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Knowledge-Based Automation: CASE 2018 in Munich/Garching, Germany

The 2018 IEEE International Conference on Automation Science and Engineering (CASE 2018) was held at the Technical University of Munich, Germany, 20–24 August 2018. CASE 2018 was the 14th edition of this conference series. The conference theme was knowledge-based automation, with the idea that our automation systems need to become (and are becoming) more and more intelligent. They enable flexibility, adaptability, and self-awareness during operation, as required for cyberphysical (CP) systems and especially for CP production systems (CPPSs) in any domain. Artificial intelligence in general (and learning in particular) is one means to gain such knowledge at runtime. Model-based development including a modeled knowledge base is another means. Both were addressed in the conference's plenary talks and technical sessions.

CASE is traditionally a multitrack conference. In addition to the established CASE topics (foundations of

automation science and applications in manufacturing, logistics, health care, and automation on the meso and microscale), special emphasis was given this year to attracting contributions on the topic of knowledge-based automation. With the support of the IEEE Robotics and Automation Society and numerous sponsors from academia and industry, an exciting

program was presented, including keynote talks, a panel discussion, workshops, award tracks, parallel sessions, an exhibition involving six companies and four associations/projects, laboratory tours, plant tours, and various social events (Figure 1). In total, 262 papers from 33 countries were presented during the conference, including those from *IEEE Robotics*



Figure 1. The 2018 CASE chairs: (from left) Program Chair Georg Frey, General Cochair Bengt Lennartson, General Chair Birgit Vogel-Heuser, and Program Chairs Alexander Fay and Cesare Fantuzzi stand in front of the banquet location, Paulaner im Tal. (Photo courtesy of Birgit Vogel-Heuser.)

and *Automation Letters*. The acceptance rate was approximately 61%.

CASE 2018 also demonstrated the traditionally close research cooperation between industry and academia in Germany. The high percentage of participants from industry (21%) as well as 13 industrial papers and six industrial work-in-progress papers allowed for a discussion of the latest findings. In addition to the regular sessions, CASE 2018 was especially successful in attracting special sessions, most of which focused on knowledge-based systems (four special sessions) and model-driven development for CPPS (eight special sessions).

Program highlights included four excellent plenary talks by world-leading scientists from different domains and a panel discussion. We were very glad to welcome Prof. Fei-Yue Wang from the Chinese Academy of Sciences, Beijing, who presented the talk “Artificial Intelligence for Automation”; Prof. Maria Pia Fanti from the University of Bari, Italy, who offered the presentation “New Approaches for Managing Logistics Systems”; Prof. Ina Schaefer from the Technical University of Braunschweig, Germany, with the presentation “Efficiently Managing Variant-Rich Systems”; and Dr. Kurt Bettenhausen from Siemens, Cromwell, Connecticut, with his presentation “System Autonomy: The Next Level of Automation Everywhere.”

Nine highly graded professors came together for a panel discussion, “The Future of Human Workers in an Age of Automation,” led by Ken Goldberg from the University of California Berkeley (UC Berkeley), and Michael Wang from Hong Kong University of Science and Technology (Figure 2). As machines and robots become more intelligent, there is growing anxiety that machines may control humans and occupy our work places. After replacing many shop floor jobs, automation may also take over jobs in engineering, which would have dramatic effects on our society and wealth. All panelists agreed on the changes to come, but they disagreed on the speed of progress and the extent of the



Figure 2. The members of the CASE 2018 panel discussion: (from left) Detlef Zuehlke, Klaus Bengler, Mengchu Zhou, Birgit Vogel-Heuser, Wolfram Burgard, Bengt Lennartson, Peter B. Luh, Dawn Tilbury, and Ken Goldberg. (Photo courtesy of Birgit Vogel-Heuser.)

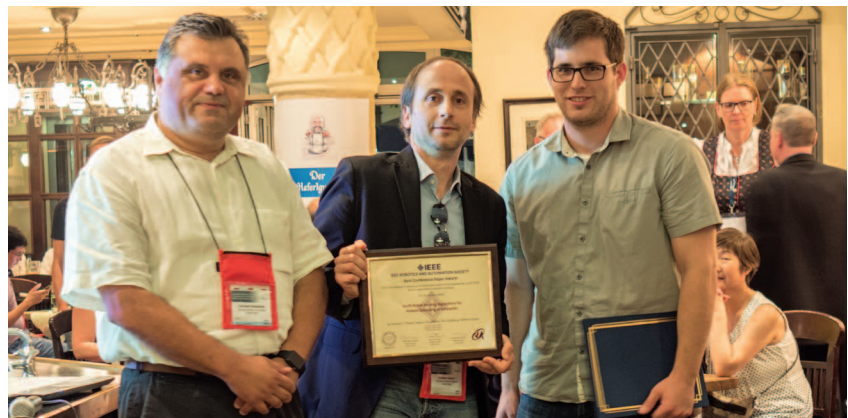


Figure 3. Two of the four recipients of the Best Conference Paper Award for “Multi-Robot Routing Algorithms for Robots Operating in Vineyards”: (from left) CASE 2018 Awards Chair Spyros Reveliotis (Georgia Institute of Technology), Stefano Carpin (UC Merced), and Thomas C. Thayer (UC Merced). (Photo courtesy of Birgit Vogel-Heuser.)

