RAJ MADHAVAN, US

Raj Madhavan (S'92-M'00-SM'06) is an internationally recognized expert in humanitarian robotics and automation technologies. He is the CEO of Humanitarian Robotics Technologies focusing on applied technology consulting, training, and research. He has held appointments with two US Govt. agencies (ORNL, NIST) and two Universities as a faculty member (UMD-CP, Amrita). He received a Ph.D. in Field Robotics from the University of Sydney, and an ME (Research) in Systems Engineering from the Australian National University. Over the last 22 years, he has published 200+ papers in archival journals, conferences, and magazines and has co-edited two books and four journal special issues. He has given numerous plenary and keynote presentations across the globe, has served on several editorial boards, program and organization committees, and national/international panels and review boards. He is the 2016 recipient of the RAS Distinguished Service Award for his "distinguished service and contributions to RAS industrial and humanitarian activities".

IEEE Activities:
COMMITTEES/BOARDS:
- Member, IEEE TAB Future Directions Committee (FDC) (2015-2016, 2017-2018)
- Co-Chair, IEEE TAB FDC 'Symbiotic Autonomous Systems' Initiative (2017-2019)
- Founding Chair, IEEE TAB FDC Incubation Project 'Autonomous Technologies and their Societal Impact' (2016)
- Founding Executive Committee Member, IEEE Global Initiative for Ethical Considerations in Artificial Intelligence and Autonomous Systems (IEEE GIECAIAS) (2015-)
- Founding Chair (2016) & Co-chair, Economics of Machine Automation and Humanitarian Activities Committee, IEEE GIECAIAS (2017-)
- Member, IEEE SIGHT Steering Committee (2015-2016)
- Chair, Partnerships Subcommittee, IEEE SIGHT (2016)
- Vice Chair, Assessment & Best Practices, IEEE Humanitarian Activities Committee (2016)
- IEEE-USA Research & Development Policy Committee (R&DPC): Corresponding Member (2012-2013)
- Member, IEEE Standards Association Standards Board New Standards Committee (NesCOM) (2012)

REGIONS:
- IEEE Region 2 Conference Coordinator (2011-2012)

SECTIONS/CHAPTERS:
- IEEE Washington Section: Director (2011-2012); Chair (2010); Vice Chair (2009); Treasurer (2008)
- IEEE Washington/Northern Virginia RAS Chapter: Founding Chair (2007-2009) [2010 RAS Chapter of the Year Award]
- IEEE Washington/Northern Virginia Sensors Council Chapter: Founding Chair (2010-2011)

STUDENT BRANCHES:
- The University of Sydney (1997-2000)

SOCIETY:
- Founding Chair, RAS Special Interest Group on Humanitarian Technology (SIGHT) (Sept. 2012-)
- Chair, RAS Robotics and Automation Research and Practice Ethics Committee (2017-)
- Evaluation Panel Member, RAS Early Career Awards (2017)
- Editor, Humanitarian Technology, *RAS Robotics and Automation Magazine* (2016-)
- Chair, RAS Nomination Committee INABA Award & Robotics and Automation Award for Product Innovation (2013, 2014, 2016)
- RAS INDUSTRIAL ACTIVITIES BOARD: Vice President (2012-2013, 2014-2015); Associate VP (2010-2011); Member-At-Large (2008-2009); Chair, RAS-Standing Committee for Standards Activities (2010-2013) (the first two standards of the Society were published during my tenure); Founding Chair, Entrepreneurship Forum and Start-up Competition (2015); Member (2016-2017).
- Chair, IEEE-RAS/IFR Innovation and Entrepreneurship in Robotics and Automation (IERA) Award Committee (2011-2015)
- Member, RAS Long Range Planning Committee (2012-2015)
- IEEE-RAS Liaison, Robotics Caucus Advisory Committee (2012-2015)
- IEEE-RAS Liaison, Society for Social Implications of Technology (SSIT) (2013)
- Member, RAS Ad Hoc Committee on Automation (2012-2013)
- Evaluation Panel Member, George Saridis Leadership Award in Robotics and Automation & Distinguished Service Award (2012)
- RAS TECHNICAL ACTIVITIES BOARD: Founding Chair, Technical Committee on Performance Evaluation and Benchmarking of Robotics and Automation Systems (TC-PEBRAS) (2009-2011); Member (2015-2016, 2017-2018).
- RAS MEMBER ACTIVITIES BOARD: Co-Chair, Education Committee (2010-2011)
- Member, RAS Conference Editorial Board: ICRA (2007-2008), IROS (2009-2010)
- *RAS Robotics and Automation Magazine*: Industry Editor (2011-2015); Co-contributor, Industry News & Views (2009-2010)

