India Robotics Roadmap

Industry Connections Activity Initiation Document (ICAID)

Version: 0.2, 8 February 2017

IC17-003-01 Approved by the IEEE-SASB 4 May 2017

Instructions

- Instructions on how to fill out this form are shown in red. It is recommended to leave the instructions in the final document and simply add the requested information where indicated.
- Shaded Tex+!t indicates a placeholder that should be replaced with information specific to this ICAID, and the shading removed.
- Completed forms, in Word format, or any questions should be sent to the IEEE Standards Association (IEEE-SA) Industry Connections Committee (ICCom) Administrator at the following address: industryconnections@ieee.org.
- The version number above, along with the date, may be used by the submitter to distinguish successive updates of this document. A separate, unique Industry Connections (IC) Activity Number will be assigned when the document is submitted to the ICCom Administrator.

1. Contact

Provide the name and contact information of the primary contact person for this IC activity. Affiliation is any entity that provides the person financial or other substantive support, for which the person may feel an obligation. If necessary, a second/alternate contact person's information may also be provided.

Name: Raj Madhavan
Email Address: raj.madhavan@ieee.org
Phone: +1-240-404-8795
Employer: Humanitarian Robotics Technologies, LLC
Affiliation: CEO

2. Participation and Voting Model

Specify whether this activity will be entity-based (participants are entities, which may have multiple representatives, one-entity-one-vote), or individual-based (participants represent themselves, one-person-one-vote).

Individual-Based

Purpose

2.1. Motivation and Goal

Briefly explain the context and motivation for starting this IC activity, and the overall purpose or goal to be accomplished.

Robotics and Automation (R&A) has proven to be a transformative technology capable of changing a nation's trajectory in terms of benefits at the GDP level to increasing the quality of lives of its inhabitants. Long touted as an economic powerhouse, despite impressive growth year after year, adoption of emerging technologies tends to be slow in India similar to other developing economies. The objectives of this roadmapping activity focused on India are to better understand and identify

- what existing R&A solutions exist across public and private sectors,
- requirements of stakeholders, and
- how existing roadblocks and impeding processes can be minimized to facilitate the adoption and growth of these technologies with particular attention to socio-economic, cultural, environmental, and sustainability factors.

These activities are anticipated to raise awareness of existing and emerging R&A technologies, bring together researchers, developers, and practitioners from government, industry, and academia. The benefits of such an effort would lead to

- industries adopting best practices and benefitting from technologies developed in more advanced parts of the globe,
- providing the academia the required steps to prepare the next generation workforce and researchers, and
- informing the government of existing gaps and how these can be bridged.

2.2. Related Work

Provide a brief comparison of this activity to existing, related efforts or standards of which you are aware (industry associations, consortia, standardization activities, etc.).

While there are internal governmental reports and forecasts available (not all of them in the open literature however), there has not been a concerted effort in bringing together various entities to facilitate public-private partnerships and work collectively towards realizing and harnessing the potential of R&A technologies for the Indian subcontinent.

2.3. Previously Published Material

Provide a list of any known previously published material intended for inclusion in the proposed deliverables of this activity.

N/A.

2.4. Potential Markets Served

Indicate the main beneficiaries of this work, and what the potential impact might be.

The following domains are the intended beneficiaries: 1) Consumer and Service robotics, 2) industrial (automotive, manufacturing), and 3) military and defense. The impact of this activity would be to provide a comprehensive and objective view of the state-of-the-art of R&A technologies, steps needed to bridge existing gaps (both technological and bureaucratic) in consultation with stakeholders via focus groups, workshops, and periodic telecons.

3. Estimated Timeframe

Indicate approximately how long you expect this activity to operate to achieve its proposed results (e.g., time to completion of all deliverables).

Expected Completion Date: 03/2019

IC activities are chartered for two years at a time. Activities are eligible for extension upon request and review by ICCom and the IEEE-SA Standards Board. Should an extension be required, please notify the ICCom Administrator prior to the two-year mark.

4. Proposed Deliverables

Outline the anticipated deliverables and output from this IC activity, such as documents (e.g., white papers, reports), proposals for standards, conferences and workshops, databases, computer code, etc., and indicate the expected timeframe for each.

The primary deliverables from this activity will include:

1. A roadmap report describing 1) identified needs to accelerate developments in the field of robotics with a focus on the Indian market; 2) prioritization recommendations to address the identified needs; 3) standards development activities that will be an enabler for the robotics industry in India.
2. Standards proposals (PARs) for IEEE-SA to put into action the recommendations in the roadmap report
3. Interactive workshops with key stakeholders to build consensus on the roadmap and standards recommendations. It is envisioned that 1-2 workshops will be held in India, the first to outline priority topics for the whitepaper, with the option for a second workshop to refine a draft report and help move it towards a consensus final report

A first roadmapping workshop will be targeted for summer 2017 in India, with completion of the roadmap report targeted for summer 2018. Subsequently, work will take place to finalize PARs for submittal at the end of 2018 and/or early 2019.

5. Funding Requirements

Outline any contracted services or other expenses that are currently anticipated, beyond the basic support services provided to all IC activities. Indicate how those funds are expected to be obtained (e.g., through participant fees, sponsorships, government or other grants, etc.). Activities needing substantial funding may require additional reviews and approvals beyond ICCom.

Industry Connections staff will provide standard support as made available to all IEEE-SA IC activities. Activity members will provide any needed support for hosted meetings, marketing activities that exceed basic IC support.
The proposed F2F workshops will aim to be co-located with other events in India involving the robotics community. Sponsorship will be sought to help defray any associated meeting costs as needed.

