Preface to Special Issue on Recent Advances in Information Technology III

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This issue of the Journal of Automation, Mobile Robotics and Intelligent Systems is devoted to selected aspects of current studies in the area of Information Technology - as presented by young talented contributors working in this field of research. This special issue is already the third edition of this series. Among included papers, one can find contributions dealing with the modelling and controlling of discrete hybrid systems, microcontrollers, the Internet of Things, 3D visualization technology, sliding mode control and finally Extended Kalman Filters. The idea of creating this special issue was born as a result of broad and interesting discussions during the Sixth Doctoral Symposium on Recent Advances in Information Technology (DS-RAIT 2019), held in Leipzig (Germany) on September 1-4, 2019 as a satellite event of the Federated Conference on Computer Science and Information Systems (FedCSIS 2019). The aim of this meeting was to provide a platform for the exchange of ideas between early-stage researchers in Computer Science (PhD students in particular). Furthermore, the Symposium was to provide all participants an opportunity to obtain feedback on their ideas and explorations from the vastly experienced members of the IT research community who had been invited to chair all DS-RAIT thematic sessions. Therefore, submission of research proposals with limited preliminary results was strongly encouraged.

Here, we would like to individually mention the contributions entitled "Sustainable Management of Marine Fish Stocks by Means of Sliding Mode Control" written by Katharina Benz, Claus Rech, and Paolo Mercorelli (Leuphana University of Lueneburg) and the paper "Proposal of Mechatronic Devices Control using Mixed Reality" by Erich Stark and Erik Kučera, Peter Drahoš, and Oto Haffner (Slovak University of Technology in Bratislava). These contributions have received the Best Paper Award at DS-RAIT 2019.

This issue contains the following DS-RAIT papers in their special, extended versions.

The first paper, entitled **Modelling and Control of Discrete-Event Systems Using Petri Nets and Arduino Microcontrollers**, and authored by Erik Kučera, Oto Haffner and Roman. Leskovský, describes a design of a new software system for modelling and control of discrete-event and hybrid systems. For this purpose, Arduino family microcontroller and Petri net technology were applied. The developed software tool was successfully verified for control of laboratory systems. The proposed system offers a graphical way for designing control algorithms for hybrid and mainly discrete-event systems. In the opinion of editors and reviewers, this work, apart from its practical values, might have large influence on the development of contemporary hybrid control systems.

Erich Stark, Erik Kučera and Oto Haffner, in their work entitled **Proposal of IoT Devices Control using Mixed Reality and QR Codes**, address problems related to establishing appropriate ways of connecting two areas: the Internet of Things (IoT) and mixed reality, where it is possible to control and monitor mechatronic devices using a mobile device with augmented/mixed reality support. The described proposal of interconnecting IoT and mixed reality can bring about a new form of Human Machine Interface that can save time for users or companies (the Industrial Internet of Things (IIoT)). In the opinion of the members of the Program Committee of DS-RAIT, this work, because of its great presentation of applicational aspects and promising results, was awarded the Best Paper of the event.

The paper entitled **Online Control Education Using 3D Holographic Visualisation**, was written by the team consisting of Jakub Matišák, Matej Rábek, Katarína Žáková. In this paper, the Authors take under consideration some aspects of Interactive 3D visualization technology. This contribution to the application for interactive teaching of control theory was well-described. This tool could be applied to simulating a holographic model of a selected mechatronic system that is a digital visualization of the real device.

Finally, Katharina Benz, Claus Rech, Paolo Mercorelli and Oleg Sergiyenko, provide a paper entitled **Two Cascaded and Extended Kalman Filters and Sliding Mode Control for Sustainable Management of Marine Fish Stocks.** The paper deals with the problem of controlling Marine Fish Stocks by the way of implementing a model described by the Lotka-Volterra equations with sliding mode control techniques, and includes some interesting methods for identifying investigated system parameters such as utilizing Extended Kalman Filters. Again in the case of

this contribution, the members of the Program Committee of DS-RAIT awarded the Best Paper of the event to this work – because of its modern aspect, great presentation and promising results.

We would like to thank all those who participated in, and contributed to the Symposium program, as well as all the authors who have submitted their papers. We also wish to thank all our colleagues, the members of the Program Committee, both for their hard work during the review process and for their cordiality and outstanding local organization of the Conference.

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