CONFERENCES:
- Founding Program Co-Chair, International Conference on Robotics and Automation for Humanitarian Applications (RAHA 2016)
- Senior Program Committee Member, IEEE International Conference on Robotics and Automation (ICRA 2016)
- Co-Chair, Robot Challenges, IEEE International Conference on Robotics and Automation (ICRA 2016)
- Regional Program Co-Chair (USA), International Conference on Control, Automation, and Systems (ICCAS 2016)
- Organizer, Autonomous Technologies and their Societal Impact Forum (IROS 2016)
- Founding Chair, Entrepreneurship Forum & Start-up Competition (IROS 2015)
- Co-Organizer, Industry Forum "Where does Entrepreneurship Fit in within Industry & Academia?" (IROS 2014)
- Co-Organizer, Industry Forum "Entrepreneurship in Robotics and Automation" (IROS 2013)

- Co-Organizer, Industry Forum "Bridging the Gap between Academia, Industry, and Government to Benefit End-Users" (ICRA 2012)
- Program Chair, Performance Metrics for Intelligent Systems Workshop (2006-2010, 2012)
- Co-Chair, Exhibits (IROS 2012)
- Chair, Exhibits & Industrial Tutorials (ICRA 2012)
- Publications Chair, International Conference on Advanced Robotics (ICAR 2011)

OTHER: Over the last 22 years, I have served on several program and organizing committees for various IEEE conferences and workshops (IROS, ICRA, CASE, RSS, ICAR, ICCAS, ICPR, TePRA, SSRR, CIVVS), and on numerous international boards and review panels.

Qualifications: Within IEEE RAS (and IEEE), I have been active in a variety of roles since 2008, including several firsts to my credit (see 'Founding' entries under 'IEEE Activities' section). I have played a significant role in enhancing the Society's standing both within IEEE and the robotics and automation community across the globe. I have had the privilege of serving the Society as Vice President of the Industrial Activities Board for two terms (2012-2013 and 2014-2015), Chair of the RAS Standards Committee (2010-2015), Founding Chair of the RAS Special Interest Group on Humanitarian Technology (RAS-SIGHT), and Founding Chair of the TC on Performance Evaluation and Benchmarking of Robotics and Automation Systems (PEBRAS). My efforts focused and directly resulted in bridging the gap between industry, academia, and government and how the IAB can engage and enable members of both the Society and the community to benefit all stakeholders through industrial forums, standards- defining activities, and outreach efforts. Under my leadership, the first two standards of the Society were published in 2015 with active participation from 150 members spread across 30 countries. Having lived, studied, and worked across four continents, viz. Asia, Australia, Europe and North America, I can effectively communicate and convey my ideas to people from different cultural and technical backgrounds while being receptive to theirs. On a personal note, I am easily approachable, humble, and over the years, have garnered the professional trust and respect of people I have worked with in the academic and industrial communities, and have the necessary energy, enthusiasm, and people skills. I firmly believe that my proven track record to forge partnerships and bring people together from different stakeholder communities from across the globe, and my demonstrated reputation as a member of the robotics and automation community make me uniquely qualified to serve as an AdCom member.

Major Accomplishments:

- VICE PRESIDENT, INDUSTRIAL ACTIVITIES BOARD (2012-2013 & 2014-2015): As VP-IAB, I have served as the Society's ambassador by promoting collaboration and cooperation via various industrial activities as outlined in the 'Qualifications' section. In my term, the Society gained visibility within the robotics and automation community with more interest from other professional societies wanting to collaborate with RAS to industrial members taking active role in the Society in terms of Board memberships, conference organization, standards activities, and industrial forums. One of the signature efforts during my term has been the promotion of entrepreneurship among Society's members and the community at large. I have organized well-received and well-attended industrial forums at ICRA'12, IROS'13, IROS'14, and IROS'15 on these topics. IEEE TAB has recognized RAS' efforts for the promotion of entrepreneurship and industrial activities, and I was invited to serve as a member of IEEE TAB Ad Hoc on Entrepreneurship (2015) and as a member of the Future Directions Committee (2015-2016, 2017-2018).
- FOUNDING CHAIR, RAS–SIGHT (2012–PRESENT): With support from the Member Activities Board, ExCom, and AdCom, I formed the Special Interest Group on Humanitarian Technology (SIGHT). RAS is the first Society in IEEE to have a SIGHT. The mission of RAS-SIGHT is to apply robotics and automation technologies for promoting humanitarian causes around the globe and to leverage existing and emerging technologies for the benefit of humanity and toward increasing the quality of life in underserved, under-developed areas in collaboration with existing global communities and organizations. RAS-SIGHT has been organizing the Humanitarian Robotics and Automation Technology (HRATC) Demo as part of the robot challenges, since ICRA'14. Currently in its 4th year, HRATC focuses on addressing the problem of removing landmines via cost-effective, reliable, and open-source R&A technologies. In addition to HRATC, several RAS-SIGHT funded projects have successfully brought together students and researchers to work on practical problems of benefit to humanity in close collaboration with the industry and academia (see http://www.ieee-ras.org/ras-sight/projects and http://www.ieee-ras.org/ras-sight/activities). The efforts of RAS–SIGHT have been widely recognized and are routinely referenced by the IEEE Humanitarian Activites Committee as an exemplar for other Societies and Councils.
- CHAIR, RAS STANDING COMMITTEE FOR STANDARDS ACTIVITIES (2010-15): As the Chair of RAS–SCSA, I spearheaded efforts to foster discussions with the research and industrial communities and other Standards Developing Organizations (such as ISO and RIA) to help develop standards for robotics and automation. I was responsible for the formation of two Study Groups, and subsequently two Working Groups. Under my leadership, the first-ever RAS Standard, 'Ontologies for Robotics and Automation' was published in February 2015. A second standard, 'Map Data Representation for Robot Navigation' currently under the balloting stage, was published in early 2016. With active participation from 150 members spread across 30 countries, these two working groups in coordination with the IEEE Standards Association produced the first two standards of the Society within a relatively short span of less than five years.
- CHAIR, IEEE/IFR INVENTION AND ENTREPRENEURSHIP IN ROBOTICS AND AUTOMATION (IERA) AWARD COMMITTEE (2011-2015): As Chair of the award committee, for 5 years, I coordinated the call for participation by soliciting companies to submit their entries for consideration, managed the evaluation process by obtaining reviews, developed the final program to have the finalists present their cases, and decided a winner by working closely with IFR and RAS Committee members at either ICRA or AUTOMATICA resulting in high quality submissions and world-class winners. The IERA award is now considered a coveted award, which can directly translate to credibility and sales as evidenced by several recent winners (Universal Robots is a standout winner before they captured their sizeable market share).
- RAM INDUSTRY EDITOR AND CONTRIBUTOR (2010-2013): In my role as the Industry Editor, I was successful in inviting companies and entrepreneurs to submit articles focusing on past and ongoing industrial research projects and implementations worldwide. This column served to inform the RAM readers of successes, challenges and lessons from all aspects of the robotics and

automation industry, including short- and long-term visions. I have been a co-contributor to a column on Industry Research and News, which collated interesting and significant happenings from around the world in robotics and automation. I also started a new series focusing on the state of the art of robotics and automation in the BRICS (Brazil, Russia, India, China, and South Africa) countries that have appeared in RAM during my tenure as the Industry Editor.

Position Statement: First and foremost, I consider myself a global citizen. Having lived, studied, and worked in four continents, my professional and personal life experiences along the way have put me on the path I am on. My current work lies at the intersection of technology for societal good, regulation/governance of emerging technologies, and technology-public policy efforts for the betterment of humanity. For the last 20+ years, I have been actively involved in mobile robotics research and development and performance evaluation, benchmarking and standardization of intelligent systems in two government labs (ORNL & NIST) and at two Universities (UMD-CP & Amrita University). Working with the government, industry, and academia has enabled me to understand the underlying weaknesses and strengths of these entities.

RAS has the distinct advantage to inform and educate the general public and policymakers of the benefits of robotics and automation both within the government and industry. A holistic view of the effects of robotics and automation technologies on the interconnected and interdependent world that we live in today is required for the Society to stay relevant, to attract younger professionals, and to pave the way for increased impact in the coming years. I also believe that the Society should strive to instill a strong sense of ethics, professionalism, and kinship to their profession in the minds of the next generation of engineers and scientists. As the AdCom debates and decides which projects, activities, and motions move forward and which ones do not get funded, it is vitally important that its members have a good understanding of the workings of the Society and the potential of the various boards and standing committees.

After having served RAS in various positions at the ExCom and Board levels, I would like to serve on the governing body of the Society to shape the Society's humanitarian, industrial, and technology-public policy activities and serve as a bridge to other existing initiatives within IEEE. Of particular interest to me is the involvement and inclusion of RAS members from developing economies in the Asia-Pacific (Region 10), South America (Region 9), and the Middle East (Region 8). I have been involved directly with members from these regions either via RAS-SIGHT or through my academic and research activities. I am a passionate advocate for the use of emerging technologies and have been actively engaged in efforts to bring together practitioners, humanitarian relief workers, analysts from the field and humanitarian aid agencies, and foundations from several countries to understand the current and future role technologies play in alleviating suffering of humanity in times of need.

I strongly believe that I bring a non-traditional view and thinking owing to my prior accomplishments and work in relevant domains. Given my unique perspective and significant experience, I will provide a solid foundation and the required background for the AdCom to make informed decisions. If given the opportunity, I am confident that I would be able to serve the Society in an exemplary fashion as I have in my other roles over the past decade.