



ICRA2017

May 29 – June 3, 2017 • Singapore



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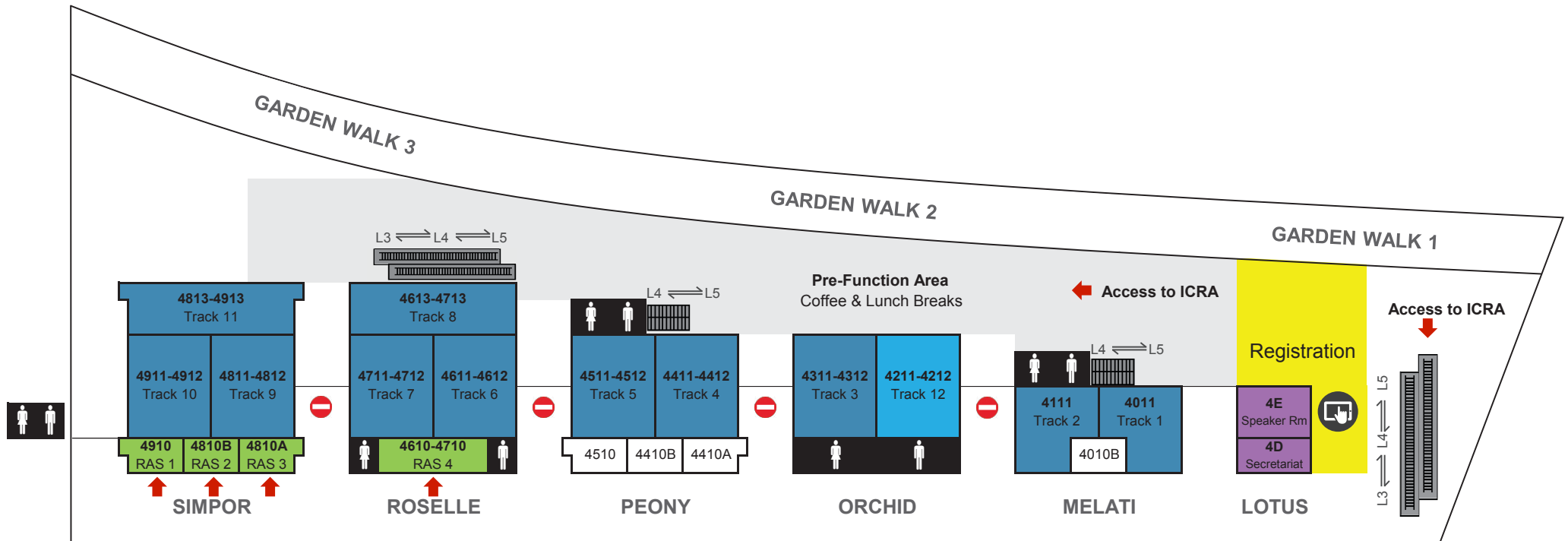
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LEVEL 4



Accurate as of May 19, 2017 and subject to changes



Technical Sessions
Workshops/Tutorials



Secretariat
Speaker room



ICRA Tablet
Helpdesk

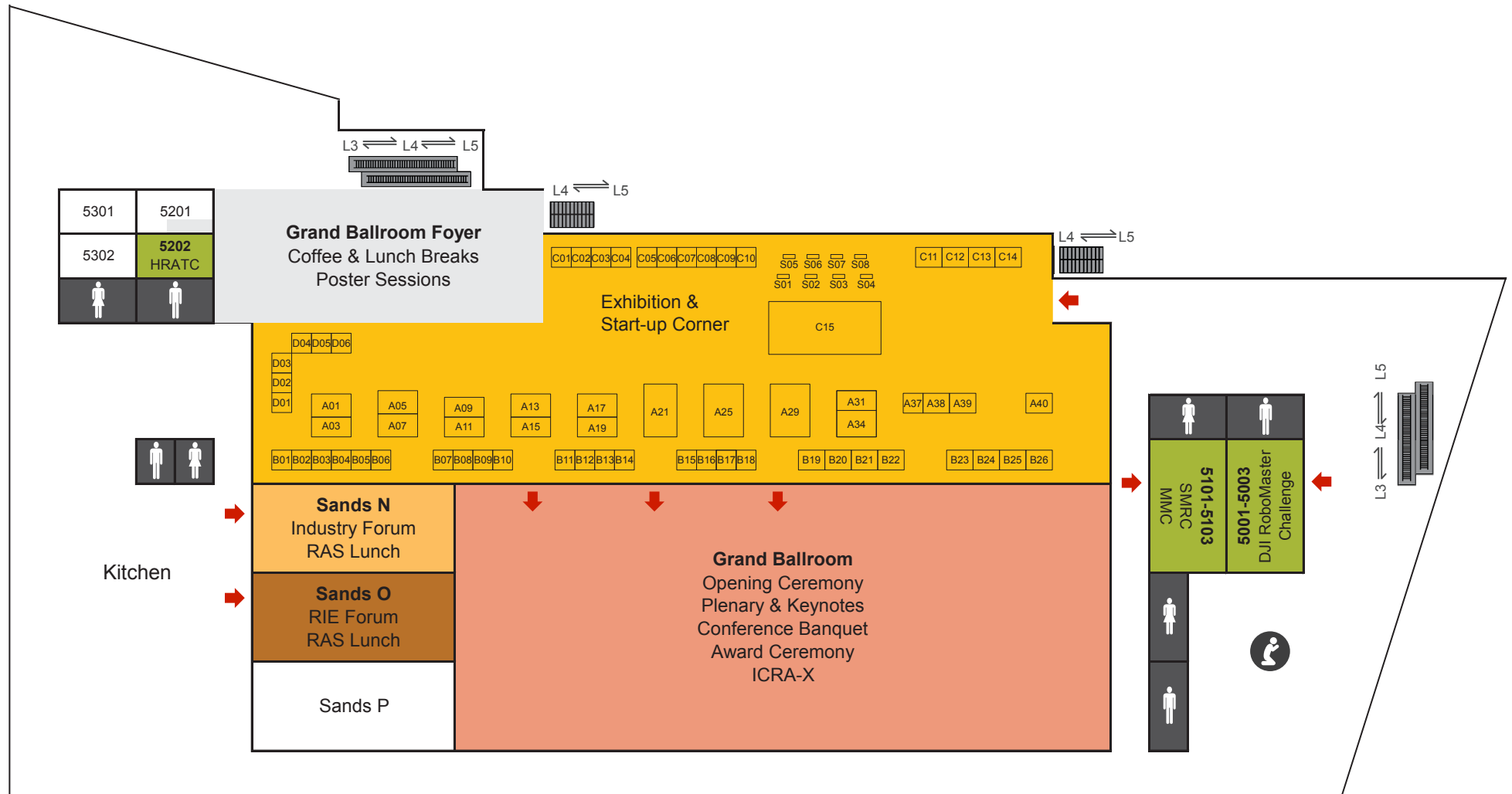


4211-4212
Special Sessions
Forums (Government / ASEAN / Ethics)
RAS Townhall Meeting



