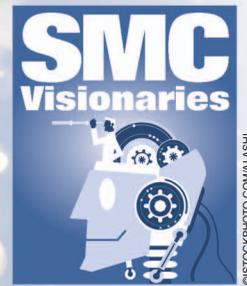


The Technical Contributions of Imre Rudas



A Strong Leader in the IEEE Community

by György Eigner



Imre J. Rudas (Figure 1) graduated in mechanical engineering from Bánki Donát Polytechnic, Budapest, Hungary, in 1971. He earned his master's degree in mathematics from Eötvös Loránd University, Budapest, Hungary, his Ph.D. degree in robotics from the Hungarian Academy of Sciences in 1987, and his doctor of science degree from the Hungarian Academy of Sciences in 2004. Prof. Rudas received his doctor honoris causa degree from the Technical University of Košice, Slovakia, from Polytechnica University of Timisoara, Romania, from Óbuda University, Budapest, Hungary, and from Slovak University of Technology, Bratislava. He was named an honorary professor in 2013 and ambassador in 2015 by Wroclaw University of Science and Technology, Poland.

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Prof. Rudas is active as a full university professor and the head of the Steering Committee of the University Research, Innovation, and Service Center. He was awarded the title of Rudolf Kalman professor by Óbuda University and the IEEE Hungary Section in 2017.

He served as the rector of Budapest Tech from 2003 until 2010. Prof. Rudas was the founder of Óbuda University, the successor of Budapest Tech, and was elected as the first rector for the period 2010–2014. He served as the president of the Hungarian Rector's Conference and was a member of the European University Association Steering Committee in 2008.

Prof. Rudas has been an IEEE Member since 1990 and an IEEE Fellow since 2002. He was the founding chair of the IEEE Systems, Man, and Cybernetics (SMC) Hungary Chapter and served Region 8 as Chapter coordinator for SMC during the period 2002–2004. He has been serving as a Technical Program Committee member of the annual SMC conferences for many years; he was the Technical Program Committee cochair of SMC 2014 and the general chair of SMC 2016. He was a Board of Governors member of the SMC Society (SMCS) in 2009–2010, 2012, and 2014 and vice president for membership development and student activities during the period 2014–2016.

He was a member of the IEEE Board of Directors Regional Activities Board and Technical Activities Board Section/Chapter Support Committee in 1998. He served the IEEE Industrial Electronics Society (IES) as a vice president in 2000–2001. He was the chair of the Hungary Section for the period 2009–2012. In 2013, Prof. Rudas established the very active Technical Committee on Computational Cybernetics in the SMCS. He was an SMCS Distinguished Lecturer during 2009–2014 and is currently a Distinguished Lecturer of the IES.

He reestablished the Hungarian Fuzzy Association in 1997 and was the president from 1997 to 2007. Since 2007, Prof. Rudas has been the honorary president of the association. He was International Fuzzy System Association (IFSA) council member from 1997 to 2013. He served IFSA as a vice president during 2005–2007 and 2007–2009, and he was the treasurer from 2009 to 2013. For

four years, he acted as the vice president of the Hungarian Academy of Engineers.

Prof. Rudas serves as an associate editor of some scientific journals, including *IEEE Transactions on Industrial Electronics*, a member of the editorial board of *Journal of Advanced Computational Intelligence*, the founder and editor-in-chief of *Acta Polytechnica Hungarica*, and a member of various national and international scientific committees. He was the founder and has been the organizer of the IEEE International Conference Series on Intelligent Engineering Systems (INES, since 1997), the IEEE International Conference on Computational Cybernetics (ICCC), the IEEE International Symposium on Computational Intelligence and Informatics (CINTI, since 2000), the IEEE International Symposium on Machine Intelligence and Informatics (SAMI, since 2003), the IEEE International Symposium on Intelligent Systems and Informatics (SISY, since 2003), the IEEE International Symposium on

Applied Computational Intelligence and Informatics (SACI, since 2004), and the IEEE International Symposium on Logistics and Industrial Informatics (LINDI, since 2007). Prof. Rudas has served as general chair and program chair of numerous international scientific conferences. He received many awards, among others the Denes Gábor award in 2006, the John von Neumann Award in 2006, the Hungarian Order of Merit in 2009, and the Pro Óbuda Award in 2014.

His present areas of research activities are computational cybernetics, soft computing, fuzzy control and fuzzy sets, robotics, cloud robotics, and the Internet of Things. He has edited and/or published 25 books and published more than 840 papers in international scientific journals, conference proceedings,

and book chapters and has received almost 5,000 citations according to Google Scholar.

