KdV) posed on a bounded interval. The control for the whole system acts in the left boundary with Dirichlet condition of the KdV equation whereas the KdV acts in the linear ODE by a Dirichlet connection. We use the so-called backstepping method in infinite dimension to convert system under consideration to an exponentially stable cascade ODE-PDE system. Then, we use the invertibility of such design to achieve the exponential stability for the original ODE-PDE cascade system by using Lyapunov analysis.

Keywords: Cascade ODE-PDE, Linearized-KdV, Backstepping, Exponential stability

1. Introduction

It is well known that the Korteweg-de Vries (KdV) equation in bounded domain models the dynamics of various types of extreme waves in shallow water, more particularly tsunami waves and freak waves (see [27]). For better understanding of KdV, one can see [28], in which different mathematical models of water wave are deduced. From theoretical point of view, the KdV controlled equation has some interesting control properties depending on where the controls are located and on the type of boundary conditions [8], [20]. In the past decades, stabilization of coupled ODE-PDE systems was

Email address: hayadi26@laposte.net ()

Download English Version:

<https://daneshyari.com/en/article/8947615>

Download Persian Version:

<https://daneshyari.com/article/8947615>

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