

Preface

This book mostly results from a selection of papers presented during the 11th International Federation of Automatic Control (IFAC) Workshop on Time-Delay Systems, which took place in Grenoble, France, February 4–6, 2013. During this event, 37 papers were presented on various topics concerning Time-Delay Systems: Modelling and identification, Stability and stabilization, Robustness issues, Filtering and observation, Diagnosis, Control design, Output feedback control, Non-linear time-delay systems, Distributed parameter systems, Infinite dimensional systems, Numerical methods, Algebraic methods, Sampled-data control, Hybrid systems, Applications with time-delay systems.

Taking into account the reviewers' evaluation and the papers' presentation, we decided to select the best papers and to collect them into that volume. The authors of 13 selected papers were invited to participate to this book and provided a more detailed and improved version of the conference paper. To enrich the book in the topics that we wished to highlight, three more chapters have been included from specialists on time-delay systems who presented their work during the 52nd IEEE Conference on Decision and Control, which held on December 10–13, 2013, at Florence, Italy.

The content of the book is divided into four main parts as follows: Modelling, Stability Analysis, Stabilization and Control, Input-Delay Systems.

Modelling *Delphine Bresch-Pietri and Nicolas Petit* propose in Chap. 1 to model temperature transport in SI engine exhaust catalyst as an implicit integral equation. In Chap. 2 *Islam Boussaada et al.* consider the modelling of a rotary drilling system. *Wim Michiels et al.* develop in Chap. 3 a model order reduction method to obtain a delay-free model from a time-delay system.

Stability Analysis *Alexey P. Zhabko and Irina V. Medvedeva* present in Chap. 4 a Lyapunov–Krasovskii approach to conclude on the stability of a system with two commensurate delays. In Chap. 5 *Alexey V. Egorov and Sabine Mondié* study the estimation of the exponential decay of a linear time-delay system. Chapter 6 by *Sérine Damak et al.* compares spectral and Lyapunov–Krasovskii approaches for

difference equations. *Anton V. Proskurnikov* presents in Chap. 7 a way to give the delay margin under which the network consensus is achieved.

Stabilization and Control *Vladimir Rășvan* develops in Chap. 8 a stabilization method for flexible systems represented as neutral functional differential equations. In Chap. 9 *Felipe Castillo et al.* give some results on the stabilization of LPV first-order hyperbolic systems. Chapter 10 by *Pierdomenico Pepe* deals with ISS stabilization of non-linear delay systems with input disturbance. In Chap. 11 *Hiroaki Mukaidani et al.* propose an optimal state feedback control for Markov Jump Stochastic Delay Systems. Chapter 12 by *Tomáš Vyhlídal et al.* considers the stabilization of flexible systems through input shapers with distributed delays.

Input-Delay Systems this part begins with Chap. 13 by *Emilia Fridman and Kun Liu* about state feedback control of input-delay systems with saturated input. In Chap. 14 *Leonardo Amaral Mozelli and Fernando de Oliveira Souza* propose a Lyapunov–Krasovskii approach to design PID controllers for SISO systems with an input delay. Chapter 15 by *Vinicius de Oliveira et al.* deals with robust fixed order H_∞ -based Smith Predictor for uncertain time-delay systems. Finally, *Daniel Melchor-Aguilar and Alejandro Morales-Sánchez* give in Chap. 16 a robust analysis of finite spectrum assignment control method for input-delay systems.

Through various topics about time-delay systems, we hope that this book will interest numerous researchers and graduate students working on control and system theory.

We would like to thank all the contributors for providing very nice and high-level chapters for this book, which participate to the book series *Advances in Delays and Dynamics*.

Grenoble, France
April 2015

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Recent Results on Time-Delay Systems
Analysis and Control

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2016, XI, 329 p. 55 illus., 34 illus. in color., Hardcover

ISBN: 978-3-319-26367-0