The following sections include recollections of Rudas by a group of his peers.

Edward Tunstel, United Technologies Research Center, East Hartford, Connecticut

I had the good fortune of meeting Prof. Rudas while I was a doctoral student. At that time, I was engaged in

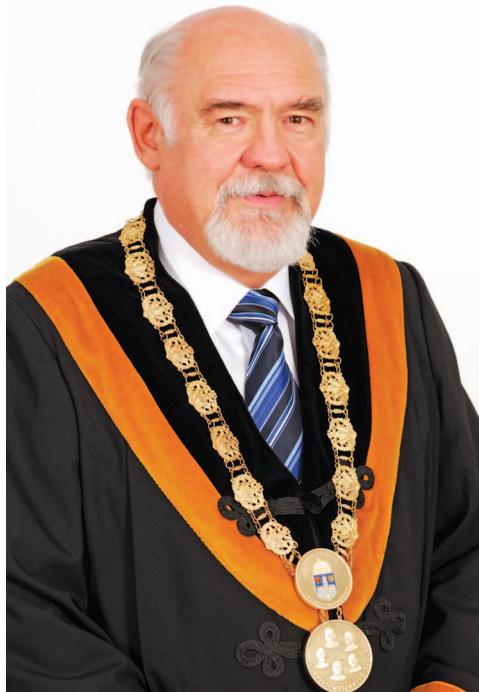


Figure 1. Imre J. Rudas.

He was always very amiable and made me feel more like a colleague than an admiring student.

researching topics in robotics related to questions he was actively investigating. He was, and is, a colleague of my doctoral advisor, Prof. Mo Jamshidi, who facilitated occasional interactions with him at conferences. He was always very amiable and made me feel more like a colleague than an admiring student. Another connection we had was that a colleague and countryman of his, whom he held in very high regard, Antal (Tony) Bejczy, was a pioneer of space robotics and happened to be employed at the same organization as me at the NASA Jet Propulsion Laboratory (JPL). With robotics as his focal research area and having had such an illustrious career already as an educator, researcher, and executive leader, Prof. Rudas was a professional role model, and I began to follow some of his work. He has focused on applying fuzzy logic and artificial intelligence techniques to robotics problems, which was also the focus of my doctoral research. It was my research focus at JPL as well, toward enabling robotic vehicles with embedded intelligence for scientific exploration on the surfaces of Mars, the moon, and asteroids.

Two of his papers from the time offered clear evidence that we have had common research interests and pondered similar research questions. His 1991 paper “Industrial Robot Control in Case of Uncertain Dynamical Parameters” addressed a control topic related to research I completed in 1989 for my master’s thesis on modeling industrial robot manipulator errors and uncertainty. His 1996 paper “An Advanced Robot Control Scheme Using ANN and Fuzzy Theory Based Solutions,” represented some synergy with my doctoral research completed in 1996 on hardware-focused implementation of mobile robot controllers using fuzzy control and other soft computing techniques. At a time when fuzzy set theory and fuzzy logic were not very widely accepted, Prof. Rudas’ attention to it as a viable and effective theoretical basis for addressing robotic intelligence and control served as trusted validation for me and my research. Over the years, I have had the further privilege of serving with Prof. Rudas on the Board of Governors for the SMCS and learning firsthand from his great example of scholarship and leadership with humility.

József Bokor, Hungarian Academy of Sciences, Budapest

I am very pleased to recall my research collaboration and friendship with Prof. Rudas. It happened that his research career started in the Computer and Automation Institute of the Hungarian Academy of Sciences (MTA SZTAKI) being active in robotics. He was fortunate enough to work with Tibor Vamos, the director of this institute. As a SZTAKI researcher, I was later lucky

enough, too, to work with Tibor in control theory. Prof. Rudas wrote his thesis in robotics and control obtaining a doctoral degree and title from the MTA. Being a member of his doctoral committees, I got a deeper insight into his excellent results. I was touched by his style and human attitude when arguing and discussing problems from various directions. Our friendship started probably as a by-product of these thesis defenses.

Prof. Rudas is a person devoted to improving and developing higher education. He acted as rector of Budapest Tech and later Óbuda University. I strongly believe that without his charismatic personality, this university could not reach the recent high recognition of students and the industrial and academic communities.

He was always eager to keep strong contact with the Hungarian academic communities abroad. His exceptional achievement to form a series of IEEE-qualified symposia with colleagues and friends from neighboring countries is something one can never overemphasize. In addition, he managed to form a Hungarian Chapter of the IEEE and to become chairman of the SMCS.

