International Symposium on Robotics Research

October 6-10, 2019 Hanoi Vietnam
Welcome to ISRR 2019!

International Symposium on Robotics Research
October 6-10, 2019 Hanoi Vietnam

The International Symposium on Robotics Research (ISRR) promotes the development and dissemination of groundbreaking research and technological innovation in robotics useful to society by providing a lively, intimate, forward-looking forum for discussion and debate about the current status and future trends of robotics, with emphasis on its potential role to benefit humans.

As one of the pioneering symposia in robotics, ISRR has established some of the most fundamental and lasting contributions in the field bringing together top international experts in robotics since 1983. ISRR 2019 continues this tradition through a program that is designed to be ideas based, and interactive in flavor, seeking the discussion of provocative new ideas, open-ended themes, and new directions for robotics and research-derived applications, including robot design, control, robot vision, robot learning, planning, and integrated robot systems.

The ISRR 2019 program comprises a combination of distinguished talks, oral and interactive presentations as well as an attractive social program. 18 distinguished talks will be given by leading roboticists presenting blue sky ideas and their views on the field including past experience, lessons learned, success and failure stories of robotics, views on the future, latest developments in robotics and impact of robotics on society. The program includes 60 presentations, each presented in oral and interactive sessions, giving time for discussions between the participants.

We are very grateful to all the contributing authors, distinguished speakers, the program committee, reviewers and sponsors as well as the organization supporting teams in Hanoi Karlsruhe for their contributions to ISRR 2019.

Wishing everyone a wonderful experience in Hanoi!

The ISRR 2019 Organization Committee

The ISRR is sponsored by the International Foundation of Robotics Research
Organization Committee

Tamim Asfour
Karlsruhe Institute of Technology

Eiichi Yoshida
National Institute of Industrial Science and Technology

Jaeheung Park
National University of Seoul

Oussama Khatib
Stanford University

Henrik Christensen
UC San Diego

Philippe Bidaud
Université Pierre et Marie Curie

Local Organization

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Organization Supporting Team

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Sandra Tartarelli
Karlsruhe Institute of Technology

Fabian Peller-Konrad
Karlsruhe Institute of Technology
Programm Committee

Tamim Asfour (Karlsruhe Institute of Technology)
Kostas E. Bekris (Rutgers University)
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Kostas E. Bekris (Rutgers University)
Jeannette Bohg (Stanford University)
Oliver Brock (Technische Universität Berlin)
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Ken Goldberg (UC Berkeley)
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Hanna Kurniawati (Australian National University)
Cecilia Laschi (Scuola Superiore Sant’Anna)
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Dinesh Manocha (University of Maryland)
Jun Morimoto (ATR Computational Neuroscience Labs)
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Jaeheung Park (Seoul National University)
Alberto Rodriguez (Massachusetts Institute of Technology)
Daniela Rus (Massachusetts Institute of Technology)
Bruno Siciliano (Univ. Napoli Federico II)
Wataru Takano (Osaka University)
Rudolph Triebel (German Aerospace Center – DLR)
Eiichi Yoshida (National Inst. of AIST)
Distinguished Speakers

Alin Albu-Schäffer  
*DLR - German Aerospace Center*  
*TU Munich*

John Hollerbach  
*University of Utah*

Antonio Bicchi  
*University of Pisa*

Makoto Kaneko  
*Osaka University*

Oliver Brock  
*Technische Universität Berlin*

Oussama Khatib  
*Stanford University*

Herman Bruyninckx  
*KU Leuven, Belgium*  
*TU Eindhoven, the Netherlands*

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*Istituto Italiano di Tecnologia*

Henrik Christensen  
*UC San Diego*

Yoshihiko Nakamura  
*University of Tokyo*

Rüdiger Dillmann  
*Karlsruhe Institute of Technology*

Daniela Rus  
*Massachusetts Institute of Technology*

Ken Goldberg  
*UC Berkeley*

Roland Siegwart  
*ETH Zurich*

Sami Haddadin  
*TU Munich*

Siddhartha Srinivasa  
*University of Washington*
Hotel information

General information

„Hanoi is a magical and charming city. I hope you will find that the character, history and romance of the Sofitel Legend Metropole Hanoi may add a little extra special something to your journey here. Savour our French art de vivre blended with elegant Vietnamese touches and please enjoy this wonderful place.”

