Editorial

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1 Introduction

In 2009, the Biannual International Conference on Signal Systems and Devices (SSD'2009) was held in Djerba, Tunisia, March 23–26, with more than 400 participants. The conference was organised jointly by the National Engineering School of Sfax (Tunisia), the University of the Bundeswehr Munich (Germany), and the University of Philadelphia – Amman (Jordan). The conference runs four parallel sessions, 11 keynote talks and two plenary sessions. The themes of the technical sessions were: systems analysis and automatic control, power electrical systems, communication and signal processing, and sensors, circuits and instrumentation systems. The conference has been technically sponsored by: IEEE Circuit and Systems Society (CAS), IEEE Instrumentation and Measurements Society (IMS), ASME Dynamic Systems and Control Division (ASME DSCD).

SSD'09 secretariat has received 366 submissions from 38 countries: Algeria, Argentina, Austria, Belgium, Canada, Christmas Islands, China, Egypt, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Iran, Iraq, Ireland, Italy, Japan, Jordan, KSA, Libya, Malaysia, Morocco, Norway, Oman, Portugal, Romania, Soudan, Spain, Switzerland, Tunisia, Turkey, Trinidad and Tobago, UAE, UK, Ukraine, and the USA. Only 234 papers were accepted.

2 Issue contents

Authors of the most innovative 14 papers dealing with modelling, identification and control theories and techniques were invited to submit an extended version of their works for a peer-review process for possible publication in this special issue. The six papers included in this issue have passed the selection rigorous review process. The contents of the papers are briefly described as follows:

1 'On a robust real-time H_∞ controller design for an electrical drive' by Soufiene Bouallègue, Joseph Haggège and Mohamed Benrejeb. In this paper, a robust H_∞ controller is designed and applied to a DC motor, as an electrical drive. In H_∞ mixed sensitivity framework, several satisfying results, mainly in terms of tracking trajectories, control signal moderation, disturbance rejection as well as robustness stability in the case of neglected dynamics uncertainty, were obtained using a four-block criterion design structure. The proposed H_∞ controller algorithm was successfully implemented and tested in the real-time framework using a multi-function data acquisition PCI-1710 board.

2 'Formation control of multiple marine vehicles with velocity reference estimation-based passivity control design' by Jawhar Ghommam, Faïçal Mnif and Oscar Calvo. This paper addresses the problem of coordination path following control of multiple autonomous vehicles. Stated briefly, the problem consists of steering a group of vehicles along a specified path, while holding a desired inter-ship formation pattern. Path following for each vehicle amounts to reducing an appropriately defined geometric error to zero. We first show a passivity property for the path following system and next, combine this with a passivity-based synchronisation algorithm to coordinate the vehicles along their paths. Vehicle coordination is achieved by adjusting the speed of each vehicle along its path according to information exchanged on the positions of a subset of the other vehicles, as determined by the communication topology adopted. We further assume the unavailability of the reference velocity to each vehicle, we consider the situation where this information is only available to a leader of this formation. Distributed observers are designed for the follower vehicles, under the assumption that the velocity of the leader cannot be measured in real-time. Simulations results are presented and discussed.

3 'Observer design for classes of non-linear networked control systems' by Romain Postoyan, Tarek Ahmed-Ali and Françoise Lamnabhi-Lagarrigue. Assuming a class of continuous-time observers is known for a given non-linear system, an observation structure is derived when sensors information is subject to network-induced communication constraints. The approach is based on the recent results on hybrid observers for sampled-data systems by Karafyllis and Kravaris (2009). Considering two classes of protocols, some asymptotic stability properties are shown to hold for the observation error, under some conditions, and explicit bounds on the maximum allowable transmission interval are given.

4 'Multimodel LQ controller design for variable-speed and variable pitch wind turbines at high wind speeds' by Nadhira Khezami, Xavier Guillaud, Naceur Benhadj Braiek. This paper focuses on designing a multimodel linear quadratic (LQ) controller for variable-speed horizontal axis wind turbines. Those turbines use blade-pitch and electromagnetic torque control to meet specified objectives for three regions of operation. We aim in this paper to use the blade-pitch control in the high wind speed operating zone. The controller is then designed in order to optimise a trade-off between two main control objectives which are alleviation of drive train dynamic loads and maximisation of energy efficiency.

It is thereafter implemented for a deloaded operation to provide an additional operating reserve necessary to increase the effective participation of the wind turbines in the system frequency regulation. A 2 MW wind turbine is considered to illustrate the good performances brought by the proposed approach by presenting and discussing the simulation results.

5 'Robust path tracking by preshaping approach designed for third generation CRONE control' by Rim Jallouli-Khlif, Pierre Melchior, Nabil Derbel and Alain Oustaloup. Preshaping approach is used to reduce system vibration in motion control. Desired systems inputs are altered so that the system finishes the requested move without residual vibration. This technique, developed by Singer and Steering, is used for flexible structure control, particularly in the aerospace field. In a previous work, this method was extended for explicit fractional derivative systems and applied to second generation CRONE control, the robustness was also studied. CRONE (the French acronym of 'commande robuste d'ordre non-entier') control system design is a frequency-domain based methodology using complex fractional integration. It permits the robust control of perturbed linear plants using the common unity feedback configuration. This paper presents the extension of the preshaping approach to generalised derivative systems and its application to third generation CRONE control. Then, to ensure robust path tracking, a robust algorithm for the shaper synthesis is developed.

6 'Fractional attractive force for robust path planning' by B. Metoui, P. Melchior, S. Najar, M.N. Abdelkrim and A. Oustaloup. A new robust path planning design for mobile robot was studied in dynamic environment. The normalised attractive force applied to the robot is based on a fictitious fractional attractive potential. This method allows to obtain robust path planning despite robot mass variation. The danger level of each obstacle is characterised by the fractional order of the repulsive potential of the obstacles. Under these conditions, the robot dynamic behaviour was studied by analysing its x-y path planning with dynamic target or dynamic obstacles. The case of simultaneously mobile obstacles and target is also considered. The influence of the robot mass variation is studied and the robustness analysis of the obtained path shows the robustness improvement due to the non-integer order properties.