It is my pleasure to describe Prof. Rudas as a true gentleman with an outstanding personality and a great scientist with a perfect academic career. I am proud to have him as good friend.

Oussama Khatib, Stanford University, California

I am privileged to have known Prof. Rudas over the past two decades. We met through our shared interests in the advancement of robotics through IEEE meetings and conferences. Prof. Rudas has taken on a very active leadership role within the IEEE’s Societies, working on establishing a series of IEEE-sponsored events within the robotics and automation fields. His efforts have brought major benefits to the engineering and scientific communities throughout his region, which have had a worldwide impact. From the late 1990s, Prof. Rudas worked to establish numerous professional conferences including INES, SAMI, SACI, CINTI, and SISY. These events have gained significant standing in the field, providing opportunities for young researchers to present their scientific work and interact with outstanding researchers and scholars from around the world. These events are largely supported by the teams of colleagues and volunteers Prof. Rudas recruited over the years through the IEEE Hungary Section.

The unprecedented popularity and activity associated with these organizations are a testimony to his vision, leadership, and dedication to the field. Prof. Rudas’ major role in research and teaching (particularly during his tenure as rector at Óbuda University), his vision with respect

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to the evolution of robotics, and the energy and enthusiasm he has shown in the pursuit of professional and technical activities all show him to be an influential leader in our field and a man of considerable contribution to the advancement of the field and the success of his colleagues and students.

Janusz Kacprzyk, Systems Research Institute, Polish Academy of Sciences, Warsaw

It is difficult to encapsulate in a few sentences my long-time relations, scientific and personal, with Prof. Rudas, his illustrious academic stature, and my feeling of being honored and privileged that my life has crossed paths so often with his. This has happened within two areas of his activities. On the one hand, I became familiar with Prof. Rudas' great scientific achievements and stature in automatic control and robotics, and in the broadly perceived industrial electronics, years ago by some of his well-known IEEE activities. His very significant research results and his vision and brilliant organizational effectiveness and efficiency have resulted in his election as the vice president of IES and an associate editor of the Society's *IEEE Transactions on Industrial Electronics*.

Moreover, he cochaired many top IEEE conferences in his areas that I had also attended, and they were very successful. Our contact greatly intensified when, some 10 or 20 years ago, Prof. Rudas became involved in extremely successful research and organizational activities in the theory and applications of fuzzy logic, for which Hungary had been one of the top countries for years. He was a cofounder of the Hungarian Fuzzy Association, one of the most active societies in the IFSA. Prof. Rudas has served as an IFSA council member, treasurer, vice president, among other roles, over many years, and I can only say that as president of IFSA, treasurer, and IFSA council member, his contributions to IFSA cannot be overestimated. The same can be said about his International Federation of Automatic Control-related activities. I have had close contact with him over the years, often traveling to Hungary, and I have witnessed his brilliant scientific activities and their appreciation by the community. Moreover, in 2010–2014, he served as rector of Óbuda University, and his relentless activities were crucial for establishing Óbuda University as a major research university in Hungary. In these activities, he has successfully combined a heavy administrative load with very active research and also an involvement in conference launching and organization. The scientific community has greatly appreciated Prof. Rudas' activities and stature, and it has awarded him with some of the top distinctions, notably

He voluntarily made extensive contributions to the development of the IEEE throughout his long and illustrious career.

IEEE and IFSA Fellowships, four honorary doctorates, top organizational functions, and many more signs of deep appreciation. On a personal level, I deeply appreciate his scientific inspiration and support, great personal qualities, and, above all, real friendship.

C.L. Philip Chen, The University of Macau, Macau SAR, China

As a long-term SMCS member and former SMCS president (2012–2013), I am pleased to write a testimonial for Rector Prof. Rudas. He has a highly accomplished career in administration and academics that is admired by many of us. He voluntarily made extensive contributions to the development of the IEEE throughout his long and illustrious career.

I have known Prof. Rudas for more than 10 years, from IEEE meetings and activities as a professional junior. He expressed his knowledge in 1) academic leadership, 2) regional activities, and 3) membership and services that impressed me greatly. And later, I became familiarized and participated in some of the professional activities that he organized.

As the founding rector of the university, he made the university a well-known technical research center and institute of the region. On many occasions that I had with his colleagues in the region including Hungary, Serbia, Romania, Slovakia, and Poland, I found that people are drawn in by his charm and his vision toward the establishment of the technical and research centers that serve the industry and make their research outcomes a reality. He successfully established the university as a regional leading university in information technology, robotics, and automation.

