

# ROSE 2013

## 2013 IEEE INTERNATIONAL SYMPOSIUM ON Robotic and Sensors Environments

PROCEEDINGS

WELCOME  
MESSAGE

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PAPERS

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October 21-23, 2013

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**2013 IEEE International Symposium on Robotic and Sensors Environments  
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## WELCOME MESSAGE FROM THE CHAIRPERSONS

On behalf of the organizing committee, it is our pleasure to welcome all participants to the 2013 IEEE International Symposium on Robotic and Sensors Environments (ROSE), being held at The George Washington University, at the heart of the United States capital, Washington, DC, on October 21-23, 2013. The IEEE ROSE Symposium is sponsored by the Institute of Electrical and Electronic Engineers (IEEE) Instrumentation and Measurement Society (IMS). It is organized in collaboration with the IMS' TC-15 Virtual Systems in Measurements, TC-22 Intelligent Measurement Systems, TC-27 Human-Computer Interface and Interaction, TC-28 Instrumentation for Robotics and Automation, and TC-30 Security and Contraband Detection technical committees.

ROSE 2013 is the 11<sup>th</sup> edition of this international technical meeting. Following a series of successful events that took place in Sweden, Austria, Canada, Italy, and Germany, this year the symposium returns to the USA after its last visit to Phoenix, AZ, in 2010.

ROSE Symposium addresses all aspects of sensing systems and technologies for robotics and industrial automation, as well as their impact on autonomous robotic and intelligent systems development and applications. This year again, ROSE will expand over three consecutive days with all authors having the opportunity to present their work orally and initiate constructive exchanges with colleagues coming from all around the world. ROSE 2013 will also feature an invited talk, and provide the participants with an opportunity to tour some robotic research laboratories at The George Washington University.

This year, the ROSE 2013 technical program committee received over 58 full-paper submissions originating from 23 different countries. All submitted manuscripts went through a thorough peer-review process. 38 papers presenting contributions of high quality have been selected for publication. The accepted papers span all relevant areas including intelligent sensing and new sensor technologies, distributed sensors, robot vision and imaging, pose estimation and localization, collaborative robotics, human-robot interaction, path planning, manipulation, robot control systems, and robot design. The three-day program is fully loaded with presentations and discussions that demonstrate the great diversity of topics that are relevant to applications of sensing and robotics, and that concentrate around a growing area of interest for a very large number of researchers.

The organizing committee wants to emphasize and acknowledge the efforts of numerous contributors to the success of the IEEE ROSE series, especially to the technical program committee members who, year after year, volunteer their time to carefully review the manuscripts and provide constructive comments to authors. Special thanks also go to the local organizers at The George Washington University, as well as to their institution who kindly accepted to host the conference this year. Our appreciation also goes to the IEEE Instrumentation and Measurement Society who repeatedly provides its support and sponsorship to the ROSE conference series, from the very beginning of the adventure, and to Kimberly Milne from Conference Catalysts for her energetic and rigorous assistance to the organization.

Finally, thank you also to all authors and participants who submitted manuscripts of an excellent quality to ROSE this year again, and directly contribute to the success of this conference.

We wish all participants a fruitful experience, and we hope you enjoy the rich history and pleasant atmosphere of Washington, DC.

Welcome to ROSE 2013!

### **2013 ROSE General Chair**

Dr. Pinhas Ben-Tzvi (The George Washington University, USA)

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## KEYNOTE SPEAKER

Satyandra K. Gupta  
Maryland Robotics Center  
University of Maryland, College Park and  
Division of Information and Intelligent Systems  
National Science Foundation

**Title:** Physics-Aware Planning for Autonomous Robots

**Abstract:** Autonomous operations require robots to be able to automatically generate plans. Physically challenging environments require robots to be able to negotiate around dynamically moving objects, cope with significant uncertainties in the outcome of action execution, sensor limitations, and the presence of intelligent adversaries. This talk will cover the following four topics. First, I will describe a planning architecture that integrates task planning, behavior selection, and trajectory planning in a seamless manner to successfully handle physically challenging environments. This approach provides the right balance between deliberative and reactive planning during the execution of complex tasks in a dynamic uncertain environment. Second, I will describe our work in the area of physically accurate computationally efficient simulations to enable physics-aware planning. Third, I will describe computational synthesis techniques for automatically generating sophisticated reactive behaviors. This synthesis approach automatically generates an initial version of an action selection policy and then gradually refines it by detecting and fixing its shortcomings. The following two applications will be used to illustrate the approach: (1) guarding of a valuable asset by autonomous unmanned sea surface vehicles and (2) assembly of micro particles in a fluidic medium using holographic optical tweezers.



**Speaker Biography:** Dr. Satyandra K. Gupta is a Professor in the Mechanical Engineering Department and the Institute for Systems Research at the University of Maryland, College Park. He was the founding director of the Maryland Robotics Center. Prior to joining the University of Maryland, he was a Research Scientist in the Robotics Institute at Carnegie Mellon University. Currently, he is on an IPA assignment at National Science Foundation and serving as a program director in the Division of Information and Intelligent Systems. He manages robotics programs.

Dr. Gupta's interest is broadly in the area of automation. He is specifically interested in automation problems arising in Engineering Design, Manufacturing, and Robotics. His current research focus is mainly on simulation-based computational synthesis and automated planning. He is a fellow of the American Society of Mechanical Engineers (ASME). He has served as an Associate Editor for IEEE Transactions on Automation Science and Engineering, ASME Journal of Computing and Information Science in Engineering, and SME Journal of Manufacturing Processes.

Dr. Gupta has received several honors and awards for his research contributions. Representative examples include: a Young Investigator Award from the Office of Naval Research in 2000, a Robert W. Galvin Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers in 2001, a CAREER Award from the National Science Foundation in 2001, a Presidential Early Career Award for Scientists and Engineers (PECASE) in 2001, Invention of the Year Award in Physical Science category at the University of Maryland in 2007, Kos Ishii-Toshiba Award from ASME Design for Manufacturing and the Life Cycle Committee in 2011, and Excellence in Research Award from ASME Computers and Information in Engineering Division in 2013. He has also received six best paper awards at conferences and 2012 Most Cited Paper Award from Computer Aided Design Journal.