RAS Meetings

LEVEL 5



Accurate as of May 19, 2017 and subject to changes



Robot Challenges



Prayer Room

WORKSHOPS/TUTORIALS

MONDAY - May 29, 2017

Half-Day Tutorial 1	Full-Day Workshop 2	Full-Day Workshop 3	Full-Day Workshop 4	Full-Day Workshop 5	Full-Day Workshop 6	Full-Day Workshop 7	Full-Day Workshop 8	Full-Day Workshop 9	Full-Day Workshop 10	Full-Day Workshop 11	Full-Day Workshop 12
08:30-12:00 Rm. 4011 Tutorial MoTA1	08:30-17:00 Rm. 4111 Full-Day Workshop MoW2	08:30-17:00 Rm. 4311/4312 Full-Day Workshop MoW3	08:30-17:00 Rm. 4411/4412 Full-Day Workshop MoW4	08:30-17:00 Rm. 4511/4512 Full-Day Workshop MoW5	08:30-17:00 Rm. 4611/4612 Full-Day Workshop MoW6	08:30-17:00 Rm. 4711/4712 Full-Day Workshop MoW7	08:30-17:00 Rm. 4613/4713 Full-Day Workshop MoW8	08:30-17:00 Rm. 4811/4812 Full-Day Workshop MoW9	08:30-17:00 Rm. 4911/4912 Full-Day Workshop MoW10	08:30-17:00 Rm. 4813/4913 Full-Day Workshop MoW11	08:30-17:00 Rm. 4211/4212 Full-Day Workshop MoW12
Tutorial on AI Planning for Robotics	Advances and Challenges on the Development, Testing and Assessment of Assistive and Rehabilitation Robots: Experiences from Engineering and Human Science Research	Robust Perception, Planning, and Control for Legged Robot Locomotion in Challenging Domains	Sensor-Based Object Manipulation for Collaborative Assembly	Warehouse Picking Automation Workshop 2017: Solutions, Experience, Learnings and Outlook of the Amazon Picking Challenge	Advanced Fabrication and Morphological Computation for Soft Robotics	Autonomous Structural Monitoring and Maintenance Using Aerial Robots	The Robotic Sense of Touch: From Sensing to Understanding	Recent Advances in Dynamics for Industrial Applications	AI Planning & Robotics: Challenges and Methods	Mechanics of Human Locomotion and the Development of Wearable Robotic Systems	Reproducible Research in Robotics: Current Status and Road Ahead
13:30-17:00 Rm. 4011 Tutorial MoT1											
Buzz: A Programming Language for Multi-Robot Systems											

18:30-22:00 | Flower Field Hall, Gardens-by-the Bay • MoWR • **Welcome Reception**

FRIDAY - June 2, 2017

Half-Day Tutorial 1	Full-Day Workshop 2	Full-Day Workshop 3	Full-Day Workshop 4	Full-Day Workshop 5	Full-Day Workshop 6	Full-Day Workshop 7	Full-Day Workshop 8	Full-Day Workshop 9	Full-Day Workshop 10	Full-Day Workshop 11	Full-Day Workshop 12
08:30-17:00 Rm. 4011 Full-Day Workshop FrW1	08:30-17:00 Rm. 4111 Full-Day Workshop FrW2	08:30-17:00 Rm. 4311/4312 Full-Day Workshop FrW3	08:30-17:00 Rm. 4411/4412 Full-Day Workshop FrW4	08:30-17:00 Rm. 4511/4512 Full-Day Workshop FrW5	08:30-17:00 Rm. 4611/4612 Full-Day Workshop FrW6	08:30-17:00 Rm. 4711/4712 Full-Day Workshop FrW7	08:30-17:00 Rm. 4613/4713 Full-Day Workshop FrW8	08:30-17:00 Rm. 4811/4812 Full-Day Workshop FrW9	08:30-17:00 Rm. 4911/4912 Full-Day Workshop FrW10	08:30-17:00 Rm. 4813/4913 Full-Day Workshop FrW11	08:30-17:00 Rm. 4211/4212 Full-Day Workshop FrW12
Human Multi-Robot Systems Interaction	Biohybrid Machine by Small-Scale Robotics and Systems	Learning and Control for Autonomous Manipulation Systems: The Role of Dimensionality Reduction	Disaster Response Robots: Design Principles and Control for Effective Mobility and Manipulation	Assistive Robotics: From the Natural to the Artificial and Back Again	Innovative Haptic Interfaces Emerging from Soft Robotics	Multi-Robot Perception-Driven Control and Planning	Event-Based Vision	AI in Automation	C4 Surgical Robots: Compliant, Continuum, Cognitive, and Collaborative	Robotics and Vehicular Technologies for Self-Driving Cars	IC3 – Industry of the Future: Collaborative, Connected, Cognitive. Novel Approaches Stemming from Factory of the Future & Industry 4.0 Initiatives

TUESDAY - May 30, 2017

08:00-08:45 | Grand ballroom • Opening TUOR • **Opening Ceremony**

08:45-09:45 | Grand ballroom • Plenary Session TUPL • **Modeling the Possibilities: From the Chalkboard to the Race Track to the World Beyond - J Christian Gerdes (Stanford University, USA)**

Track 1	Track 2	Track 3	Track 4	Track 5	Track 6	Track 7	Track 8	Track 9	Track 10	Track 11	Track 12	Forum 1	Forum 2
09:55-11:10 Rm. 4011 Regular Session TUA1	09:55-11:10 Rm. 4111 Regular Session TUA2	09:55-11:10 Rm. 4311/4312 Regular Session TUA3	09:55-11:10 Rm. 4411/4412 Regular Session TUA4	09:55-11:10 Rm. 4511/4512 Regular Session TUA5	09:55-11:10 Rm. 4611/4612 Regular Session TUA6	09:55-11:10 Rm. 4711/4712 Regular Session TUA7	09:55-11:10 Rm. 4613/4713 Regular Session TUA8	09:55-11:10 Rm. 4811/4812 Regular Session TUA9	09:55-11:10 Rm. 4911/4912 Regular Session TUA10	09:55-11:10 Rm. 4813/4913 Regular Session TUA11	09:55-11:10 Rm. 4211/4212 Invited Presentation TUA12	09:55-11:10 Sands N Forum TUA13	09:55-11:10 Sands O Forum TUA14
Actuators 1	Optimization and Optimal Control	Computer Vision 1	ITS Perception & Planning	Multi-Robot Systems 1	Learning and Adaptive Systems 1	Force and Tactile Sensing 1	Haptics and Haptic Interfaces	TRO Session - Perception and Planning	Rehabilitation Robotics	Intelligent and Flexible Automation	Special Session - Intelligent Manufacturing and Automation	Industry Forum 1	Robotics Innovation & Entrepreneurship Forum 1

11:10-11:30 | TUAM_Coffee_Break

11:30-12:45 Rm. 4011 Regular Session TUB1	11:30-12:45 Rm. 4111 Regular Session TUB2	11:30-12:45 Rm. 4311/4312 Regular Session TUB3	11:30-12:45 Rm. 4411/4412 Regular Session TUB4	11:30-12:45 Rm. 4511/4512 Regular Session TUB5	11:30-12:45 Rm. 4611/4612 Regular Session TUB6	11:30-12:45 Rm. 4711/4712 Regular Session TUB7	11:30-12:45 Rm. 4613/4713 Regular Session TUB8	11:30-12:45 Rm. 4811/4812 Regular Session TUB9	11:30-12:45 Rm. 4911/4912 Regular Session TUB10	11:30-12:45 Rm. 4813/4913 Regular Session TUB11	11:30-12:45 Rm. 4211/4212 Invited Presentation TUB12	11:30-12:45 Sands N Forum TUB13	11:30-12:45 Sands O Forum TUB14
Actuators 2	Motion Planning and Optimization	Computer Vision 2	Autonomous Agent	Multi-Robot Systems 2	Learning and Adaptive Systems 2	Force and Tactile Sensing 2	Human-Robot Interaction 1	Multilegged Robots	Medical Robots and Systems 1	Design and Manufacturing	Special Session - Medical and Micro Robotics	Industry Forum 2	Robotics Innovation & Entrepreneurship Forum 2