Sofitel Legend Metropole Hotel Hanoi, General Manager

Important locations for the conference:

La Veranda & Patio:

All oral sessions and distinguished talks will take place at this location.

Thang Long Hall:

All interactive sessions, lunch and the farewell dinner will take place at Thang Long Hall.
Programme

Welcome Reception
Sunday, October 6, 19:00

La Veranda & Patio of the Sofitel
Legend Metropole Hotel
Monday, October 7

08:50 - 09:00  Welcome

09:00 - 10:10  Distinguished Talks

09:00  Oussama Khatib
        TBD

09:30  Daniela Rus
        Soft Capable Robots

10:10 - 11:20  Session 1: Control

10:10  Asymmetric Dual-Arm Task Execution Using an Extended Relative Jacobian
        D. Almeida, Y. Karayiannidis

10:15  Consensus-Based ADMM for Task Assignment in Multi-Robot Teams
        R. N. Haksar, O. Shorinwa, P. Washington, M. Schwager

10:20  Rapidly-Exploring Quotient-Space Trees: Motion Planning Using Sequential Simplifications
        A. Orthey, M. Toussaint

10:25  Optimally Convergent Trajectories for Navigation
        N. Kong, A. Johnson

10:30  Towards Online Observability-Aware Trajectory Optimization for Landmark-Based Estimators
        K. M. Frey, T. Steiner, J. P. How

10:35  Joint Space Stiffness and Damping for Cartesian and Null Space Impedance Control of Redundant Robotic Manipulators
        C. Saldarriaga, N. Chakraborty, I. Kao

10:40  On the Use of Cayley Transform for Kinematic Shape Reconstruction of Soft Continuum Robots
        S. Grazioso, G. Di Gironimo, B. Siciliano

10:45  Compliance Optimization Considering Dynamics for Whole-Body Control of a Humanoid
        K. Yamamoto, Y. Nakamura

10:50  Composition of Templates for Transitional Pedipulation Behaviors
        T. Topping, V. Vasilopoulos, A. De, D. Koditschek
10:55 Probabilistic Mapping of Tissue Elasticity for Robot-Assisted Medical Ultrasound
* M. Napoli, S. Goswami, S. McAleavey, M. Doyley, T. Howard

11:20 - 12:30 Interactive Session: Control

12:30 - 13:00 Distinguished Talk

12:30 Alin Albu-Schäffer
*Nonlinear Elastic Resonance Modes for Efficient Locomotion: From Biology to Robots and Back*

13:00 - 14:30 Lunch Break

14:30 - 16:10 Distinguished Talks

14:30 Ken Goldberg
*Robo-Exoticism: Art, History, and Our All Too Human Machines*

15:00 Antonio Bicchi
*SymBionics, or about Being a Bot*

15:30 Siddhartha Srinivasa
*Manipulation Challenges for the Next 20 Years*

16:10 - 17:20 Session 2: Grasping and Manipulation

16:10 Certified Grasping
*B. Aceituno-Cabezas, J. Ballester, A. Rodriguez*

16:15 KPAM: KeyPoint Affordances for Category-Level Robotic Manipulation
*L. Manuelli, W. Gao, P. Florence, R. Tedrake*

16:20 Aerial Manipulation and Grasping by the Versatile Multilinked Aerial Robot DRAGON
*M. Zhao, K. Okada, M. Inaba*

16:25 Towards Assistive Robotic Pick and Place in Open World Environments
*D. Wang, C. Kohler, A. ten Pas, A. Wilkinson, M. Liu, H. Yanco, R. Platt*
16:30 Inferring Occluded Geometry Improves Performance When Retrieving an Object from Dense Clutter
A. Price, L. Jin, D. Berenson

16:35 Robot-Assisted Feeding: Generalizing Skewering Strategies across Food Items on a Plate
R. Feng, Y. Kim, G. Lee, E. Gordon, M. Schmitte, S. Kumar, T. Bhattacharjee, S. Srinivasa

