

TCS Workshop on Robotics for Waste Management  
Advances in Robotics (AIR 2017)  
IIT Delhi, New Delhi: June 28, 2017

“Sustainable Waste Management – Will Robots Augment Humans or Replace Humans?”

The modern human society is generating waste at an unprecedented rate. In quantitative terms, the world produces about 4.7 million tonnes of garbage per day; it is expected to rise to up to 6 million tonnes by 2025. To the global figure, India contributes about 0.2 million tonnes each day; most of the garbage is discarded without being subjected to proper treatment. To manage solid wastes, many developed societies are increasingly adopting automation. Solid waste management primarily includes steps such as collection, transportation, segregation, recycling and proper disposal. Automating solid waste management in India has some inherent challenges owing to poor infrastructure and availability of cheap manual labour. Not having a formal policy or system for waste management in India doesn't help either. Given this background, it becomes imperative to seek technological solutions which can not only improve the quality of life of people engaged in such jobs but also lead to new business opportunities. The purpose of this workshop is to deliberate on various aspects of Waste Management in the country and explore how technological interventions might help improve the situation.

Speakers / Panelists

1. Shri Ramanathan Ramanan, Mission Director, Atal Innovation Mission, Niti Aayog, Govt of India.
2. Dr. T. V. Ramachandran, Centre for Ecological Sciences, IISc Bangalore.
3. Dr. Jagannath Raju, CTO, Systemantics
4. Dr. Ramanan, Niti Aayog, GoI
5. Prof. Subir K Saha, HoD, ME, IIT Delhi
6. Prof. Sudipto Mukherjee, IIT Delhi
7. Mr. Anurag Asati, Founder and CEO, [www.Thekabadiwala.com](http://www.Thekabadiwala.com)

Biographies and photographs will be shared later.

Agenda:

1. Introduction – Opening Remarks by Dr. Balamurali P , TCS Research– 5 minutes
2. Keynote Lecture 1 by Shri Ramanathan Raman, Mission Director Niti Aayog – 20 minutes
3. Keynote Lecture 2 by Dr. T. V. Ramachandra, CES, IISc – 20 minutes
4. Keynote lecture 3 by Dr. Jagannath Raju, CTO, Systemantics – 20 minutes
5. Panel Discussion moderated by a Mr. Rajesh Sinha, TCS Research – 60 minutes.
6. Conclusion and Closing Remarks by Dr. Arpan Pal TCS Research – 5 minutes.

## Biography of Speakers



**Shri Ramanathan Ramanan** is currently serving as Mission Director, Atal Innovation Mission, NITI Aayog. He joined TCS in 1981 after graduating from IIT Mumbai in Electrical Engineering. He took the reins of CMC Ltd. as the Chief Operating Officer after CMC Ltd., a government owned crown jewel organization, was divested and acquired by the Tata Group in 2001. He was then elevated to MD & CEO in 2003. In North America, Ramanan guided CMC Americas, as Chairman, and has also served on board of Tata Business Support Services Limited (TBSSL) as Director. Presently, he is a key board member in the New Zealand Trade & Enterprise (NZTE) Beachheads Advisory Panel. Since 2004, he has been a mentor for various Tata group companies, giving shape to their pursuit of their journey towards Business Excellence. Shri Ramanan was conferred with the prestigious title “CEO of the Year – 2015” by CMO Asia in a glittering ceremony held in Singapore. He was also featured as one of India’s most “Value”able CEOs by Businessworld in 2011 and 2013, assessed on the basis of consistent value imparted to its stakeholders over a period of three years. He was the only CEO to be featured among the Top 9 most “Value”able CEOs twice for the same title. His other eminent industry recognitions include prestigious national awards like ‘Udyog Rattan Award’ in 2009 by Institute of Economic Studies, ‘Indira Gandhi Sadbhavna Award’ in 2006 and ‘Rajiv Gandhi Shiromani Award’ in 2006 for Outstanding Individual Achievements & Distinguished Services by National Integration & Economic Council. A prominent Hyderabad based media house honored his exemplary leadership for ‘Outstanding performance in mid-sized IT sector’ in 2012. Ramanan was recently recognised by Financial Times and Citi for CMC’s outstanding contribution in innovations related to Urban Ingenuity with community impact in Asia.