12:45-13:45 | TULunch_Break

13:45-14:15 | Grand ballroom • Keynote session TUKAN • **EndoMaster: A Surgical Robot's Journey from the Research Lab to the Operating Theatre - Louis Phee (Nanyang Technological University, Singapore)**

14:15-14:45 | Grand ballroom • Keynote session TUKBN • **Capturing Vivid 3D Models of the World from Video - Lourdes Agapito (University College London, UK)**

14:45-16:00 Rm. 4011 Regular Session TUC1	14:45-16:00 Rm. 4111 Regular Session TUC2	14:45-16:00 Rm. 4311/4312 Regular Session TUC3	14:45-16:00 Rm. 4411/4412 Regular Session TUC4	14:45-16:00 Rm. 4511/4512 Regular Session TUC5	14:45-16:00 Rm. 4611/4612 Regular Session TUC6	14:45-16:00 Rm. 4711/4712 Regular Session TUC7	14:45-16:00 Rm. 4613/4713 Regular Session TUC8	14:45-16:00 Rm. 4811/4812 Regular Session TUC9	14:45-16:00 Rm. 4911/4912 Regular Session TUC10	14:45-16:00 Rm. 4813/4913 Regular Session TUC11	14:45-16:00 Rm. 4211/4212 Invited Presentation TUC12	14:45-16:00 Sands N Forum TUC13	14:45-16:00 Sands O Forum TUC14
Actuators 3	Planning	Computer Vision 3	Autonomous Vehicle	Distributed Robot Systems 1	Learning and Adaptive Systems 3	Grasping 1	Human-Robot Interaction 2	Best Conference Paper Award	Medical Robots and Systems 2 Rehabilitation Robotics	Industrial Robots	Special Session - Human Centric Robotics	Industry Forum 3	Robotics Innovation & Entrepreneurship Forum 3

16:00-16:25 | TUPM_Coffee_Break

16:25-17:40 Rm. 4011 Regular Session TUD1	16:25-17:40 Rm. 4111 Regular Session TUD2	16:25-17:40 Rm. 4311/4312 Regular Session TUD3	16:25-17:40 Rm. 4411/4412 Regular Session TUD4	16:25-17:40 Rm. 4511/4512 Regular Session TUD5	16:25-17:40 Rm. 4611/4612 Regular Session TUD6	16:25-17:40 Rm. 4711/4712 Regular Session TUD7	16:25-17:40 Rm. 4613/4713 Regular Session TUD8	16:25-17:40 Rm. 4811/4812 Regular Session TUD9	16:25-17:40 Rm. 4911/4912 Regular Session TUD10	16:25-17:40 Rm. 4813/4913 Regular Session TUD11	16:25-17:40 Rm. 4211/4212 Invited Presentation TUD12	16:25-17:40 Sands N Forum TUD13	16:25-17:40 Sands O Forum TUD14
Actuators 4	Collision Avoidance	Computer Vision 4	Visual-Based Navigation	Distributed Robot Systems 2	Learning and Adaptive Systems 4	Grasping 2	Human-Robot Interaction 3	Best Student Paper Award	Medical Robots and Systems 3 Rehabilitation Robotics	Wheeled Robots	Special Session - Advanced Robot Design	Industry Forum 4	Robotics Innovation & Entrepreneurship Forum 4

WEDNESDAY - May 31, 2017

08:20-09:20 | Grand ballroom • Plenary Session WePL • **Nobel Turing Challenge: Grand Challenge of AI, Robotics, and Systems Biology - Hiroaki Kitano (Sony Computer Science Laboratories, Inc., Japan)**

Track 1	Track 2	Track 3	Track 4	Track 5	Track 6	Track 7	Track 8	Track 9	Track 10	Track 11	Forum 1	Forum 2	Forum 3
09:30-10:45 Rm. 4011 Regular Session WeA1	09:30-10:45 Rm. 4111 Regular Session WeA2	09:30-10:45 Rm. 4311/4312 Regular Session WeA3	09:30-10:45 Rm. 4411/4412 Regular Session WeA4	09:30-10:45 Rm. 4511/4512 Regular Session WeA5	09:30-10:45 Rm. 4611/4612 Regular Session WeA6	09:30-10:45 Rm. 4711/4712 Regular Session WeA7	09:30-10:45 Rm. 4613/4713 Regular Session WeA8	09:30-10:45 Rm. 4811/4812 Regular Session WeA9	09:30-10:45 Rm. 4911/4912 Regular Session WeA10	09:30-10:45 Rm. 4813/4913 Regular Session WeA11	09:30-10:45 Rm. 4211/4212 Forum WeA12	09:30-10:45 Sands N Forum WeA13	09:30-10:45 Sands O Forum WeA14
Kinematics and Dynamics	Mapping 1	Visual Learning	Sensor and Robotic Networks	Aerial Robot 1	Cognitive Robotics	Grippers and Other End- Effectors	Physical Human-Robot Interaction	TRO Session - Actuation, Locomotion, Grasping	Medical Robots and Systems 4	Automation	Government Forum 1	Industry Forum 5	Robotics Innovation & Entrepre- neurship Forum 5

10:45-11:05 | WeAM_Coffee_Break

11:05-12:20 Rm. 4011 Regular Session WeB1	11:05-12:20 Rm. 4111 Regular Session WeB2	11:05-12:20 Rm. 4311/4312 Regular Session WeB3	11:05-12:20 Rm. 4411/4412 Regular Session WeB4	11:05-12:20 Rm. 4511/4512 Regular Session WeB5	11:05-12:20 Rm. 4611/4612 Regular Session WeB6	11:05-12:20 Rm. 4711/4712 Regular Session WeB7	11:05-12:20 Rm. 4613/4713 Regular Session WeB8	11:05-12:20 Rm. 4811/4812 Regular Session WeB9	11:05-12:20 Rm. 4911/4912 Regular Session WeB10	11:05-12:20 Rm. 4813/4913 Regular Session WeB11	11:05-12:20 Rm. 4211/4212 Forum WeB12	11:05-12:20 Sands N Forum WeB13	11:05-12:20 Sands O Forum WeB14
Compliance	Mapping 2	Visual Localization	Sensor Fusion and Control	Aerial Robot 2	Policy Search	Robotic Manipulation	Humanoid Robots 1	Biologically- Inspired Robots 1	Medical Robots and Systems 5	Service Robotics 1	Government Forum 2	Industry Forum 6	Robotics Innovation & Entrepreur- ship Forum 6

12:30-13:00 | Grand ballroom • Keynote session WeKAN • **Industry 4.0: Automation and Robotics - Peter Luh (University of Connecticut, US)**

13:00-13:30 | Grand ballroom • Keynote session WeKBN • **Research at the Intersection between Robots and Play: Designing Robots for Children's Healthcare - Ayanna Howard (Georgia Tech, USA)**