6. Management and Procedures

6.1. IEEE Sponsoring Committee

Indicate whether an IEEE sponsoring committee of some form (e.g., an IEEE Standards Sponsor) has agreed to oversee this activity and its procedures.

Has an IEEE sponsoring committee agreed to oversee this activity?: No

If yes, indicate the sponsoring committee's name and its chair's contact information.

Sponsoring Committee Name: Committee Name
Chair's Name: Full Name
Chair's Email Address: who@where
Chair's Phone: Number, including country code

Additional sponsoring committee information, if any.

6.2. Activity Management

If no IEEE sponsoring committee has been identified in 7.1 above, indicate how this activity will manage itself on a day-to-day basis (e.g., executive committee, officers, etc).

Raj Madhavan will serve as the Chair of this activity (see attached bio on the last page of this document). An Executive Committee of experts from industry, academia, and government will be established to identify and bring together various stakeholders and volunteers. An Organizing Committee will be constituted towards the organization workshops.

6.3. Procedures

Indicate what documented procedures will be used to guide the operations of this activity; either (a) modified baseline *Industry Connections Activity Policies and Procedures,* (b) Sponsor policies and procedures accepted by the IEEE-SA Standards Board, or (c) Working Group policies and procedures accepted by the Working Group's Sponsor. If option (a) is chosen, then ICCom review and approval of the P&P is required. If option (b) or (c) is chosen, then ICCom approval of the use of the P&P is required.

Will use the baseline Industry Connections Activity Policies and Procedures.

7. Participants

7.1. Stakeholder Communities

Indicate the stakeholder communities (the types of companies or other entities, or the different groups of individuals) that are expected to be interested in this IC activity, and will be invited to participate.

The focus will be on involving representatives from entities across the industry, government, academia, and end-users. IEEE-SA staff from India and other IEEE Societies will also be invited to contribute to this activity.

7.2. Expected Number of Participants

Indicate the approximate number of entities (if entity-based) or individuals (if individual-based) expected to be actively involved in this activity.

50

7.3. Initial Participants

Provide a list of the entities or individuals that will be participating from the outset. It is recommended there be at least three initial participants for an entity-based activity, or five initial participants (each with a different affiliation) for an individual-based activity.

Use the following table for an entity-based activity:

Entity	**Primary Contact**	**Additional Representatives**
Entity Name	Contact Name Email Address Phone Number	Name, Email Address Name, Email Address

Use the following table for an individual-based activity:

Below is a tentative list of participants (not all of whom have been contacted/confirmed):

Individual	**Contact Information**	**Employer**	**Affiliation**
Name	Email Address	Entity Name	Entity Name
Prof. SK Saha	saha@mech.iitd.ac.in	IIT New Delhi	
Rejin Narayanan	rejin@ingenrobotics.com	Ingen Robotics	
Achu Wilson	achuwilson@gmail.com	Sastra Robotics	
K. Jaikishan	jaikishan@lntecc.com	L & T	
S. Lakshmi Narayanan	sln-pm@lntecc.com	L & T	
Sri Chandra	sri.chandra@ieee.org	IEEE-SA	
Rudi Schubert	r.schubert@ieee.org	IEEE-SA	
Raj Madhavan	humrobtech@gmail.com	HRT, LLC	

Biography

Raj Madhavan is the Founder & CEO of Humanitarian Robotics Technologies, LLC, focusing on applied technology consulting, training, and research. Most recently he was a Distinguished Visiting Professor of Robotics at Amrita University, Kerala, India (February 2016-January 2017) and has held appointments with the Oak Ridge National Laboratory (March 2001-January 2010) as an R&D staff member based at the National Institute of Standards and Technology (March 2002-June 2013), and as an assistant and associate research scientist, and as a member of the Maryland Robotics Center with the University of Maryland, College Park (February 2010-December 2015). 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 20 years, he has contributed to topics in field robotics, and systems and control theory. His current research interests lie in humanitarian robotics and automation – the application and tailoring of existing and emerging robotics and automation technologies from a variety of domains, including unmanned (aerial, ground) vehicles. He is particularly interested in the development of technologies and systems that are cost effective, reliable, efficient and geared towards improving the quality of lives of people in under-served and underdeveloped communities around the globe. He has authored over 185 papers in archival journals, conferences, and magazines including three books and four journal special issues.

Within IEEE, Dr. Madhavan was the Founding Chair of the IEEE Washington/Northern Virginia Section Robotics Automation Society (2007- 2009; 2010 Best Chapter of the Year Award) and Sensors Council Chapters (2008-2009). He is a senior member of IEEE and is currently active within IEEE in the following roles: Co-chair, TAB Future Directions Committee Initiative Symbiotic Autonomous Systems; Member, IEEE FDC; ExCom Member and Co-chair, Economics of Machine Automation and Humanitarian Activities, IEEE-SA Global Initiative on the Design of Artificial Intelligence and Autonomous Systems. Within the IEEE Robotics and Automation Society, he served as the Founding Chair of the Technical Committee on Performance Evaluation and Benchmarking of Robotics and Automation Systems, TC-PEBRAS (2009-2011), Founding Chair of the Humanitarian Robotics and Automation Technology Challenge, HRATC (2014, 2015), Vice President of the Industrial Activities Board (2012-2015), Chair of the Standing Committee for Standards Activities (2010-2015), and since 2012 is the Founding Chair of the Special Interest Group on Humanitarian Technology (RAS-SIGHT). He is the 2016 recipient of the IEEE RAS Distinguished Service Award for his "distinguished service and contributions to RAS industrial and humanitarian activities".