Introductory notes for the Acta IMEKO Special Issue on the 23rd International Symposium on Measurement and Control in Robotics organised by TC17

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Dear Readers,

Measurement and control techniques are crucial for achieving reliable and safe autonomous features in robotics. Recent developments in both fields are key enablers for the constantly widening use of robots in industrial, medical, military and service-oriented applications.

Faithful to its traditions, the 23rd edition of the International Symposium on Measurement and Control in Robotics (ISMCR), organised by IMEKO Technical Committee 17, has provided a forum for the exchange of the latest research results and novel ideas in robotic technologies and applications, this time with a special emphasis on smart mobility. The symposium focused on various aspects of research, applications and trends in relation to robotics, advanced human–robot systems and applied technologies in the fields of robotics, telerobotics, autonomous vehicles and simulator platforms, as well as VR/AR and 3D modelling and simulation.

The symposium was hosted by the Budapest University of Technology and Economics in Budapest, Hungary. Due to the COVID-19 pandemic, the symposium was held in a hybrid format; authors outside Hungary participated remotely, while those in Hungary had the choice between online and in-person attendance at the event in accordance with the current regulations.

A total of 49 submissions were received from 11 different countries. The review process, involving 106 external reviews, resulted in 40 accepted papers. A special technical session was devoted to the topic of robotised intervention in risky (chemical, biological, radiological and nuclear) environments. In accordance with the symposium's main topics, three invited plenary lectures were given by specialists from the industry (KUKA robotics, ThyssenKrupp Components Technology) and academia. Topics included the virtualised stability analysis of mechatronic systems, human–robot collaboration in industrial production and new standardisation trends in the navigation of industrial mobile robots.

Based on their technical and scientific value and the evaluation of the reviewers, the authors of ten contributions were invited to submit extended versions of their papers for this special issue.

The paper entitled 'Vision-based reinforcement learning for lane-tracking control', authored by Kalapos et al., applies AI-based techniques to solve the lane-following and obstacle avoidance problem of autonomous vehicles, successfully implementing the results in the onboard computers of reduced-sized testbed vehicles.

Staying with autonomous vehicles, in the paper 'Using coverage path planning methods for car park exploration' by Ádám et al. exploration methods to find the optimal traversal of an unknown parking area to identify free parking spaces are presented.

Reinforcement learning can also be used in the control of multi-agent robotic systems, as suggested by the paper by Paczolay entitled 'A2CM: a new multi-agent algorithm', which presents an optimised and modified version of the so-called synchronous actor–critic algorithm.

De Cubber et al. address a similar optimisation problem in their contribution entitled 'Distributed coverage optimisation for a fleet of unmanned maritime systems'. The authors propose a methodology that optimises the coverage of a fleet of unmanned maritime agents, thereby maximising the chances of identifying potential threats.

High-level autonomous functions and human–robot collaboration must be reliably and safely supported by platforms (robotic arms, drones, vehicles, etc.); hence, a second group of

papers is devoted to the presentation of related results. Szabó et al. report an identification method for friction parameters in their paper entitled 'Dynamic parameter identification method for robotic arms with static friction modelling'. The author considered friction models which are linear in terms of unknown parameters.

The paper entitled 'Uncertain estimation-based motion planning algorithms for mobile robots', authored by Gyenes et al., proposes the extension of two obstacle avoidance methods, the velocity obstacle technique and the artificial potential field method, to take into consideration the time-varying uncertainty of the measured data in relation to the localisation of static and dynamic obstacles.

The autonomous delivery of items by drones requires suitable gripping devices and grasping strategies. In their paper entitled 'A lightweight magnetic gripper for a delivery aerial vehicle: design and applications', Sutera et al. report the design of a low-power and lightweight magnetic gripper that takes into consideration the size and weight of the of transported objects.

Füchter et al. studied the possibilities of using AR techniques in specific phases of pilot training. Their paper entitled 'Aeronautic pilot training and augmented reality' reports the design experience of a mobile/tablet application prototype that reproduces the flight panel of a Cessna 150 aircraft.

The paper entitled 'Human–robot collision predictor for flexible assembly' by Paniti et al. presents a prediction-based collision warning system for a cobot scenario in which a robotic arm and human operators share a common workspace that also takes communication delays into consideration.

Another type of human–robot interaction is the user interface for controlling a robotic arm. The paper entitled 'A 3D head pointer: a manipulation method that enables spatial position and posture for supernumerary robotic limbs' by Oh et al. addresses the specific problem of controlling a wearable robotic arm using face orientation and head motion. It should be noted that this contribution received the best paper award of the symposium.

We would like to express our gratitude to all the authors for their contributions and their participation at the ISMCR2021 symposium despite the unprecedented conditions created by the pandemic. We must also thank Prof. Francesco Lamonaca, editor-in-chief of ACTA IMEKO, and his team for their help and support during the editorial process of this special issue. It has been a great honour to serve as guest editors for this special issue, and we hope that the papers will inspire future research in the IMEKO TC17 area of expertise and beyond.

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Guest editors