13:30-14:30 | WeLunch_Break

14:30-15:45 Rm. 4011 Regular Session WeC1	14:30-15:45 Rm. 4111 Regular Session WeC2	14:30-15:45 Rm. 4311/4312 Regular Session WeC3	14:30-15:45 Rm. 4411/4412 Regular Session WeC4	14:30-15:45 Rm. 4511/4512 Regular Session WeC5	14:30-15:45 Rm. 4611/4612 Regular Session WeC6	14:30-15:45 Rm. 4711/4712 Regular Session WeC7	14:30-15:45 Rm. 4613/4713 Regular Session WeC8	14:30-15:45 Rm. 4811/4812 Regular Session WeC9	14:30-15:45 Rm. 4911/4912 Regular Session WeC10	14:30-15:45 Rm. 4813/4913 Regular Session WeC11	14:30-15:45 Rm. 4211/4212 Forum WeC12		
Tendon/Wire Robotics	Motion and Path Planning 1	Visual Servoing	Slam 1	Aerial Robot 3	RGB-D Perception	Manipulation Planning 1	Humanoid Robots 2	Biologically- Inspired Robots 2	Surgical Robotics 1	Service Robotics 2	Government Forum 3		

15:45-16:05 | WePM_Coffee_Break

16:05-17:20 Rm. 4011 Regular Session WeD1	16:05-17:20 Rm. 4111 Regular Session WeD2	16:05-17:20 Rm. 4311/4312 Regular Session WeD3	16:05-17:20 Rm. 4411/4412 Regular Session WeD4	16:05-17:20 Rm. 4511/4512 Regular Session WeD5	16:05-17:20 Rm. 4611/4612 Regular Ses- sion WeD6	16:05-17:20 Rm. 4711/4712 Regular Session WeD7	16:05-17:20 Rm. 4613/4713 Regular Session WeD8	16:05-17:20 Rm. 4811/4812 Regular Session WeD9	16:05-17:20 Rm. 4911/4912 Regular Session WeD10	16:05-17:20 Rm. 4813/4913 Regular Session WeD11	16:05-17:20 Rm. 4211/4212 Forum WeD12		
Soft Robotics 1	Motion and Path Planning 2	Visual Tracking	Slam 2	Aerial Robot 4	Semantic Understanding	Manipulation Planning 2	Humanoid Robots 3	Biologically- Inspired Robots 3	Surgical Robotics 2	Marine Robotics	RAS Townhall Meeting		

18:30-21:45 | Grand Ballroom • WeBanquet • **Conference Banquet**

THURSDAY - June 1, 2017

08:20-09:20 | Grand ballroom • Plenary Session ThPL • **Framing the International Discussion on the Weaponization of Increasingly Autonomous Technologies - Kerstin Vignard (United Nations Institute for Disarmament Research)**

Track 1	Track 2	Track 3	Track 4	Track 5	Track 6	Track 7	Track 8	Track 9	Track 10	Track 11	Forum 1	Forum 2
09:30-10:45 Rm. 4011 Regular Session ThA1	09:30-10:45 Rm. 4111 Regular Session ThA2	09:30-10:45 Rm. 4311/4312 Regular Session ThA3	09:30-10:45 Rm. 4411/4412 Regular Session ThA4	09:30-10:45 Rm. 4511/4512 Regular Session ThA5	09:30-10:45 Rm. 4611/4612 Regular Session ThA6	09:30-10:45 Rm. 4711/4712 Regular Session ThA7	09:30-10:45 Rm. 4613/4713 Regular Session ThA8	09:30-10:45 Rm. 4811/4812 Regular Session ThA9	09:30-10:45 Rm. 4911/4912 Regular Session ThA10	09:30-10:45 Rm. 4813/4913 Regular Session ThA11	09:30-10:45 Rm. 4211/4212 Forum ThA12	09:30-10:45 Grand ballroom Forum ThA13
Soft Robotics 2	Motion and Path Planning 3	Vision and Range Sensing 1	Slam 3	Aerial Robot 5	Object Detection and Segmentation	Robot Motion Control	Telerobotics and Teleoperation	TRO Session - Multi-Modal Robot Design and Control	Biorobotics	Space Robotics	ASEAN & Emerging Country Forum 1	Public Forum 1 - ICRA-X

10:45-11:05 | ThAM_Coffee_Break

11:05-12:20 Rm. 4011 Regular Session ThB1	11:05-12:20 Rm. 4111 Regular Session ThB2	11:05-12:20 Rm. 4311/4312 Regular Session ThB3	11:05-12:20 Rm. 4411/4412 Regular Session ThB4	11:05-12:20 Rm. 4511/4512 Regular Session ThB5	11:05-12:20 Rm. 4611/4612 Regular Session ThB6	11:05-12:20 Rm. 4711/4712 Regular Session ThB7	11:05-12:20 Rm. 4613/4713 Regular Session ThB8	11:05-12:20 Rm. 4811/4812 Regular Session ThB9	11:05-12:20 Rm. 4911/4912 Regular Session ThB10	11:05-12:20 Rm. 4813/4913 Regular Session ThB11	11:05-12:20 Rm. 4211/4212 Forum ThB12	11:05-12:20 Grand ballroom Forum ThB13
Soft Robotics 3	Motion and Path Planning 4	Vision and Range Sensing 2	Slam 4	Aerial Robot 6	Failure Detection and Recovery	Robust and Adaptive Control	Human Factors 1	Micro/Nano Robots 1	Physically Assistive Devices	Parallel Robots	ASEAN & Emerging Country Forum 2	Public Forum 2 - ICRA-X

12:20-13:20 | ThLunch_Break

13:20-14:50 | Grand ballroom • Award session ThAwC • **Award Ceremony**

14:50-15:20 | Grand ballroom • Keynote session ThKAN • **An Operational Platform of Cloud Robotics - Bill Huang (Cloud Minds, China)**

15:20-15:50 | Grand ballroom • Keynote session ThKBN • **Model-Based Optimization for Humanoid and Wearable Robots - Katja Mombaur (University of Heidelberg, Germany)**

15:50-16:10 | ThPM_Coffee_Break

16:10-17:25 Rm. 4011 Regular Session ThC1	16:10-17:25 Rm. 4111 Regular Session ThC2	16:10-17:25 Rm. 4311/4312 Regular Session ThC3	16:10-17:25 Rm. 4411/4412 Regular Session ThC4	16:10-17:25 Rm. 4511/4512 Regular Session ThC5	16:10-17:25 Rm. 4611/4612 Regular Session ThC6	16:10-17:25 Rm. 4711/4712 Regular Session ThC7	16:10-17:25 Rm. 4613/4713 Regular Session ThC8	16:10-17:25 Rm. 4811/4812 Regular Session ThC9	16:10-17:25 Rm. 4911/4912 Regular Session ThC10	16:10-17:25 Rm. 4813/4913 Regular Session ThC11	16:10-17:25 Rm. 4211/4212 Forum ThC12	
Soft Robotics 4	Motion and Path Planning 5	Vision and Range Sensing 3	Slam 5	Aerial Robot 7	Probability and Statistical Methods	Calibration and Identification	Human Factors 2	Micro/Nano Robots 2	Prosthetics and Exoskeletons	Flexible Robots	Ethics Forum	

19:00-21:00 | Night Safari • ThFR • **Farewell Reception**

SPECIAL SESSIONS ON EMERGING ROBOTICS TECHNOLOGY

Supported by National Robotics Programme, Singapore

Venue: Room 4211/4212 (Level 4)

These special sessions will focus on novel and creative approaches in designing or developing robots for automation, medical or surgical tasks, and space exploratory missions.