Prof. Rudas organized many IEEE-sponsored international annual conferences in the region as the general chair and delivered keynote speeches. These included, but are not limited to, the IEEE International Symposium on Intelligent Systems and Informatics in Hungary and Serbia; the IEEE International Symposium on Applied Computational Intelligence and Informatics in Romania; the IEEE World Symposium on Applied Machine Intelligence and Informatics in Slovakia; and INES in Hungary, Spain, and Slovakia. These conferences have attracted many professional and engineers and students. As a result, these activities increased the visibility and membership of the SMCS.

These few words are not enough to describe Prof. Rudas' successful career and contribution: they are only the tip of the iceberg. He is a role model for many of us as he trained and educated many junior members to ensure the continuity of the leadership for the university and professional groups, especially in the Society and the IEEE.

**Keith W. Hipel, University of Waterloo,
Ontario, Canada**

Rector Prof. Rudas is a fine gentleman, a gifted scholar, and an inspirational educational leader who is genuinely devoted to helping others to succeed in their academic careers and personal lives. I have had the distinct pleasure and honor of meeting Prof. Rudas over many years at international IEEE conferences held around the globe and in his home country. The conferences that I participated at in Hungary, for which he was the gracious host and main organizer, included the 2016 IEEE International Conference on Systems, Man, and Cybernetics; the 2013 IEEE International Conference on System Science and Engineering; and ICC 2013. I also took part in LINDI 2012, which convened at the Smolenice Castle in nearby Slovakia. Over the years, I have gained great respect for Prof. Rudas, by observing this remarkable scholar in action at many academic events, from the local level at his own university, to the national level across Hungary, and to international forums around the world. Imre has made many significant contributions to the development and maturation of our cherished SMCS.

Among his numerous admirable achievements, let me mention one that occurred in Hungary. From 2003 to 2010, Prof. Rudas was rector of Budapest Tech. Through his long-term vision and dedicated work in making his dream operational, he transformed Budapest Tech into the widely respected Óbuda University, for which he was the founding and first rector from 2010 to 2014. In a country like Hungary, with its long tradition of being a beacon in education, this was not an easy feat to achieve. Congratulations go to Prof. Rudas! I am honored and proud to be an alumnus of Óbuda University!

I have witnessed firsthand Prof. Rudas assisting students and colleagues alike via providing sage advice and taking concrete steps to make things happen. Let me relay to you just one of the ways in which my kind friend has personally helped me. In my former role as president-elect of the Academy of Sciences within the Royal Society of Canada, I was keen to establish links with the Hungarian Academy of Science. Prof. Rudas expeditiously arranged an appointment for me in the busy schedule of his nation's science academy president. During the morning of Monday, 3 September 2012, Imre and I met with President Jozsef Palinkas of the Hungarian Academy of Science at the academy's headquarters, which was located in an impressive building situated beside the mighty Danube River in Budapest. Among the topics discussed were

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possible means for cooperation in research between Hungary and Canada and the current underfunding of research in both countries.

Of high interest, however, was the stimulating discussion we had regarding the historical reasons for Hungary producing so many geniuses in the late 19th and early 20th centuries. One reason was the exceptional quality of teaching by highly educated teachers, such as Prof. Ratz (who taught the renowned John von Neumann), Jenő Wigner, Leo Szilard, and Ede Teller at a private Lutheran high school (Gimnazium) in Budapest. True to form, Prof. Rudas made sure that I personally visited this high school as well as taking me to see the birthplace of John von Neumann. He also ensured that other SMCS colleagues such as Jim Tien, Mo Jamshidi, Bill Gruver, and Philip Chen visited these same important locations for educational advancements one year later! So, now you know the secret to why Prof. Rudas is such a highly successful academic and greatly respected academic leader: his talent

is embedded in his Hungarian academic genes, along with a good dose of sincerity and kindness!

**Shun-Feng Su, National
Taiwan University, Taipei**

It is my great honor to say a few words about Prof. Rudas. We have known each other for many years. Our close collaboration started around 10 years ago when he gave an invited lecture about "Recent Advances in Information Aggregation" in Taipei. Since that time, he presented lectures in Taiwan as a Distinguished Lecturer of the SMCS and served as keynote speaker or plenary speaker at many international conferences organized in Taiwan or organized by Taiwanese professors. The topics covered his research achievements including intelligent systems, aggregation operators, robot control, cloud robotics, and the Internet of Anything. His talks were always interesting and very inspiring to the audience. In fact, so many of his research interests are very close to mine and as results of our collaboration, we have published some joint papers. We also coedited a successful special issue, "Industry 4.0," in *IEEE Access* in 2017.

