PREFACE

Special section on

Automation and Communication Systems for Autonomous Platforms

Autonomous control systems for air, land, surface and underwater objects have become increasingly popular in recent years. However, special attention should be paid to control systems for underwater objects, which are related to the specific requirements of the marine environment. There are significant problems with construction, power supply, and signal propagation in the aquatic environment. The articles presented in this special section focus on the current developments in mechanics, energy supply, automation and control problems, especially for autonomous vehicles. The topics include the latest techniques, solutions, and their applications in a range of civilian and military fields.

The section presents four theoretical and experimental papers on automation and robotics, autonomous vehicles, mechatronic systems, renewable energy, as well as the modelling and simulation of dynamic objects.

The paper *Dual quaternions for the kinematic description of a fish–like propulsion system* describes fish-like propulsion system kinematics with the implementation of quaternions and dual quaternions. Although quaternions are more compact than rotation matrices, their use is not always associated with reduced numerical computation and memory requirements. The article presents the algebraical form of quaternions, which is less memory-demanding than the matrix representation. All the codes used to prepare this work are presented, and they can be employed to investigate how well quaternions perform in a specific assignment.

The second paper, entitled *A dynamic model as a tool for design and optimization of propulsion systems of transport means*, presents an example of a dynamic model of power transmission systems, which has been developed to support work aimed at designing new and optimizing existing systems of that type, as well as to help diagnose them by developing diagnostic algorithms sensitive to early stages of damage development.

The third paper, *Multi-symptom measurement based fault detection of the PEM fuel cell system*, covers the results of research focused on assessing the possibilities of diagnosing the oxidant supply subsystem, in particular too low an oxidant flow leading to oxygen starvation and cathode flooding, based on the analysis of voltage occurring at individual cells of the stack, as well as based on vibration and acoustic emission (AE) measurements. The presented results show that the faulty operation of that system can be indicated either through electrical or vibroacoustic emission measurements.

The fourth paper, entitled *A dynamic submerging motion model of the hybrid-propelled unmanned underwater vehicle: Simulation and experimental verification*, covers the topic of a dynamic model of the hybrid unmanned underwater vehicle (HUUV) using screw propellers and biomimetic lateral fins. Firstly, a simulation model of the vehicle performing depth and pitch changes is presented. Then, the vehicle's hydrodynamic coefficients obtained from CFD simulations are discussed. Further, the results of HUUV experimental studies in a swimming pool are presented. Lastly, simulation results are compared with the experiment results to verify the model's correctness. During the experiments, the vehicle's motion in the swimming pool was recorded using a submerged camcorder and then analysed using the Tracker software.

The editors hope that all readers of the papers published in this special section will find that the authors' detailed and careful presentation of ideas, methods and results broadens their knowledge. We want to thank all the authors of the submitted papers and the reviewers, who provided constructive comments and suggestions. We also wish to acknowledge the journal's Editor-in-Chief, Professor Józef Korbicz, for accepting this special section as well as the fruitful cooperation throughout the publication process.

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Zygmunt Kitowski is a graduate of the Polish Naval Academy (PNA) in Gdynia in electrical engineering (1969). Initially, after a short service on a submarine as an electromechanic officer, he undertook scientific and teaching work at the PNA. In 1973 he obtained a master's degree in electrical machinery from the Gdańsk University of Technology. In 1978 he received a doctoral degree in automation and robotics at the Naval Academy in Leningrad. In 1989, the Council of the Faculty of Power Engineering and Aviation of the Warsaw University of Technology granted him a postdoctoral degree in automation and robotics. In 1997, at the request of the same council, he received a professorial title from the President of the Republic of Poland. Since 1970 he has been working in various positions at the PNA. His scientific and teaching activity is related to computer control systems of manned and unmanned surface ships as well as underwater vehicles.

Paweł Piskur graduated from the Military University of Technology in Warsaw in 2004 with a master's degree in airplane studies. He subsequently worked in the Polish Army's Marine Aviation Base. In 2010 he received a PhD degree in mechanical engineering from the Koszalin University of Technology. Since 2017 he has been working at the Polish Naval Academy. His research area is strictly connected with unmanned underwater vehicles, especially biomimetic propulsion systems.

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