TUESDAY - MAY 30, 2017	
0955 – 1110	SESSION 1 Intelligent Manufacturing and Automation Chair: Marcelo Ang , National University of Singapore, Singapore
0955 – 1020	Alternative Sensing and Perception based on Physical fields for Robotics and Automation Kok-Meng Lee , Georgia Institute of Technology, USA
1020 – 1045	Sampling-Based Motion Planning: Advances and Challenges Nancy Amato , Texas A&M University, USA
1045 – 1110	Robotic Machining: Challenges and Chances Han Ding , Huazhong University of Science & Technology, China
1110 – 1130	AM Break – L4 Pre-Function Area
1130 – 1245	SESSION 2 Medical and Micro Robotics Chair: Dong-Soo Kwon , Korea Advanced Institute of Science and Technology (KAIST), Korea
1130 – 1155	Recovery of Function in Major Spinal Cord Injury Using Spinal Stimulation and Assistive Robotics Joel Burdick , California Institute of Technology, USA
1155 – 1220	Micro Medical Robotics: Painless and Scarless Max Meng , The Chinese University of Hong Kong, China
1220 – 1245	Opportunities at the Bottom Bradley Nelson , Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland
1245 – 1345	Lunch – L4 Pre-Function Area

1445 – 1600	SESSION 3 Human Centric Robotics Chair: Jianwei Zhang , University of Hamburg, Germany
1445 – 1510	Ensuring Safety of Humans and Industrial Robots Sharing the Same Workspace Masayoshi Tomizuka , University of California, Berkeley, USA
1510 – 1535	Cognitive Sensing for Robotic Dexterous Operations Fuchun Sun , Tsinghua University, China
1535 – 1600	Bipedal Walking: A Pluridisciplinary Perspective Jean-Paul Laumond , LAAS-CNRS, France
1600 – 1625	PM Break – L4 Pre-Function Area
1625 – 1805	SESSION 4 Advanced Robot Design Chair: Ronald Lumia , University of New Mexico, USA
1625 – 1650	Ten Technologies That Will Change Robotics, and the World, Forever Gregory Chirikjian , Johns Hopkins University, USA
1650 – 1715	Design of Robotic Systems to Trace Specified Curves Michael McCarthy , University of California, Irvine, USA
1715 – 1740	Design and Application of Parallel-Parallel 6-Legged Robots Feng Gao , Shanghai Jiao Tong University, China
1740 – 1805	Robotic Technology Efforts at the NASA/Johnson Space Center Myron Diftler , NASA Johnson Space Center, USA

ROBOTICS INNOVATION & ENTREPRENEURSHIP (RIE) FORUM

Sponsored by SGInnovate

Venue: Sands O (Level 5, next to Grand Ballroom)

The RIE Forum aims to advance real-world innovations by connecting start-ups with industry leaders and participating investors:



TUESDAY - MAY 30, 2017	
0955 – 1115	SESSION 1 Autonomous Driving Chair: Jim Ostrowski , Blue River Technology, USA
0955 – 1010	Singapore's Vision for Autonomous Vehicle Deployment Chris Leck , Director of Futures Division, Ministry of Transport, Singapore
1010 – 1025	Cloud Robotics: Intelligent Machines in a Cloud-Connected World James Kuffner , CTO, Toyota Research Institute, USA
1025 – 1040	nuTonomy: Driving towards tomorrow Emilio Frazzoli , CTO, nuTonomy, Singapore
1040 – 1055	Start-ups: RobSense Technology, Movel AI, xenobot, ArtiSense
1055 – 1110	Q&A with Panel Discussion
1110 – 1130	AM Break – L5 Grand Ballroom Foyer
1130 – 1245	SESSION 2 Logistics Robotics Chair: Michael Lau , Newcastle University International, Singapore
1130 – 1145	Emergence of Intelligent Logistics Picking Systems Rosen Diankov , CTO, Mujin, Japan
1145 – 1200	Robotics in Logistics: DPDHL Trend Study and Pilots Tamanna Dahiya , Director of APAC Innovation Center, DHL Customers Solution & Innovation, Singapore
1200 – 1220	Start-ups: Cosmiqo International, Unitech Mechatronics, SMRTRobotics
1220 – 1245	Q&A with Panel Discussion
1245 – 1345	Lunch Break – L5 Grand Ballroom Foyer
1445 – 1600	SESSION 3 Service Robotics Chair: Jim Ostrowski , Blue River Technology, USA
1445 – 1500	The Business of Delivering Delivery Robots Steve Cousins , CEO, Saviok, USA
1500 – 1515	Scaling Research to Consumer Products Stefan Grufman , Teamleader Software & Signal team, Husqvarna Group, Sweden
1515 – 1535	Start-ups: qAIRa, Nourish Technology Inc, Transforma Robotics, Yinhe Robotics
1535 – 1600	Q&A with Panel Discussion
1600 – 1625	PM Break – L5 Grand Ballroom Foyer

1625 – 1740	SESSION 4 Healthcare Robotics Chair: Bert Grobben , Founder & CEO, Budding Innovations, Singapore
1625 – 1640	CHARTing Future Healthcare Delivery Selina Seah , ACEO, Changi General Hospital, Singapore
1640 – 1655	da Vinci Robotic Surgery Platform – A product development perspective Pushkar Hingwe , Director of Robotic Motion Control, Intuitive Surgical, USA
1655 – 1715	Start-ups: ArtiCares, SG Robotics, Kinexcs Private Limited
1715 – 1740	Q&A with Panel Discussion

WEDNESDAY - MAY 31, 2017	
0930 – 1045	SESSION 5 Collaborative Manufacturing Chair: Michael Lau , Newcastle University International, Singapore
0930 – 0945	Dual Arm Collaborative Robot "duAro" for SMEs in Singapore Yasuhiko Hashimoto , General Manager, Robot Division, Kawasaki Heavy Industry, Japan
0945 – 1000	Keeping Pace with Technology Advancement and Disruption through Industry-led Public-private Partnership in Advanced Manufacturing R&D David Low , CEO, Advanced Remanufacturing Technology Centre (ARTC), Singapore
1000 – 1020	Start-ups: Robotic Materials Inc., Mechavision Technology, Sunrise Instruments, Smart Robots s.r.l., ÆRobotics
1020 – 1045	Q&A with Panel Discussion
1045 – 1105	AM Break – L5 Grand Ballroom Foyer
1105 – 1220	SESSION 6 Education and Social Robotics Chair: Bert Grobben , Founder & CEO, Budding Innovations, Singapore
1105 – 1120	Robots for Early Childhood Education Adrian Lim , Director of Education Sector, Sectoral Innovation Group, Info-communications Media Development Authority (IDMA), Singapore
1120 – 1135	Bring Alive Our Dream Robot with the Developer Community Sarah Zhang , Head of Developer Partnerships & Business Operations, Segway Robotics Inc., China
1135 – 1155	Start-ups: Dragonautics, KEYi Technology
1155 – 1220	Q&A with Panel Discussion

INDUSTRY FORUM

Venue: Sands N (Level 5, next to Grand Ballroom)

The Industry Forum has two key tracks: **Technology Innovations in Robots and Automations** and the **IERA Awards**, featuring robotics and automation companies' experiences and advances in technological solutions to real world problems, and inventors whose ideas translate into world-class products.