As a recognition of our collaboration, I was awarded as an honorary professor of Óbuda University. To my understanding, such an international collaboration program was established by Prof. Rudas at Óbuda University. He has served in IFSA as vice president and treasurer for seven years, and his strong support was essential for me to become a vice president and then the president of the

association. In recognition of his contributions to IFSA, he was named an IFSA fellow in 2017. Prof. Rudas has established several IEEE-sponsored conferences and symposia; he served as general chair or program chair of numerous other conferences. He was the general chair of SMC 2016, which was recognized as very successful, or even the best SMC flagship conference in recent years. As the program chair of this conference, I had the opportunity to work under his exceptionally effective leadership. He also served as the vice president for membership of the SMCS and included me in the membership committee, assigning me chair of the subcommittee of young professionals and students. He has done a lot in the realm of member recruiting activities. As a result, after his term, the number of members of the SMCS increased significantly compared to in other IEEE Societies. It has been a great honor to work with him over these many years.

Worldwide, Prof. Rudas is a well-known and highly respected scientist. He has a charismatic and energetic personality with very good sense of humor. It has been an honor and privilege to be his friend and coworker for such a long time.

Levente Kovács, Physiological Controls Research Center, Óbuda University, Budapest, Hungary

I met Prof. Rudas at conferences organized by the IEEE Hungary Section. After five years of continuous attendance, he asked me to help him in membership development for the IEEE Hungary Section. This is how I became the Membership Development Officer of the IEEE Hungary Section, and this is how he infected me with the IEEE phenomena.

Because of the close relationship we had under his presidency at the IEEE Hungary Section, I joined his initiative to build an excellence research center at Óbuda University, and I have created the Physiological Controls Research Center. Our scientific relationship became stronger and stronger day by day, while on the one hand becoming vice chair and now chair of the IEEE Hungary Section, and on the other hand during his presidency under Óbuda University, I revitalized the John von Neumann Faculty of Informatics as a vice dean of education.

I was involved step by step in conference organization for the local IEEE Hungary Section, culminating with the annual flagship conference of the SMCS: SMC 2016. As the Local Organizing Committee responsible under his general conference chairship, we created a very good and efficient team. Prof. Rudas believed me as a scientist as well, and he was one of the few people who supported me in my European Union European Research Council Excellence Grant application that I later won in 2016.

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From these examples, it can be seen that Prof. Rudas has the gifts of a talented manager and the endurance to build up new generations for the benefit of the scientific community and, hence, for the advancement of technology for humanity.

György Eigner, Óbuda University, Budapest, Hungary

I met Prof. Rudas in 2006 when I started my undergraduate studies at the Bánki Donát Faculty of Budapest Tech, Hungary, which is where he earned his first diploma and started his career years ago. At that time, he was the president of Budapest Tech. Thanks to him, I was able to finish my studies at Óbuda University because the college was transformed into the university under his leadership, which was a process started by him. The next time our cooperation became deeper was in 2013 when I started my

Ph.D. degree studies (again at Óbuda University). That was when Prof. Rudas became a mentor to me. We also participated in international conferences together including SMC 2014, for which he provided me great opportunities for international networking.

In 2014, when he was the vice president of SMCS and began many progressive initiatives, he invited me to be the chair of the student activities subcommittee. My career at SMCS started with that move thanks to Prof. Rudas. His exemplary acts show the way to me even today. One of the biggest adventures for me was participating in the organization of SMC 2016 where I served in many roles. We worked for a long time to make a successful conference. I have learned, and continuously learning from him, on about many topics thanks to his wide scientific knowledge, especially in cybernetics, his strategic thinking, and his unique viewpoint. He is not just a great scientist, a role model, and mentor to me, but also a good friend.

About the Author

György Eigner (eigner.gyorgy@nik.uni-obuda.hu) earned his B.S. and M.S. degrees from Óbuda University and Budapest University of Technology and Economics, Hungary, in 2011 and 2013, respectively. He earned his Ph.D. degree at the Applied Informatics and Applied Mathematics Doctoral School of Óbuda University in 2017. He is currently an adjunct professor at Óbuda University in the John von Neumann Faculty of Informatics and postdoctoral researcher at the Physiological Controls Research Center of Óbuda University's Research, Innovation and Service Center. He is a member of the Board of Governors of the IEEE Systems, Man, and Cybernetics Society.