Next-Generation Robots and Systems

Dan O. Popa
Muthu B. J. Wijesundara
Editors

8 May 2014
Baltimore, Maryland, United States

Sponsored and Published by
SPIE
### Contents

<table>
<thead>
<tr>
<th>Session</th>
<th>Topic</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SESSION 1</strong> SENSORS FOR NEXT-GENERATION ROBOTICS I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9116 02</td>
<td>A haptic sensing upgrade for the current EOD robotic fleet (Invited Paper) [9116-1]</td>
<td>P. Rowe, RE2, Inc. (United States)</td>
</tr>
<tr>
<td>9116 03</td>
<td>Tactile MEMS-based sensor for delicate microsurgery [9116-2]</td>
<td>Y. S. Park, Argonne National Lab. (United States); W. Lee, The Univ. of Texas at Arlington (United States); N. Gopalsami, Argonne National Lab. (United States); M. Gundeti, The Univ. of Chicago Medical Ctr. (United States)</td>
</tr>
<tr>
<td>9116 04</td>
<td>Tactile sensing and compliance in MicroStressBot assemblies [9116-3]</td>
<td>R. Majumdar, V. Foroutan, I. Paprotny, Univ. of Illinois at Chicago (United States)</td>
</tr>
<tr>
<td>9116 05</td>
<td>Haptic exploration of fingertip-sized geometric features using a multimodal tactile sensor [9116-4]</td>
<td>R. D. Ponce Wong, R. B. Hellman, V. J. Santos, Arizona State Univ. (United States)</td>
</tr>
<tr>
<td><strong>SESSION 2</strong> SENSORS FOR NEXT-GENERATION ROBOTICS II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9116 07</td>
<td>Conformal grasping using feedback controlled bubble actuator array [9116-6]</td>
<td>W. Carrigan, R. Stein, M. Mittal, M. B. J. Wijesundara, The Univ. of Texas at Arlington Research Institute (United States)</td>
</tr>
<tr>
<td>9116 08</td>
<td>Development and characterization of a new silicone/platine based 2-DoF sensorized end-effector for micromanipulators [9116-7]</td>
<td>X. Xu, J. Agnus, M. Rakotondrabe, FEMTO-ST Institute, CNRS, Univ. de Franche-Comté (France)</td>
</tr>
<tr>
<td>9116 09</td>
<td>A multidirectional capacitive proximity sensor array [9116-8]</td>
<td>J. Long, Mitsubishi Electric Research Labs. (United States) and Univ. of California, San Diego (United States); B. Wang, Mitsubishi Electric Research Labs. (United States)</td>
</tr>
<tr>
<td><strong>SESSION 3</strong> SENSORS FOR NEXT-GENERATION ROBOTICS III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9116 0A</td>
<td>Needs and emerging trends of remote sensing [9116-9]</td>
<td>M. McNair, The Univ. of Texas at Arlington (United States)</td>
</tr>
</tbody>
</table>
Toward controlling perturbations in robotic sensor networks [9116-10]
A. G. Banerjee, S. R. Majumder, General Electric Global Research (United States)

Advanced THz sensor array for precise position and material properties recognition [9116-11]
A. Sešek, J. Trontelj, Univ. of Ljubljana (Slovenia); A. Švigelj, Letrika Lab. d.o.o (Slovenia)

Sensor selection for outdoor air quality monitoring [9116-12]
K. L. Dorsey, J. R. Herr, Univ. of California, Berkeley (United States); A. P. Pisano, Univ. of California, San Diego (United States)

SESSION 4 SENSORS FOR NEXT-GENERATION ROBOTICS IV

EHD as sensor fabrication technology for robotic skins [9116-14]
J. Shin, W. H. Lee, C. P. Nothnagle, M. B. J. Wijesundara, The Univ. of Texas at Arlington Research Institute (United States)

Grip pressure measurements during activities of daily life [9116-20]
J. Sanford, The Univ. of Texas at Arlington (United States); C. Young, Univ. of North Texas Health Science Ctr. at Fort Worth (United States); D. Popa, The Univ. of Texas at Arlington (United States); N. Bugnariu, R. Patterson, Univ. of North Texas Health Science Ctr. at Fort Worth (United States)

Author Index
Conference Committee

Symposium Chair

David A. Whelan, Boeing Defense, Space, and Security (United States)

Symposium Co-chair

Wolfgang Schade, Technische Universität Clausthal (Germany) and Fraunhofer Heinrich-Hertz-Institut (Germany)

Conference Chairs

Dan O. Popa, The University of Texas at Arlington (United States)
Muthu B. J. Wijesundara, The University of Texas at Arlington Research Institute (United States)

Conference Program Committee

Rakesh Murthy, Jet Propulsion Laboratory (United States)
Andrew J. Tickle, Coventry University (United Kingdom)
Introduction

2014 saw the debut of a new emerging technologies conference dedicated to Sensors for Next Generation Robotics. We envisioned our conference as a meeting forum for engineers and scientists, from academia, industry, and national labs, focusing on emerging sensors and their applications for robotics. Since every robot is equipped with sensors, we hope to bring to the forefront unique challenges of sensor fabrication, integration, information processing, control, and usability for robotics.

Due to the proliferation of mass-produced, miniaturized sensors, it is now possible to envision massively distributed sensors being used to enhance perception, cognition, and control capabilities of next generation robots. In fact, applications where new, more intelligent robots are needed cut across all dimensional scales and industrial sectors. Examples include assisted living environments, search and rescue in disaster areas, neural surgery and prosthetics, nanomanufacturing, self-driving vehicles, human-friendly industrial assembly and smart material handling, and so on. One exciting next generation application is endowing humanoid robots with perception comparable with those of humans, including distributed touch through robotic skin, hearing, and vision, but also super-human perception, such as the ability to see in the dark. Using off-the-shelf sensors that have not been designed specifically for robotics is fraught with additional challenges that must be mitigated by consideration of power, weight, and interconnection to the robot early on in the design process.

This conference focuses on new sensors and sensor arrays for robotics and autonomous vehicles, new form factors, and packaging schemes to help integrate robots and sensors, new applications of robots enabled by increased perception capabilities, and challenges in sensor fusion, networking, and control brought about by massive amounts of sensor data available to the robot. Technical scientific papers related to robot sensors that push beyond the state-of-the-art in industry are solicited. New robotics applications reflecting the state of the art in industry, including those with dual uses (military-defense and commercial-industrial) are also welcome.

In 2014, the conference had 14 submitted papers and 15 presentations organized in 4 sessions, including: 1) Haptics and Tactile Sensing, 2) Sensor Arrays and Interaction Control, 3) Remote Sensing and Sensor Networks, and 4) Sensor Fabrication and Evaluation. We envision that the number of papers and attendance at our conference will increase in future years, as robots become more ubiquitous in our daily lives. We look forward to your participation in 2015!

Dan O. Popa
Muthu B. J. Wijesundara