TUESDAY - MAY 30, 2017	
0955 – 1110	SESSION 1 New Paradigms in Construction Automation and Robotics Chair: Erdal Kayacan , Nanyang Technological University, Singapore Co-organised with JTC
0955 – 1010	Overcoming Building & Infrastructure challenges with Robotics and Automation Solutions Soon Poh Heah , Assistant CEO, JTC, Singapore
1010 – 1025	Infrastructure Service Robots: Enhancing Productivity and Safety Ehsan Asadi , Co-founder, Director and Principal Scientist, Transforma Robotics, Singapore
1025 – 1040	The real "Smart Factory"- SEW-EURODRIVE's approach towards Industrie 4.0 Thilo Grimm , Managing Director, SEW-Eurodrive, Singapore
1040 – 1055	Industry 4.0 and Facilities Design Brendel Torsten , Partner, io-consultants GmbH, Germany
1055 – 1110	Panel Discussion / Q&A
1110 – 1130	AM Break – L5 Grand Ballroom Foyer
1130 – 1245	SESSION 2 Next Generation Industry and Service Robots Chair: Nelson Chang , Manager, Industrial Technology Research Institute, Taiwan
1130 – 1145	Recent KUKA Innovations and Future Challenges Rainer Bischoff , Head of Corporate Research, KUKA Roboter, Germany
1145 – 1200	Human Interaction and Programming of Robots in the Future Patric Hed , Technology Manager, Robots & Applications, ABB Robotics
1200 – 1215	Beyond the Smart Factory: People and Robots Keith Blanchet , Senior Director, Service Robotics Division, Kinova, Canada
1215 – 1230	Building Trust with Robots in Service Industries David Hanson , Founder & CEO, Hanson Robotics
1230 – 1245	Panel Discussion / Q&A
1245 – 1345	Lunch – L5 Grand Ballroom Foyer
1445 – 1600	SESSION 3 IERA Award Presentation Chairs: Erwin Prassler and Arturo Baroncelli
1445 – 1500	Introduction to IERA 2017 Erwin Prassler
1500 – 1520	ANYdrive – a modular joint actuator for advanced interacting robots Marco Hutter , Member of the Board, ANYbotics AG, Switzerland
1520 – 1540	Hunova - an easy to use and intuitive medical device Jody Saglia , Chief Technology Officer, Movendo Technology, Italy
1540 – 1600	Sensing flexibility: 3D force and 6-axis force/torque sensors for industrial robotic applications György Cserey , OptoForce, Hungary

1600 – 1625	PM Break – L5 Grand Ballroom Foyer
1625 – 1740	SESSION 4 IERA Award Presentation Chairs: Erwin Prassler and Arturo Baroncelli
1625 – 1645	Chairless Chair® Sven Liebermeister , Noonee
1645 – 1705	Relay autonomous delivery robot Steve Cousins , CEO, Savioke, USA
1705 – 1740	Deliberation by jurors

WEDNESDAY - MAY 31, 2017	
0930 – 1045	SESSION 5 Innovations in Human-centric Robotics Chair: Zen Koh , Managing Director, Hocoma Asia Pacific, Singapore
0930 – 0945	Spiritual Machines Chunlin Ji , Co-founder & Vice President, Kuang-Chi Institute of Advanced Technology, China
0945 – 1000	The RAMCIP project: Developing a service robot for MCI patients at home Dimitrios Giakoumis , Senior Research Associate, Centre for Research and Technology, Greece
1000 – 1015	ITRI's Robotic-based Automation Technology for Industrial Applications Nelson Chang , Manager, Industrial Technology Research Institute, Taiwan
1015 – 1030	Clinical Application of NeuroRehabilitation Robotics Zen Koh , Managing Director, Hocoma Asia Pacific, Singapore
1030 – 1045	Panel Discussion / Q&A
1045 – 1105	AM Break – L5 Grand Ballroom Foyer
1105 – 1220	SESSION 6 Advanced Autonomous Systems and Devices Chair: Paul Tan , Co-Director, ST Engineering-NTU Corporate Lab, Singapore Co-organised with ST Engineering
1105 – 1120	Managing Demand-driven R&D in Corporate Labs for Successful Translation into Industries Paul Tan , Co-Director, ST Engineering-NTU Corporate Lab, Singapore
1120 – 1135	Automated Aircraft Inspection Using Unmanned Aerial Systems Jia Hui Pang , Systems Engineer, ST Aerospace, Singapore
1135 – 1150	Accelerator for AI Computing Simon See , Director, Nvidia Technology Center and Solution Architect and Engineering, Asia Pacific and Japan, Nvidia, Singapore
1150 – 1205	Role of Competitions in Technology Innovations in Robots Lakmal Seneviratne , Associate Provost of Research and Graduate Studies & Professor of Robotics, Khalifa University, UAE
1205 – 1220	Panel Discussion / Q&A

GOVERNMENT FORUM

Venue: Room 4211/4212 (Level 4)

Speakers from Asia, Europe and the US will share about their countries' programs and projects in robotics and automation.

WEDNESDAY - MAY 31, 2017	
0930 – 1045	SESSION 1 Investments and National Robotics R&D Direction Chair: Kin Huat Low , Nanyang Technological University, Singapore
0930 – 0950	An overview of Singapore's National Robotics R&D Programme Tong Boon Quek , Chief Executive, National Robotics Programme, Singapore
0950 – 1010	Policies and measures for robot development and utilization Atsushi Yasuda , Director, Robotics Policy Office, Manufacturing Industries Bureau, Ministry of Economy, Trade and Industry, Japan
1010 – 1030	Research in Intelligent Robots and Autonomous Systems at the National Science Foundation Reid Simmons , Program Director, Robust Intelligence, National Robotics Initiative, Smart & Autonomous Systems, CISE/IIS, National Science Foundation, USA
1030 – 1045	Panel Discussion
1045 – 1105	AM Break – L4 Pre-Function Area
1105 – 1220	SESSION 2 Government and Industry Role in Driving Growth Chair: Cecilia Laschi , Scuola Superiore Sant'Anna, Pisa
1105 – 1125	Robotics Research in the Engineering Directorate of the US National Science Foundation Jordan Berg , Program Director, National Science Foundation, USA
1125 – 1145	From Esprit to H2020: 25 years of European support to robot motion research Jean-Paul Laumond , Head of Research, LAAS-CNRS (Team Gepetto), France
1145 – 1205	ERC - Funding opportunities in Europe for creative minds from anywhere in the world Anna G. Mignani , Seconded national Expert-Scientific Officer, European Research Council Executive Agency, European Commission
1205 – 1220	Panel Discussion
1430 – 1545	SESSION 3 Bridging the Gap: Government, Academic & Industry Chair: Cecilia Laschi , Scuola Superiore Sant'Anna, Pisa
1430 – 1450	The Future of Biorobotics in the Fourth Industrial Revolution Maria Chiara Carrozza , Professor of Biorobotics, The Biorobotics Institute, Scuola Superiore Sant'Anna, Italy
1450 – 1510	The European challenge for promoting large scale, disruptive research initiatives: the Flagship projects on Future Emerging Technologies (FET) and the FLAG-ERA Network of European funding agencies Eugenio Guglielmelli , Professor, Università Campus Bio-Medico, Italy
1510 – 1530	Robot R&D Direction of Korea Kyung-Hoon Kim , Program Director, MOTIE Intelligent Robot R&D, Korea Evaluation Institute of Industrial Technology, Korea
1530 – 1545	Panel Discussion

ASEAN & EMERGING COUNTRY FORUM

Venue: Room 4211/4212 (Level 4)

The combined ASEAN and emerging market economies have immensely strong growth potential and offer numerous opportunities for robotics and automation, in areas such as food security, disaster mitigation, medical and healthcare, oil exploration and industrial maintenance, and more.