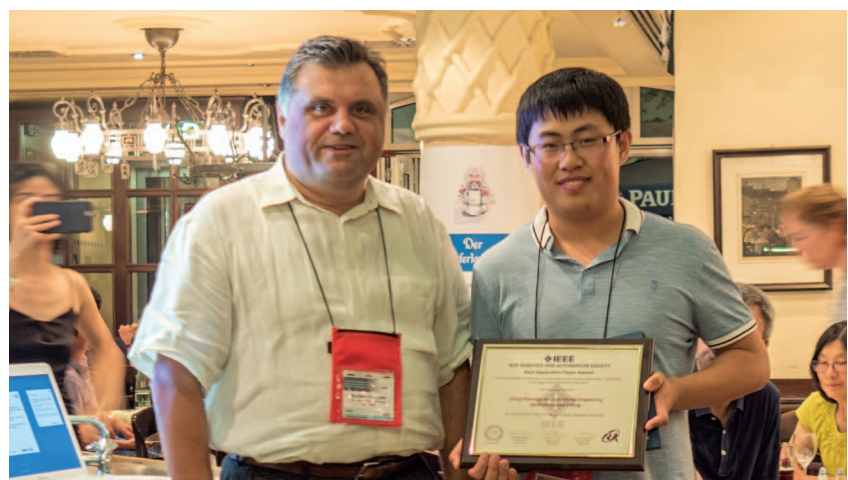


Figure 4. The Best Application Paper Award for “Grasp Planning for Customizes Grippers by Iterative Surface Fitting” awarded by Spyros Reveliotis to the author team Yongxing Fan, Hsien-Chung Lin, Te Tang, and Masayoshi Tomizuka from UC Berkeley. Spyros Reveliotis (left) is pictured with Yongxing Fan. (Photo courtesy of Birgit Vogel-Heuser.)

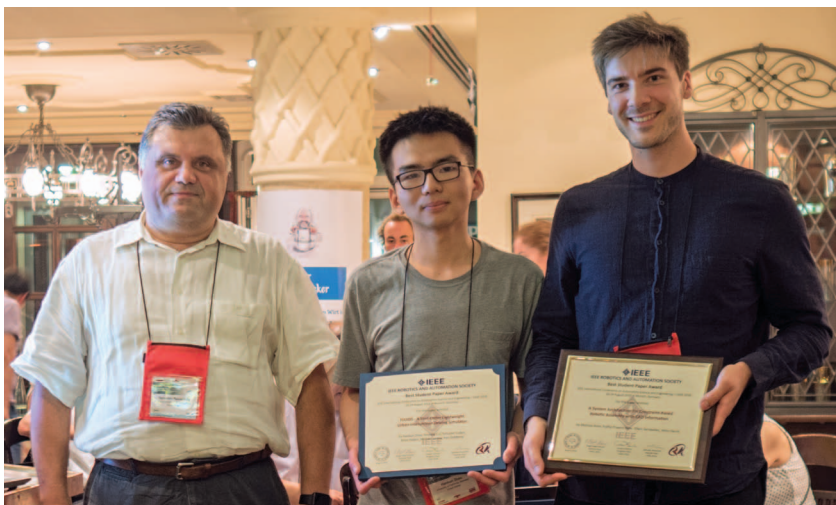


Figure 5. The cowinners of the Best Student Paper Award for “Fluids—A First-Order Lightweight Urban Intersection Driving Simulator,” authored by Hankun Zhao, Andrew Cui, Schuyler Cullen, Brian Paden, Michael Laskey, and Ken Goldberg from UC Berkeley, Samsung, and the Massachusetts Institute of Technology and for “A System Architecture for Constraint-Based Robotic Assembly with CAD Information,” authored by Mathias Hauan Arbo, Yudha Prawira Pane, Erwin Aertbelien, and Wilm Decre from the Norwegian University of Science and Technology, Trondheim, and Katholieke University of Leuven, Belgium: (from left) CASE 2018 Awards Chair Spyros Reveliotis (Georgia Institute of Technology), Hankun Zhao (UC Berkeley), and Mathias Hauan Arbo (Norwegian University of Science and Technology, Trondheim). (Photo courtesy of Birgit Vogel-Heuser.)



Figure 6. The opening ceremony at the Deutsches Museum. (Photo courtesy of Birgit Vogel-Heuser.)

advancements. Panelists identified not only threats but also huge opportunities for responsible automation engineers. As a result, it is our responsibility to cooperate with ergonomists, psychologists, and sociologists, as well as economists, to cope with this massive

challenge, include expertise from other communities, and address the challenge in interdisciplinary ways.

At this year’s CASE, prizes were awarded for Best Conference Paper Award (Figure 3), Best Application Paper Award (Figure 4), and Best Stu-

dent Paper Award (Figure 5). Among all submitted papers, ten papers were selected as finalists. All nominees were invited to present their papers in a plenary session and compete for the prize in front of a selected committee. The transparent selection criteria focused on the strength and innovation of the paper’s technical content, the visual qualities of the manuscript, and the performance during the oral presentation and the following question-and-answer session; however, this did not ease the final decision for the committee, which finally awarded two Best Student Paper Awards. Editor-in-Chief and Awards Chair Spyros Reveliotis introduced the award-winning teams during the banquet.

Besides educational events, social events also played an important role in fruitful networking at CASE 2018. An opening ceremony at the Deutsches Museum, a world-class institution for natural science and technology, followed by Bavarian food, beer, and music provided attendees a taste of Bavarian culture (Figure 6).

Behind a great international conference, good organization, coordination, and cooperation are indispensable. We extend sincere thanks to all volunteers, supporters, reviewers, participants, committees, sponsors, and organizers for your contribution to the success of this conference. See “CASE 2018 Chairs” for a list of the chairs for this conference.

CASE 2018 Chairs

Birgit Vogel-Heuser, General Chair
Bengt Lennartson, General Cochair
Cesare Fantuzzi, Program Cochair
Alexander Fay, Program Cochair
Georg Frey, Program Cochair
Carlos E. Pereira, Program Cochair