

## Preface

### **Special Issue dedicated to the 70<sup>th</sup> Birthday of Professor Imre J. Rudas – Part I**

Technology development unfolds in medatransds these decades, transforming individuals and the society alike. The Internet of Things, Cloud Robotics, Industry 4.0, agile Cyber-Physical Systems show the way along which these transformations occur. The fundamental engineering concepts behind are rooted in academic research, often presented at the major scientific conferences of the community. The IEEE International Conference on Intelligent Engineering Systems (INES) is one of those, a prestigious series established by Bánki Donát Polytechnic and Budapest Tech as the predecessors of Óbuda University. The IEEE INES series was started in 1997, and in 2019, reaches its 23<sup>rd</sup> edition, dedicated to a special occasion, the celebration of Professor Imre J. Rudas' birthday. The conference was held April 25-27, 2019 in Gödöllő, in the magnificent Royal Palace, favorite summer residence of Queen Elizabeth in the 1840s. Over 140 attendees were present from 22 countries, delivering 63 talks and 2 keynote lectures in a variety of related research topics.

The current Acta Polytechnica Hungarica issue is a collection of the newest research results based on the selected presentation at the 23<sup>rd</sup> IEEE INES. The articles span across a wide range of intelligent engineering, focusing on control and applications. The intelligence relates to the characteristics of how uncertainty, i.e., unmodeled dynamics can be handled, or what kind of solutions can be used in order to operate in an uncertain environment with proper sensing techniques. The presented solutions discuss the autonomous or automatic ways to execute given sequences or tasks without human user interaction (without detailed instructions). Arguably, the next few years will be dominated by the topics of artificial intelligence. The control engineering perspectives of soft computing gave new sights of control engineering (e.g., Tensor-Product-based control), and expanded the range of applicability in different fields: robotics, medical applications, data mining, cybersecurity, computer networks, accounting, agriculture, chemical processes, military applications, etc. Theories leading to applications, feeding into product developments for the benefit of all.

As it was clearly articulated duing the confernece, the whole series and probably this journal could not have lived withour Imre J. Rudas. Every such major project has its “power engine”, distinguished senior who channels the connections, mediates the subfields, and keeps this linked scientific community at a high international standard. Imre J. Rudas, just turned 70 during the IEEE INES 2019.

His wide spectrum of professional interest is reflected in the variety of the conference contributions, and this *Acta Polytechnica Hungarica* special issue is dedicated to him. The current volume is a selection of his most renowned collaborators and friends throughout the world, as a special tribute to his whole academic carrier. 70 years of outstanding achievement truly deserves a reflection.

Imre J. Rudas graduated from Bánki Donát Polytechnic (Budapest) in 1971, received Master Degree in mathematics from Eötvös Lóránd University (Budapest) and received Ph.D. in robotics from the Hungarian Academy of Sciences in 1987. Achieved the Doctor of Science degree from the Hungarian Academy of Sciences in 2004. He received his first Doctor Honoris Causa degree from the Technical University of Košice (Slovakia) (2001), followed by the “Politehnica” University of Timișoara (Romania) in 2005, Óbuda University (2014) and the Slovak University of Technology (Bratislava) in 2016. He is Honorary Professor (2013) and Ambassador (2016) of the Technical University of Wrocław. His research activity is related to robotics, computational cybernetics with special emphasis on robot control, soft computing, computer-aided process planning, and fuzzy control and fuzzy sets. He has published more than 850 scientific publications, 125 journal papers, and authored 4 scientific books. The number of his independent citations is over 5000, with h-index of 32. He served as Rector of Budapest Tech from August 1, 2003 and became the founding Rector of Óbuda University in 2010 until 2014. He founded the University Research and Innovation Center of Óbuda University in 2012 and the *Acta Polytechnica Hungarica* journal in 2004, where he still serves as editor-in-chief.

He has a rich history with IEEE as well, started in 1991. He became IEEE Fellow in 2001, member of the IEEE Board of Directors Section/Chapter Support Committee (1998). He was mainly active in two IEEE Societies: the IEEE Industrial Electronics Society he was Administrative Committee Member and Senior Member (1996) and Vice-President of the Society (2000-2001). However, even bigger devotion presented to the IEEE System, Man and Cybernetics Society, where he was several times member of the Board of Governors (2007-2009, 2012, 2014), Vice-President (2013-2016), and currently he is President-Elect of the Society (2019). He is the founding chair of the Computational Cybernetics Technical Committee and co-chair of the Cyber-Medical Systems Technical Committee of the IEEE SMC Society. In the meantime, Imre J. Rudas served and made his footprint in the IEEE Hungary Section as well, where he was first Treasurer (1994-1998), then Vice Chair (2003-2009), and finally Chair (2009-2013). He was founding chair at IEEE Hungary Section level of the IEEE Chapter of Computational Intelligence Society (2003-2008), IEEE Chapter of System, Man and Cybernetics Society (2003-2008) and IEEE Joint Chapter of Industrial Electronics and Robotics & Automation Societies (1997-2002).

Among the several scientific awards received, he is laureate of the John von Neumann Award (2006), the Dennis Gábor Award (2006), the civil division of the Hungarian Order of Merit (2009), Pro Óbuda Award (2014), International Fuzzy

System Association Fellow (2016) and first awardee of the Rudolf Kalman Professor title given jointly by IEEE Hungary Section and Óbuda University (2017).

In the past decades, thousands of students, hundreds of colleagues and dozens of friends gained inspiration and professional support from Imre J. Rudas. His academic work was groundbreaking in Hungary, and the institutions and organization he established became a prominent part of the nation's engineering heritage. His professional network and outreach cover continents, and people around the globe are building on his results.

The editors are grateful to Imre J. Rudas for all his achievements care and support, and thankful to the authors for their excellent work composing this volume.

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