THURSDAY - JUNE 1, 2017	
0930 – 1045	SESSION 1 Progress in Robotics and Automation in the ASEAN Region Chairs: Marcelo Ang , National University of Singapore and John-John Cabibihan , Qatar University
0930 – 0940	Singapore Marcelo Ang , National University of Singapore
0940 – 0950	Malaysia Ching Seong Tan , Multimedia University, Malaysia; Terra-Phoenix Sdn Bhd; iCYCLE Malaysia Sdn Bhd
0950 – 1000	Philippines Laurence Gan Lim , De La Salle University, Philippines
1000 – 1010	Thailand Mana Saedan , Chiang Mai University, Thailand
1010 – 1045	Panel Discussion / Q&A
1045 – 1105	AM Break - L4 Pre-Function Area
1105 – 1220	SESSION 2 Progress in Robotics and Automation in Emerging Market Economies Chairs: Marcelo Ang , National University of Singapore and John-John Cabibihan , Qatar University
1105 – 1115	India Prahlad Vaddakeppat , National University of Singapore
1115 – 1125	Thailand Jackrit Suthakorn , Mahidol University, Thailand
1125 – 1135	Turkey Erdal Kayacan , Nanyang Technological University, Singapore
1135 – 1145	United Arab Emirates Lakmal Seneviratne , Khalifa University, United Arab Emirates
1145 – 1220	Panel Discussion / Q&A

ETHICS FORUM

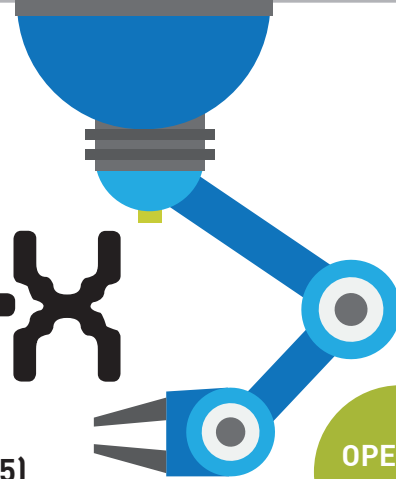
Venue: Room 4211/4212 (Level 4)

Are robots 'stealing' jobs from human workers? Do we bear any responsibility in the so-called 'technological unemployment'? And are robotic weapons 'ethical'? What are our responsibilities and what role should we play in the societal debates on robotic weapons?

Prominent speakers from academia and NGOs will share their ideas and engage the audience on these questions through their presentations, panel discussion, and interaction with the floor.

THURSDAY - JUNE 1, 2017	
1610 – 1725	ETHICS FORUM Chair: Quang-Cuong Pham , Nanyang Technological University, Singapore Co-Chairs: Ludovic Righetti , Max Planck Institute for Intelligent Systems, Germany; Raja Chatila , Past President, IEEE RAS (2014 – 2015) & Director of Research, CNRS, France
1610 – 1620	IEEE global initiative for ethical considerations in AI and autonomous systems Raja Chatila , Past President, IEEE RAS (2014 – 2015) & Director of Research, CNRS, France
1620 – 1635	Robotics and Anthropomorphism: the need to deconstruct the discourse Jean-Paul Laumond , Director of Research, CNRS (French National Center for Scientific Research)
1635 – 1655	On the open letter for the ban of autonomous weapons and the survey on impacts of Robotics and AI on jobs Toby Walsh , Professor, University of New South Wales (UNSW), Australia
1655 – 1725	Panel Discussion <ul style="list-style-type: none"> • Raja Chatila, Past President, IEEE RAS (2014 – 2015) & Director of Research, CNRS, France • Toby Walsh, Professor, UNSW, Australia • Jean-Paul Laumond, Director of Research, CNRS, France • Kerstin Vignard, Deputy Director and Chief of Operations, UN Institute for Disarmament Research • Raj Madhavan, CEO, Humanitarian Robotics Technologies & Chair, IEEE RAS Research and Practice Ethics Committee • Naho Kitano, Researcher at Tokyo Institute of Technology, Co-Founder and former director of Hibot Corp

ICRA-X



OPEN TO PUBLIC!

Venue: Grand Ballroom (Level 5)

What will the robots of the future look like? How can they change mobility, ocean exploration, and farming as we know it? Find out at this public forum with presentations by distinguished experts on popular and cutting-edge topics in the field.

THURSDAY - JUNE 1, 2017

0930 – 1045	SESSION 1 Frontiers of Robotics Chair: Ken Goldberg , UC Berkeley, USA
0930 – 0955	Ocean One: A Robotic Avatar for Oceanic Discovery Oussama Khatib , Stanford University, USA
0955 – 1020	The Quest for Natural Machine Motion Antonio Bicchi , University of Pisa & Italian Institute of Technology, Italy
1020 – 1045	Driving Toward Tomorrow Emilio Frazzoli , Massachusetts Institute of Technology (MIT), USA & Singapore-MIT Alliance for Research and Technology
1045 – 1105	AM Break – L5 Grand Ballroom Foyer
1105 – 1220	SESSION 2 Innovation and Entrepreneurship Chair: Jing Xiao , University of North Carolina at Charlotte, USA
1105 – 1130	Additive-generative Industrial Design for Robotic Automation Axel Thallemer , National University of Singapore, Singapore
1130 – 1155	Essential Ingredients of Building a Successful Robotic Startup Zexiang Li , Hong Kong University of Science and Technology, Hong Kong
1155 – 1220	Computer Vision and Robotics in the New Era of Digital Agriculture Jim Ostrowski , Blue River Technology, USA

ROBOT CHALLENGES

DJI RoboMaster Mobile Manipulation Challenge

Venue: Room 5001-5003 (Level 5)

TUESDAY - MAY 30, 2017

09:00-12:00	1st Round
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13:30-16:00	2nd Round
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WEDNESDAY - MAY 31, 2017

09:00-12:00	3rd Round
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Humanitarian Robotics and Automation Technology Challenge 2017

Venue: Room 5202 (Level 5, next to the breaks area)

- May 30-31, 09:00-17:00 daily
- Interactive sessions with organizers during coffee break timeslots daily.

Mobile Microrobotics Challenge 2017

Venue: Room 5101-5103 (Level 5)

TUESDAY - MAY 30, 2017

09:00-12:00	Autonomous Accuracy Challenge
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13:45-16:45	Microassembly Challenge
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WEDNESDAY - MAY 31, 2017

09:30-12:00	Showcase & Poster Session
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Soft Material Robot Challenge

Supported by SIASUN

Venue: Room 5101-5103 (Level 5)

TUESDAY - MAY 30, 2017

09:00-12:00	Soft Component Technologies Challenge
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14:00-17:00	Soft Robot Speed Challenge
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WEDNESDAY - MAY 31, 2017

09:00-12:00	Soft Component Technologies Challenge
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14:00-17:00	Soft Component Technologies Challenge
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SOCIAL EVENTS



Welcome Reception WR

Monday - May 29, 2017

Venue: Waterview Room & Flower Field Hall, Gardens by the Bay

Time: 18:30 - 22:00

For delegates with the corresponding 'WR' tag on their badges or guests with a **Welcome Reception ticket**, take a leisurely stroll to Gardens by the Bay via the Garden Bay Bridge on Level 4. Detailed walking directions can be found on the ICRA website.

Please present your ICRA badge for admission and complimentary drink at the dinner venue.