16:40 Manipulation with Suction Cups Using External Contacts
X. Cheng, Y. Hou, M. T. Mason

16:45 Combining Coarse and Fine Physics for Manipulation Using Parallel-In-Time Integration
W. C. Agboh, D. Rubrecht, M. R. Dogar

16:50 REACH: Reducing False Negatives in Robot Grasp Planning with a Robust Efficient Area Contact Hypothesis Model
M. Danielczuk, J. Xu, J. Mahler, M. Matl, N. Chentanez, K. Goldberg

16:55 A Billion Ways to Grasp: An Evaluation of Grasp Sampling Schemes on a Dense, Physics-Based Grasp Data Set
C. Eppner, A. Mousavian, D. Fox

17:20 - 18:30 Interactive Session: Grasping and Manipulation
Tuesday, October 8

09:00 - 10:10 **Distinguished Talks**

09:00 Roland Siegwart  
*From Robotics Research to Applications: A Difficult but Rewarding Journey*

09:30 Henrik Christensen  
*Human-Robot Collaboration in Urban Environments*

10:10 - 11:20 **Session 3: Robot Vision**

10:10 Towards Resilient Autonomous Navigation of Drones  
*A. Santamaria-Navarro, R. Thakker, D. D. Fan, B. Morrell, A. Aghamohammadi*

10:15 Generalized Proximal Methods for Pose Graph Optimization  
*T. Fan, T. Murphey*

10:20 A Photo-Realistic Synthetic Dataset for Analyzing the Effects of Moving Objects on Visual Localization Algorithms for Drones  
*J. Yang, S. Lee, B. Lee*

10:25 Attitude Tracking from a Camera and an Accelerometer on Gyro-Less Devices  
*T. Do, L. Neira, Y. Yang, S. Roumeliotis*

10:30 A Unified Pipeline for 3D Detection and Velocity Estimation of Vehicles  
*X. Du, M. H. Ang Jr, S. Karaman, D. Rus*

10:35 Exploration without Global Consistency Using Local Volume Consolidation  
*T. Cieslewski, A. Ziegler, D. Scaramuzza*

10:40 Vision-Based Autonomous UAV Navigation and Landing for Urban Search and Rescue  
*M. Mittal, R. Mohan, W. Burgard, A. Valada*

10:45 Visual-Inertial Localization for Skid-Steering Robots with Kinematic Constraints  
*X. Zou, M. Zhang, Y. Chen, Y. Liu, G. Huang, M. Li*
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<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Presenters</th>
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<tr>
<td>10:55</td>
<td>Model-Free Visual Control for Continuum Robot Manipulators Via Orientation Adaptation</td>
<td>M. Verghese, F. Richter, A. Gunn, W. Phil, M. C. Yip</td>
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<td>11:20 - 12:30</td>
<td>Interactive Session: Robot Vision</td>
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<td>12:30 - 13:00</td>
<td>Distinguished Talk</td>
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<td>12:30</td>
<td>Makoto Kaneko</td>
<td>Fast and Fine Manipulation of RBCs in Artificial Capillary and Their Mysterious Behaviors</td>
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<td>13:00 - 14:30</td>
<td>Lunch Break</td>
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<td>14:30 - 16:10</td>
<td>Distinguished Talks</td>
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<td>14:30</td>
<td>Oliver Brock</td>
<td>Intelligence: A Robotics Problem</td>
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<td>15:00</td>
<td>Frank Chongwoo Park</td>
<td>To Learn or Not to Learn: Robot Modeling in the Age of Machine Learning</td>
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<td>15:30</td>
<td>Rüdiger Dillmann</td>
<td>From Models to Neuromorphic Approaches for SNN-Based Robot Control</td>
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<td>16:10 - 17:20</td>
<td>Session 4: Robot Learning</td>
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<td>16:10</td>
<td>Unsupervised Real-Time Control through Variational Empowerment</td>
<td>M. Karl, P. Becker-Ehmck, M. Soelch, D. Benbouzid, P. van der Smagt, J. Bayer</td>
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16:25  Learning User Preferences for Trajectories from Brain Signals  
       H. Kolkhorst, W. Burgard, M. Tangermann

