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Editorial

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Biographical notes: Faïçal Mnif received a BE in Electrical Engineering from the Ecole Nationale d'Ingénieurs de Sfax (Tunisia) in 1988, an MSc in Industrial Electronics in 1991 and a PhD in Control and Robotics in 1997 from the Ecole Polytechnique de Montreal (Canada). He is an Associate Professor of Control Engineering and Robotics at the National Institute of Applied Sciences and Technology (Tunisia). Currently, he is on leave to Sultan Qaboos University (Oman) in the Department of Electrical and Computer Engineering. He is a Member of the research unit on MEChatronics and Autonomous systems (MECA). His main research interests include robot modelling and control, control of autonomous vehicles, modelling and control holonomic and non-holonomic mechanical systems, robust and non-linear control.

Nabil Derbel is the General Chairman of the multiconferences SSD. He received his Engineering Diploma from the Ecole Nationale d'Ingénieurs de Sfax (ENIS) in 1986, the DEA in Automatic Control from the INSA de Toulouse in 1986, his PhD from the LAAS (France) in 1989 and the Doctorat d'Etat from the ENIT (Tunisia) in 1997. He joined the Tunisian University in 1989, where he has held different positions involved in research and teaching. Currently, he is a Full-time Professor of Automatic Control at the ENIS. His current interests include optimal control, complex systems and intelligent control. He is the author /co-author of more than 230 technical papers. He is chairing two Research Units: MEChatronics and Autonomous systems (MECA) and Computers, Imaging and ELectronic Systems (CIELS).

1 Introduction

In 2005, the biannual International Conference on Signal Systems and Devices (SSD'2005) was held in Sousse, Tunisia, 21–24 March, with more than 450 participants. The conference was organised jointly by the National Engineering School of Sfax (Tunisia) and the University of the Bundeswehr Munich (Germany). The conference ran four parallel sessions and three keynote talks. 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 was technically sponsored by: IEEE Circuit and Systems Society (CAS), IEEE Instrumentation and Measurements Society (IMS), ASME Dynamic Systems and Control Division (ASME DSCD).

SSD'05 secretariat received 510 submissions from 43 countries: Algeria, Argentina, Belgium, Canada, China, Egypt, France, Germany, Greece, India, Indonesia, Iran, Iraq, Ireland, Italy, Japan, Jordan, Korea, Kuwait, K.S.A., Lebanon, Lithuania, Libya, Malaysia, Morocco, Oman, Pakistan, Poland, Portugal, Qatar, Romania, Russia, Sarajevo, Syria, Singapore, Spain, Sweden, Tunisia, UAE, UK, Ukraine, USA, Yemen. Only 383 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 eight papers included in this issue have passed the rigorous selection review process. The contents of the papers are briefly described as follows:

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‘Strong stabilisation: an LMI approach’, by Abdul-Wahid A. Saif: in this paper, the strong stabilisation problem of proper and non-minimum phase linear time-invariant systems is considered. The formulation of the problem resulted in a sufficient condition in a form of Linear Matrix Inequality (LMI). A necessary and sufficient condition is given in a form of Quadratic Matrix Inequality (QMI).

‘Approximation and balanced reduction of non-linear systems, by bilinear models’, by Maamar Bettayeb and Said Djennoune. The authors propose an order model reduction scheme for a class of non-linear systems. The method is based on a truncated balanced realisation algorithm mixed with a bilinearisation process of the non-linear system.

‘Non-linear systems control via fuzzy models: a multicontroller approach’, by M. Boumehraz and K. Benmahammed. This paper presents a Lyapunov-based switching controller design method for non-linear systems using Takagi-Sugeno fuzzy models. The basic idea of the proposed approach is to represent the fuzzy model as a set of uncertain linear systems. The controller is obtained by solving the corresponding set of Algebraic Ricatti Equations (AREs).

‘Generalised observers for a class of non-linear systems’, by M. Farza, M. M’Saad, F.L. Liu and B. Targui. In this paper, a general class of MIMO non-linear systems with unknown inputs is considered with a view to observer synthesis. The particularity of this class of systems lies in the fact that the expression of the outputs depends on the unknown inputs. In each case of the proposed situations, a non-linear observer is synthesised under appropriate hypotheses, to jointly estimate all state variables together with the unknown inputs.

‘Non-linear observers for state and unknown inputs estimation’, by F.L. Liu, M. Farza and M. M’Saad. In this paper, high gain observers are proposed for a class of multioutput non-linear systems with unknown inputs in order to simultaneously estimate the whole state together with the unknown inputs. Two situations are analysed and an observer is proposed in each case. In the first, the dynamics of the proposed observer can be arbitrarily assigned while in the second one only a part of the observer dynamics can be freely assigned.

‘On the dynamic properties and control of underactuated surface vessels’, by Jawhar Ghommam, Faïçal Mnif, Abderraouf BenAli and Nabil Derbel. The authors studied the problem of controlling the planar position and orientation of an autonomous surface vessel using two independent thrusters. It is shown that although the system is not asymptotically stabilisable to a given equilibrium configuration using a time-invariant continuous feedback, it is strongly accessible and small-time locally controllable at any equilibrium. A discontinuous time-invariant controller is then constructed to almost exponentially stabilise the system to the desired configuration.

‘A robust adaptive control using neural network’, by Hassen Mekki, Mohamed Chtourou and Nabil Derbel. The aim of this paper is to discuss the use of neural network-based adaptive control to get asymptotically exact cancellation.

‘On the PID control of systems with large delays’, by Houda Ben Jmaa Derbel. This paper deals with the PID control of linear first-order systems with pure delays. The optimisation procedure of the PID controllers used genetic algorithms to find empirical expressions of the PID parameters.