
Preface

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Biographical notes: Hamid Reza Karimi is currently Professor of Applied Mechanics with the Department of Mechanical Engineering, Politecnico di Milano, Milan, Italy. His original research and development achievements span a broad spectrum within the topic of automation/control systems, and intelligence systems with applications to complex systems such as wind turbines, vehicles, robotics and mechatronics. He is an ordinary Member of Academia Europa (MAE), Distinguished Fellow of the International Institute of Acoustics and Vibration (IIAV), Fellow of The International Society for Condition Monitoring (ISCM), Fellow of the Asia-Pacific Artificial Intelligence Association (AAIA), and a Member of Agder Academy of Science and Letters.

Defeng Wu received his BE in Automatic Control, PhD in Control Theory and Control Engineering in 2005 and 2010, respectively both from Dalian Maritime University, China. From 2008 to 2009, he was a visiting PhD student at University of Reading, UK. From March 2011 to August 2019, he was a Lecturer/Associate Professor at Jimei University, Xiamen, China. Currently, he is a Professor and Vice Dean at Jimei University. He also acted as a visiting scholar at Illinois Institute of Technology from 2015 to 2016. He serves as the editor for Signal, Image and Video Processing. He is Senior Member of IEEE. His current research interests include systems and control theory, machining learning, reinforcement learning, computational intelligence and its applications in marine engineering.

Yanzheng Zhu received his PhD in control science and engineering from the Harbin Institute of Technology, Harbin, China, in January 2016. He is currently a Full Professor with the College of Electrical Engineering and Automation, Shandong University of Science and Technology. His research interests include non-deterministic switched systems, fault diagnosis and tolerant control, and their applications. He serves as an Associate Editor for *IEEE Control Systems Letters*, and was a Guest Editor for *European Journal of Control*.

Shaolong Yang is Associate Professor, School of Naval Architecture and Ocean Engineering, Huazhong University of Science and Technology (HUST). His research interests include path planning and control of marine vehicles. He received the BE and PhD in marine engineering from Dalian Maritime University, China, in 2011 and 2017, respectively. He serves as the guest editor for the *International Journal of Vehicle Design*, and the editorial member for *International Journal on Marine Navigation and Safety of Sea Transportation*. Also, he is a reviewer for *International Journal of Intelligent Robotics and Applications*, *Ocean Engineering*, *Soft Computing*, and *Journal of Automatica Sinica*.

1 Introduction

In recent years, offshore technology has been getting more and more attention in different sectors, such as energy industry, transportation industry, food industry, for instance. Specifically, the main challenge in offshore technology development is to compromise between reducing operation and maintenance costs and improving system reliability and functionality. Among the existing complexities in offshore systems, reported in open literature, two topics of engineering design and automation technologies are prioritised for real-time operation of the system in offshore environments. However, with a focus on mobile systems in the offshore context, the system design and automation technologies for offshore vehicles are important issues to be investigated from both theoretical and practical aspects.

The main focus of this special issue is on the new developments in theoretical and technological achievements for the system design, modelling, stability analysis, control synthesis, filtering problem and real time operation of vehicles in offshore environments.

2 Highlights of the special issue

With a stringent peer review process, there are 12 papers finally included in this Special Issue. A brief summary of the selected accepted papers is discussed in the following.

The authors in the paper entitled ‘Network-based formation control of unmanned autonomous systems with directed topologies’ proposed a formation control design for unmanned autonomous systems with nonlinear dynamics and directed topology by appropriately constructing a Lyapunov function. In the paper entitled ‘Leader-follower formation transformation control based on priority model for unmanned surface vehicle in narrow waters’ the authors proposed a strategy of formation generation and formation transformation for multiple unmanned surface vehicles in narrow waters. The authors in the paper entitled ‘Image-based visual servoing of underwater vehicles for tracking a

moving target using model predictive control with motion estimation' developed an image-based visual servoing target-tracking strategy for an underwater vehicle to track a moving target beneath the vehicle using a downward-facing camera. The relative position, orientation, and velocity of the moving target were estimated using a nonlinear unscented Kalman filter. A nonlinear model predictive controller was employed to generate the velocity commands for underwater vehicles by optimising the visual target trajectories.

The paper 'Experimental validation of an improved underwater sphere-target localisation scheme for an autonomous underwater vehicle manipulator system' developed an underwater sphere-target localisation method based on non-parallel binocular vision for an autonomous underwater vehicle manipulator system. The experimental results show that the developed method requires less time than the existing target extraction methods and satisfies the real-time requirements.

The paper entitled 'FlameNet: a lightweight convolutional neural network for flame detection and localisation' proposed a lightweight deep convolutional neural network, called FlameNet, for flame detection and localisation in the real world. The authors in the paper entitled 'Integrated behaviour decision-making and trajectory tracking for dynamic collision avoidance of an ASV using receding horizon optimisation' proposed a receding horizon optimisation scheme for integrated behaviour decision-making and trajectory tracking based on Q-learning methodology to ensure the dynamic collision avoidance of an autonomous surface vessel. The authors in the paper entitled 'DRNN-MIMO-PID control strategy for multi-point mooring system' proposed a DRNN (Dynamic Recurrent Neural Network) MIMO (Multi-Input-Multi-Output) - PID (Proportional + Integral + Derivative) control scheme for MPMS (Multi-Point Mooring System). The proposed scheme was mathematically simulated, verified by four-point mooring hardware-in-the-loop system, and applied to a four-point mooring dredger.

In the paper entitled 'Compressive sealing process in vehicle engineering', the authors investigated the improvement of the inner corner paste reliability of the sealing strip. The authors in the paper 'Method of improving the soil compactor's ride quality based on the optimal negative stiffness structure' proposed a new driver's seat suspension designed by the negative-stiffness-structure and cab's isolation used by the hydraulic mounts to enhance the soil compactor's ride quality. The paper entitled 'An algorithm for solving travelling salesman problem based on improved particle swarm optimisation and dynamic step Hopfield network' proposed an algorithm based on improved particle swarm optimisation and a dynamic step Hopfield neural network for solving the travelling salesman problem. The authors in the paper entitled 'Improved duelling deep Q-networks based path planning for intelligent agents' described how an efficient learning mechanism using the importance sampling technique is incorporated into duelling DQN algorithm, and is further applied to path planning task for an agent. In addition, in the paper entitled 'Calibration of multi-sensor fusion for autonomous vehicle system', the authors proposed an effective multi-sensor calibration method for autonomous vehicle systems that consists of three aspects: single-sensor intrinsic calibration, multi-sensor extrinsic calibration and multi-sensor time synchronisation.

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