16:30  Automatic Encoding and Repair of Reactive High-Level Tasks with  
       Learned Abstract Representations  
       A. Pacheck, G. Konidaris, H. Kress-Gazit

16:35  Multi-Class Target Tracking Using the Semantic PHD Filter  
       J. Chen, P. Dames

16:40  Belief-Space Planning Using Learned Models with Application to  
       Underactuated Hands  
       A. Kimmel, A. Sintov, J. Tan, B. Wen, A. Boularias, K. E. Bekris

16:45  Introspective Robot Perception Using Smoothed Predictions from  
       Bayesian Neural Networks  
       J. Feng, M. Durner, Z. Marton, F. Balint-Benczedi, R. Triebel

16:50  Autonomous Exploration under Uncertainty Via Graph  
       Convolutional Networks  
       F. Chen, J. Wang, T. Shan, B. Englot

16:55  Mitigating Network Latency in Cloud-Based Teleoperation Using  
       Motion Segmentation and Synthesis  
       N. Tian, A. K. Tanwani, K. Goldberg, S. Sojoudi

17:20 - 18:30  Interactive Session: Robot Learning

Banquet  
Tuesday, October 8, 19:00  
Banquet at Cau Go Vietnamese Cuisine Restaurant
Wednesday, October 9

09:00 - 10:10 **Distinguished Talks**

09:00 Giogio Metta

*iCub & Friends: My Quest for Building a Community of Roboticists*

09:30 Herman Bruyninckx

*Do You Know That Story about That Robot That Met Another Robot and Asked “Why?”*

10:10 - 11:20 **Session 5: Design, Control, Tools**

10:10 Bilevel Optimization for Planning through Contact: A Semidirect Method

*B. Landry, L. Joseph, Z. Manchester, M. Pavone*

10:15 Active Rendezvous for Multi-Robot Pose Graph Optimization Using Sensing Over Wi-Fi

*W. Wang, N. Jadhav, P. Vohs, N. Hughes, M. Mazumer, S. Gil*

10:20 Robust Motion Planning for Non-Holonomic Robots with Planar Geometric Constraints

*P. Tajvar, A. Varava, D. Kragic, J. Tumova*

10:25 Fast Reciprocal Collision Avoidance under Measurement Uncertainty

*K. Shah, G. Angeris, M. Schwager*

10:30 Globally Optimal Joint Search of Topology and Trajectory for Planar Linkages

*Z. Pan, M. Liu, X. Gao, D. Manocha*

10:35 BRIGHT: Benchmarking Research Infrastructure for Generalized Heterogeneous Teams

*T. Padir*

10:40 The PRISMA Hand: A Sensorized Robust Hand for Adaptive Grasp and In-Hand Manipulation

