Preface

Kevin Deng

State Key Lab of Automotive Simulation and Control,
Jilin University, Changchun 130025, China
E-mail: kvdeng@gmail.com

Annie Zhao

General Motors Global R&D Center,
30500 Mound Road, Warren, MI 48090, USA
E-mail: qingrong.zhao@gm.com

Biographical notes: Kevin Deng has been Professor of Jilin University since 2010. Prior to that, he worked for General Motors Global R&D Center since 1996. He was a three-time recipient of the Charles McCuen Award by GM R&D Center, and twice a recipient of the Boss Kettering Award, the most prestigious award in GM for technical invention and innovation. He holds 22 US patents, with another 14 applications pending. He is the author of over 60 peer-reviewed papers in international journals and conferences. Currently, he serves as editor or associate editor for several international journals. His primary research interests are in vehicle control, intelligent and autonomous driving, and modelling and simulation technologies.

Qingrong (Annie) Zhao is a Senior Researcher at General Motors Global R&D Center. Her research interests include vehicle dynamics, simulation, controls, and integration. She obtained her PhD in Electrical Engineering from the University of Cincinnati, Ohio, USA, in 2007. She is an author of a dozen peer-reviewed papers in international journals and conferences, and co-inventor of two US patents and has received numerous honours and awards. She is an Associate Editor of the International Journal of Vehicle Autonomous Systems.

2012 marks the 10th anniversary of IJVAS. Ten years ago, when autonomous vehicle technologies and systems were still in their infancy, IJVAS was launched with the goal of providing an international authoritative forum and referred reference to evaluate, disseminate, and promote technological advancements in this field. Over the years, a stringent peer review process, fast response time, and timely publication schedule have resulted in a respected journal that monitors the latest cutting-edge technologies.

To celebrate ten years of success, we are publishing two special anniversary issues that collect 10 articles from world-renowned scholars and researchers in the field and cover a wide spectrum of current research and future trends in vehicle autonomous technologies. The first issue, IJVAS Vol. 10, No 3, provides an overview of some key enabling technologies for vehicle autonomous driving, in particular, the environmental sensing technologies. This second issue discusses some core technologies for vehicle autonomous driving, such as vehicle controls.

This issue begins with an article entitled 'Autonomous vehicle control at the limits of handling', by Professor Christian Gerdes et al., which presents an autonomous racing controller, designed to gain insights into vehicle control at the friction limits. Experimental results demonstrate that the controller can robustly track a path while operating at the limits of tyre adhesion and provide insights for the future development of vehicle active safety systems.

Professor Edward Gu proposes a cascaded system model to represent dynamic interactions between human driver and vehicle in his article entitled 'Modelling of human-vehicle dynamic interactions and control of vehicle active systems'. The proposed methodology can be directly applied to the models and controls of vehicle active systems, such as the active suspension and active restraint systems that interact with the human driver for better safety, comfort and ride quality.

Professor Amir Khajepour et al. present a framework of a hardware-in-the-loop simulation for power level estimation of planetary rovers in the article entitled 'Hardware-in-the-loop for power level estimation of planetary rovers'. The research demonstrates the effectiveness of such a test platform, which can also be easily adapted for electric vehicle applications.

The article entitled 'Optimisation of high speed crash avoidance in autonomous vehicles', by Dr Matt Best, proposes an optimisation approach for vehicle's standard brake, acceleration and steering control inputs. The proposed approach allows vehicle parameters to be optimised simultaneously in order to find the best vehicle handling balance. The goal is to quantify the best possible vehicle escape manoeuvres for collision avoidance.

Finally the article entitled 'Regulation control-input for multi-vehicle formation', by Professor Lotfi Beji, et al., presents an analytical method to solve the stabilising control problem via a decentralised form for multi-vehicle navigation, including regulations with respect to some predefined obstacles. The result shows that the proposed stabilising control input is smooth among different multi-robot navigation cases.

In summary, this special issue provides some in-depth discussions on vehicle controls related to autonomous driving, such as controls at the limit of handling, control interaction with human driver, optimisation method for high speed crash avoidance, and controls for multi-vehicle navigation, etc. We are very much impressed by the quality of the articles that we received.

Although autonomous driving is no longer a dream, the path to reality is still full of technological barriers that must be overcome. Safety regulations, as well as social and market forces, will combine to accelerate the rapid development of autonomous driving technologies. IJVAS has been committed to providing a high-quality international forum and refereed reference and will continue to be at the forefront of covering new developments related to the advanced research and development of vehicle autonomous systems.

We would like to take this opportunity to express our heartfelt gratitude to the authors for their great contributions and to the editorial staff for their diligent efforts in making this happen. We would also like to thank you, our loyal readers, for being with us for the last ten years, and we look forward to your continued support in the future.