## Preface

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**Biographical notes:** Nacer K. M'Sirdi is Professor at Polytech Marseille; University Aix Marseille III. He got PhD in Electronics (1983) and Doctorat d'Etat (1988) in adaptive signal processing for non stationary signals at the INPG of Grenoble. He was assistant professor in University of Paris 6 (1987) and Professor at University of Versailles (1993) and dean of (LRV) Robotics Laboratory of Versailles. From 2005, he is member of LSIS-CNRS. His main research activities deal with adaptive and robust control, signal processing, diagnosis and robust observation and control techniques for complex non linear systems such as in vehicle dynamics and robotics.

Luis Alvarez-Icaza is a full Professor at Instituto de Ingeniería, Universidad Nacional Autónoma de México since 1998. He received his PhD in Mechanical Engineering from the University of California at Berkeley in 1996. His main research activities are related with control and estimation on nonlinear systems with friction phenomena.

This special issue of the *International Journal of Vehicle Design* contains eight papers related with advanced traction/braking vehicle control and estimation problems. The first four of those papers are related to the observation or estimation of vehicle parameters, in particular those related with vehicle dynamics, tyre forces and lateral behaviours. Three more papers deal with problems of engine control, electric hybrid vehicles by control allocation and advanced Antilock Braking System (ABS) control. The last paper presents an interesting approach for vehicle following based on the information provided by a single camera.

The paper 'Robust observer-based fault-tolerant control for vehicle lateral dynamics', by Oudghiri, Chadli and El Hajjaji, identifies a non-linear vehicle model and its state by means of a Takani–Sugeno fuzzy model. An LMI formulation is then used to design a stabilising feedback control. A fault-tolerant control strategy is designed for the two most important sensors: lateral acceleration and yaw rate.

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The paper 'Second order sliding-mode observer for estimation of vehicle dynamic parameters', by M'Sirdi, Rabhi, Fridman, Davila and Delanne, deals with the problem of recovering longitudinal and angular velocities of vehicles based on the measurements of wheel angular position obtained from standard ABS low resolution position sensors.

Based on the recovered states, critical parameters such as wheel stiffness and effective wheel radius are recovered. This paper makes intensive use of second order sliding mode observers and profits from its finite time convergence properties. Results are verified by experiments on an instrumented Peugeot 406.

The third paper is 'Fast estimation and compensation of the tyre force in real time control for vehicle dynamic stability control system', by Li, Song, Wang and Wu. It introduces a novel algorithm to estimate and compensate tyre forces with the intention of improving vehicle normal attitude and stability in limited handling conditions. The algorithm is based on a detailed modelling of the brake system and makes use of active braking control.

The last paper of the first set, 'Vehicle parameter estimation and stability enhancement using sliding mode techniques', by Shraim, Ouladsine, Fridman and Romero, presents the design of sliding mode observers to estimate some of the states related to the dynamics of a vehicle in motion, in particular those related to the interaction of road and tyre. In addition, the paper includes the design of a sliding mode controller to perform braking manoeuvres in critical situations. Simulation results are presented.

'Turbocharged spark ignition engine modelling and control strategy', by Khiar, Lauber, Guerra and Floquet, deals with the non-linear modelling and design of a control strategy for spark-ignited machines. A fuzzy control strategy is illustrated for the case of a turbocharged gasoline engine with the goal of lowering fuel consumption and pumping losses.

In 'Traction and braking of hybrid electric vehicles using control allocation', Laine and Fredriksson propose an allocation algorithm that combines control actions of the different actuators in order to achieve energy management goals and vehicle stability improvements.

The paper 'A fuzzy logic controlled Anti-lock Braking System (ABS) for improved braking performance and directional stability', by Yigit Yazicioglu and Samim Unlusoy presents a fuzzy logic controller to improve vehicle control and directional stability during braking. The system consists of two tandem controllers, one directed to control longitudinal slip and the other side slip.

The last paper, 'Is it possible to follow a vehicle using just one camera?', by Zayed, Boonaert and Bayart, presents the design of a system that allows a vehicle to follow a leading vehicle based on its licence plate. Image processing techniques and simple kinematics assumptions are posed to detect the main features of the licence plate. Simulation and experimental results are provided.