**Dr. Jagannath Raju** is currently a Chief Technical Officer at Systemantics where he is responsible for the company’s product development and technology strategy. He incubates product ideas based on market requirements and leads their development into full-fledged products. His consulting experience in the USA covers development of innovative robotic systems for space, underwater and hazardous applications for projects funded by NASA, Federal Sea Grant Program, Department of Energy and the National Science Foundation. He also served as a consultant in the Boston area to many companies involved in robotics and automation R&D, especially in semiconductor fabrication and handling, and was a visiting scientist at the Mechanical Engineering Laboratory, Tsukuba, Japan under a fellowship from Japan’s Ministry of International Trade and Industry. After repatriating back to India in 1993 he worked as a consultant to the Center for Artificial Intelligence and Robotics, Bangalore for the development of a controller for a robotic inspection platform. His expertise covers many areas of technology relevant to robotic systems, viz., mechanical design, actuator and sensors, computer control, signal and power electronics and embedded and application software. Jagannath is a B Tech from the Indian Institute of Technology, Madras, and holds a master’s degree from the University of California, Berkeley, CA, USA, and master’s & doctoral degrees from Massachusetts Institute of Technology, Cambridge, MA, USA.



Dr. T.V. Ramachandra, FIE, FIEE (UK) obtained Ph.D. in Ecology and Energy from Indian Institute of Science. At present, Coordinator of Energy and Wetlands Research Group (EWRG), Convener of Environmental Information System (ENVIS) at Centre for Ecological Sciences (CES). During the past twenty years he has established an active school of research in the area of energy and environment. Details of the research and publications are archived at (<http://ces.iisc.ernet.in/energy>). As per Google Scholar, he has about 6000+ citations with an h-index of 36 and i10 index of 120.



**Mr. Anurag Asati** is a co-founder of a start-up called [www.thekabadiwala.com](http://www.thekabadiwala.com) which focuses on various waste management activities like collection, segregation and recycling of urban solid waste. Prior to this, he obtained his Bachelor’s degree in Information Technology from Rajiv Gandhi Prodyogiki Vishwavidyalaya, Bhopal, Madhya Pradesh and worked as a database administration consultant for about two years. He has been widely covered in the print as well as electronic media for his work in this area. His aim is to organize the waste management sector by providing Hi-Tec Services to the end users and spread awareness amongst people that “nothing is waste until you intentionally make it so”.



**Prof. Subir Kumar Saha**, a 1983 mechanical engineering graduate from the RE College (Now NIT), Durgapur, India, completed his M. Tech from IIT Kharagpur, India, and Ph. D from McGill University, Canada. Upon completion of his Ph. D, he joined Toshiba Corporation's R&D Center in Japan. After 4-years of work experience in Japan, he has been with IIT Delhi since 1996. He is actively engaged in teaching, research, and technology over last three decades. He established the Mechatronics Laboratory at IIT Delhi in 2001. As recognition of his international contributions, Prof. Saha was awarded the Humboldt Fellowship in 1999 by the AvH Foundation, Germany, and the Naren Gupta Chair Professorship at IIT Delhi in 2010. He has been also a visiting faculty in Canada, Australia, and Italy. He has more than 175 research publications in reputed journals/conference proceedings and several books to his credit. He has delivered more than 150 invited/keynote lectures in India and abroad. His special interests are: 1) innovative research by converting rural problems into research topics, which he pursues through a lecture series called MuDRA or Multibody Dynamics for Rural Applications (delivered 35 times since 2007) and his book on Multibody Systems; 2) an innovative teaching methodology, which is pursued through another lecture series called RoCK-BEE or Robotic Competition Based Education in Engineering (delivered 48 times since 2007) and a book on the same name published by [www.pothi.com](http://www.pothi.com).



**Prof. Sudipto Mukherjee** is a VOLVO Chair Professor of Design and Manufacturing in the department of mechanical engineering at IIT Delhi. He obtained his B. Tech. In ME from IIT Kanpur followed by MS and PhD from Ohio State University, USA. He has over two decades of teaching and research experience during which he has co-authored about 200+ publications and several patents. **He** has to his credit several innovative concepts like the Massively Parallel Binary System, Foldable shipping container (patented in India, China and International application through PCT) AGTRAM for the Delhi Traffic Police (patented and ToT), Design of torque limiting bolt (Patented and ToT to SIP Houston, USA) and the Crossing. The moving elements he designed for the CROSSING exhibition for Xerox PARC show the convergence of technology, aesthetics and art. He is a fellow of Institute of Engineers and a member of several professional bodies including Indian National Academy of Engineers (INAE).