*H. Liu, P. Ferrentino, S. Pirozzi, B. Siciliano, F. Ficuciello*

10:45 Embedded Neural Networks for Robot Autonomy

*S. Aguasvivas Manzano, D. Hughes, C. Simpson, R. Patel, N. Correll*
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| 10:50 | Taking Recoveries to Task: Recovery-Driven Development for Recipe-Based Robot Tasks  
| 10:55 | ScRATCHS: Scalable and Robust Algorithms for Task-Based Coordination from High-Level Specifications  
| 11:20 - 12:30 | Interactive Session: Design, Control, Tools |
| 12:30 - 13:00 | Distinguished Talk |
| 12:30 | Sami Haddadin  
*Increasing the Closed Loop Dynamics of Robotics Research* |
| 13:00 - 14:30 | Lunch Break |
| 14:30 - 16:10 | Distinguished Talks |
| 14:30 | Peter Corke  
*TBD* |
| 15:00 | John Hollerbach  
*Realistic Walking on a Treadmill* |
| 15:30 | Yoshihiko Nakamura  
*TBD* |
| 16:10 - 17:20 | Session 6: Planning |
| 16:10 | The Blindfolded Robot: A Bayesian Approach to Planning with Contact Feedback  
B. Saund, S. Choudhury, S. Srinivasa, D. Berenson |
| 16:15 | Introducing PIVOT: Predictive Incremental Variable Ordering Tactic for Efficient Belief Space Planning  
K. Elimelech, V. Indelman |
| 16:20 | Multilevel Monte-Carlo for Solving POMDPs Online  
M. Hoerger, H. Kurniawati, A. Elfes |
16:25 Multi-Objective Policy Generation for Multi-Robot Systems Using Riemannian Motion Policies  
A. Li, M. Mukadam, M. Egerstedt, B. Boots
16:30 Task-Motion Planning for Navigation in Belief Space  
A. Thomas, F. Mastrogiavanni, M. Baglietto
16:35 Adaptive Underwater Robotic Sampling of Dispersal Dynamics in the Coastal Ocean  
16:40 A Unified Sampling-Based Approach to Integrated Task and Motion Planning  
W. Thomason, R. A. Knepper
16:45 Temporal Scheduling and Optimization for Multi-MAV Planning  
W. Wu, F. Gao, L. Wang, B. Zhou, S. Shen
16:50 Taming Combinatorial Challenges in Clutter Removal  
W. N. Tang, J. Yu
16:55 Probabilistically Safe Corridors to Guide Sampling-Based Motion Planning  
J. Huh, O. Arslan, D. Lee

17:20 - 18:30 Interactive Session: Planning

Farewell Dinner  
Wednesday, October 9, 19:00
Dinner at Sofitel Legend Metropole Hotel Restaurant
“Once upon a time, soon after the Việt people established their country, invaders came. The Jade Emperor sent Mother Dragon and her Child Dragons down to earth to help the Việt people fight against their enemy. Right at the time invaders’ boats were rushing to the shore, the dragons landed down on earth. The dragons immediately sent out from their mouths a lot of pearls, which then turned into thousands of stone islands emerging in the sea like great walls challenging the invaders’ boats. The fast boats couldn’t manage to stop and crashed into the islands and into each other and broke into pieces.

After the victory, Mother Dragon and Child Dragons didn’t return Heaven but stayed on earth at the place where the battle had occurred. The location Mother Dragon landed is nowadays Hạ Long Bay...”

The Excursion to Halong bay will start at 09:30 at the Sofiel Legend Metropole Hotel.

All participants will enjoy a drive to Halong city in around 2.5 hours via the highway followed by a stopover at Legend Pearl to learn how locals culture pearl into the live oysters and to see how they harvest pearl.

After that, a deluxe boat awaits for an about 4 hour long boat cruise of this stunning area. The crew will offer a special seafood lunch while the boat is cruising through the islets. Lunch includes one complimentary soft drink. Then, visit the natural beautiful landscapes of Halong Bay and discover a beautiful caves: Heaven Palace grotto.

After about 4 hour navigation, all participants are back to harbor for a drive back to Hanoi. Arrive the hotel at around 18.00.
Friday, October 11

Workshop at Hanoi University of Science and Technology (HUST)
\[\text{Details will be announced during the symposium}\]

Social Events

**Sunday, October 6, 19:00**
Welcome Reception
*La Veranda & Patio of the Sofitel Legend Metropole Hotel*

**Tuesday, October 8, 19:00**
Banquet
*Cau Go Vietnamese Cuisine Restaurant*

**Wednesday, October 9, 19:00**
Farewell Dinner
*Sofitel Legend Metropole Hotel Restaurant*

**Thursday, October 10, 9:30 am**
Excursion and Discussion Groups
*Halong Bay*
Contact information for urgent matters

Sofitel Legend Metropole Hotel:
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Senior Event Planner
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Email: Thuy.Bui@sofitel.com

Duty Manager (24/7)
Phone: +84 90 344 8208
Email: h1555-du1@sofitel.com

ISRR Organizers:
Tamim Asfour (24/7)
ISRR 2019 General Co-Chair
Phone: +49 172 6193436
Email: asfour@kit.edu

Emergency information:
Police assistance: 113
Fire brigade: 115
Medical emergency (Hanoi): 9340555
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<th>Sunday</th>
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<td>9:00 – 10:10</td>
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<td>19:00 – 20:00</td>
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<td>19:00 – 22:00</td>
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