Conference Banquet CB

Wednesday - May 31, 2017

Venue: Grand Ballroom (Level 5), Sands Expo and Convention Centre

Time: 18:30 - 21:45

For delegates with the corresponding 'CB' tag on their badges or guests with a **Conference Banquet ticket**, enjoy a Chinese sit-down dinner at the Grand Ballroom, Southeast Asia's biggest ballroom, while being entertained by performances.

Please present your ICRA badge and Conference Banquet ticket for admission and complimentary drink at the dinner venue.



Farewell Reception FR

Thursday - June 1, 2017

Venue: Night Safari

Time: 19:00 - 21:00

For delegates with the corresponding 'FR' tag on their badges or guests with a **Farewell Reception ticket**, take the chartered bus to Night Safari where you will receive a bento dinner and Night Safari admission ticket to enjoy at your own pace. Please proceed to the pick-up point on the ground floor (outside Hall B) at least 15 minutes before.

- From MBS to Night Safari: first bus leaves 17:45; last bus leaves 19:15 (regular intervals).
- From Night Safari to MBS: First bus leaves 21:00; last bus leaves 22:15 at intervals of 15 minutes

Please present your ICRA badge before boarding the bus at Marina Bay Sands.

USEFUL INFORMATION

Complimentary WiFi at ICRA

SSID: ICRA2017

Password: IEEEICR@

Nearest train station

CE1/DT16 Bayfront Station on the yellow Circle Line and blue Downtown Line.

Taxi

Taxi booking hotline: +65 6342 5222

Alternatively, use the Grab or Uber apps to book a taxi or private car.

Venue Address

Sands Expo and Convention Centre
10 Bayfront Avenue, Singapore 018956

Chop your ICRA souvenir stamp here!



CONFERENCE APP QUICK GUIDE

The conference app is pre-loaded on the ICRA Tablet given to early and advance Standard and Student registrants.

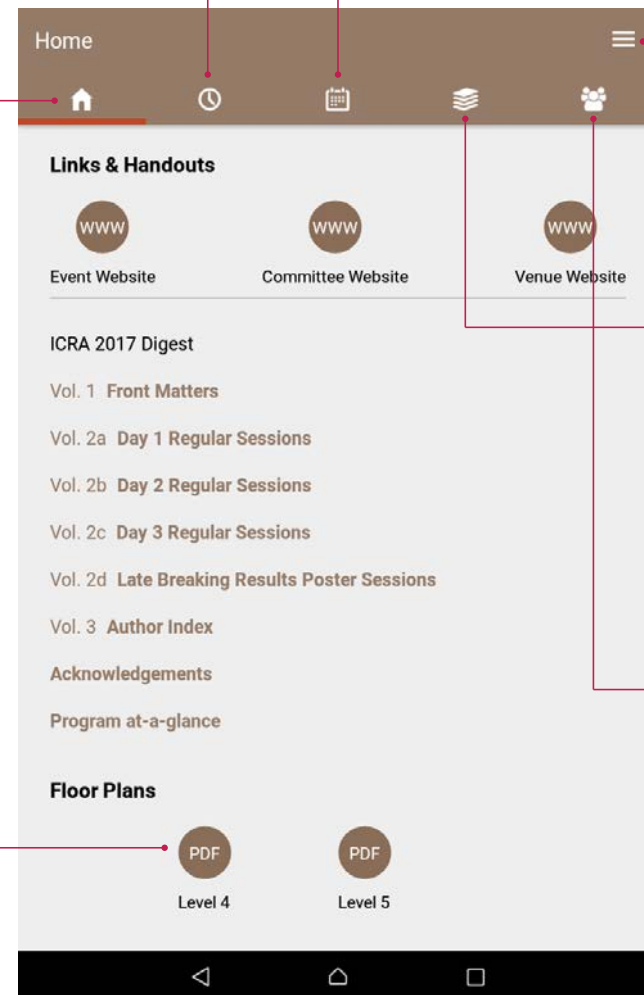
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EXHIBITORS

Venue: Grand Ballroom Foyer (Level 5)

The exhibition at ICRA 2017 includes a Start-up Corner, with product showcases and live demonstrations by some of the biggest names in the robotics and automation industry. Opening hours:

May 30 (Tuesday)	May 31 (Wednesday)	June 1 (Thursday)
08:00 – 17:00	08:20 – 17:00	08:20 – 17:00
AAAS / SCIENCE	B09	MOOG INC. C06 & C07
ABB PTE LTD	C11	MUJIN INC. A34
AMAZON ROBOTICS	A01	NANYANG TECHNOLOGICAL UNIVERSITY C15
ATI INDUSTRIAL AUTOMATION	B14	NEUROMEKA B04
AUBO ROBOTICS	A39	NEW ENERGY AND INDUSTRIAL TECHNOLOGY DEVELOPMENT ORGANIZATION A11
BEIJING EWAYBOT TECHNOLOGY LLC	B05	NIHON BINARY CO., LTD B02
BITCRAZE	C08	NOW PUBLISHERS C01
CAMBRIDGE UNIVERSITY PRESS	C04	NUTONOMY D02
CEPTON TECHNOLOGIES, INC.	S06	OPTITRACK A40
CLEARPATH ROBOTICS	B19	PAL ROBOTICS A03
CNITECH CAS	C14	PERCEPTIN C12
CODE OCEAN	S05	PHOENIX TECHNOLOGIES INC B15
CRUISE AUTOMATION	B22	PREFERRED NETWORKS INC. A13
DJI	A31	RED DOT ROBOTICS PTE LTD D05
ELID TECHNOLOGY INTERNATIONAL	D06	ROBOCUP FEDERATION C09
FETCH ROBOTICS	B13	ROBOTIS CO., LTD A21
FORCE DIMENSION	C10	ROBSENSE TECHNOLOGIES S03
FRONTIERS	B07	ROS-INDUSTRIAL ASIA PACIFIC CONSORTIUM B08
GT ROBOT TECHNOLOGY PTE LTD	D03	SAGE PUBLISHING B01
HAPTION	B16	SHADOW ROBOT COMPANY C13
HEBI ROBOTICS INC.	B17	SHANGHAI FOURIER INTELLIGENCE CO., LTD B23
HOKUYO AUTOMATIC CO., LTD.	B10	SHANGHAI GAITECH SCIENTIFIC INSTRUMENTS CO.,LTD A38
ICRA 2018	S07	SHANGHAI JIAO TONG UNIVERSITY A15
ICRA 2019	S08	SINGAPORE INDUSTRIAL AUTOMATION ASSOCIATION D04
IEEE RA SOCIETY	C05	SONGSHAN LAKE XBOT PARK A07
INFINIUM ROBOTICS PTE LTD	D01	SPRINGER NATURE A09
INILABS, GMBH	B12	ST ENGINEERING A19
INSTITUTO ITALIANO DI TECNOLOGIA	B06	SUNRISE INSTRUMENTS B03
INTELROPE GMBH & YIKUN CHINA	C03	TOKYO ROBOTICS INC. B11
IROBOT	B24	TRANSFORMA ROBOTICS S04
ITRI, TAIWAN	A37	UBER ATG B26
JD.COM	A29	UBTECH EDUCATION (SHENZHEN) CO., LTD A25
JTC	C15	UVIFY INC. C02
KAWASAKI HEAVY INDUSTRIES, LTD	A17	VTRUS INC. S01
KEYI TECHNOLOGY	S02	
KHALIFA UNIVERSITY	B21	
KINOVA ROBOTICS	B20	
KNR SYSTEMS INC.	B18	
KUKA ROBOTER GMBH	A05	
MATHWORKS	B25	

*Names in bold are start-up companies