Autonomous Robots (2018) 42:1299–1300
https://doi.org/10.1007/s10514-018-9775-9

Special issue on "Robotics: Science and Systems", 2016

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Published online: 29 June 2018

Welcome to this special edition of *Autonomous Robots* (AURO) which we hope the readers will enjoy as it illustrates some of the most advanced and recent research in robotics. It features some of the papers from the twelfth Robotics: Science and Systems (RSS) conference which was held June 2016 at the University of Michigan in Ann Arbor, MI, USA. The manuscripts in this issue were carefully selected from the papers presented at RSS 2016 which had already gone through a highly competitive selection process. We encourage readers to also look at the special issue of the International Journal of Robotics Research (IJRR) that assembles another set of papers from RSS 2016.

This issue includes 12 papers on the following topics:

- SLAM.
- Planning.
- Autonomous vehicles.
- Sensors and systems for manipulation.
- Multi-robot systems.

We have two papers that fall under the SLAM topic. The paper "Street-View Change Detection with Deconvolutional Networks" by Pablo Fernndez Alcantarilla, Simon Stent, German Ros, Roberto Arroyo, and Riccardo Gherardi, addresses the problem of change detection in videos. It presents an approach that includes a nice combination of IMU/GPS integration, sparse point clouds, super pixels and deconvolutional networks. The paper "Sequence-based sparse optimization methods for long-term loop closure detection in visual SLAM" by Fei Han, Hua Wang, Guoquan Huang, and Hao Zhang, addresses the problem of loop closure detection. It formulates image sequence matching as an optimization problem regularized by structured sparsity-inducing norms. It guarantees the global optimum.

We have three papers under the Planning topic. The paper "Accomplishing high-level tasks with modular robots" by Gangyuan Jing, Tarik Tosun, Mark Yim, and Hadas Kress-Gazit, addresses the problem of synthesizing controllers for modular robots performing tasks using a library of configurations and behaviors. Tasks are formulated as LTL statements transformed into controllers implemented as finite state machines. The presented approach adapts to task requirements through transitions between configurations. The paper "Representing, learning, and controlling complex object interactions" by Yilun Zhou, Benjamin Burchfiel, and George Konidaris, addresses the problem of representation of complex interactions with objects where robot actions indirectly affect the goal. It formalizes the model through a Markov Decision Process and proposes a planning algorithm that finds a suboptimal policy. The paper "Going with the flow: a graph based approach to optimal path planning in general flows" by Dhanushka Kularatne, Subhrajit Bhattacharya, and M. Ani Hsieh, addresses the problem of planning trajectories for ASV/UAV vehicles subject to flows. It presents a graph-based approach for planning time and energy efficient paths.

We have three papers on Autonomous Vehicles. The paper "On the relationship between dynamics and complexity in multi-agent collision avoidance" by Jeffrey Kane Johnson addresses multi-agent collision avoidance in the context of autonomous driving and identifies that the complexity class of collision avoidance in such systems is dependent on their dynamics. When agents can instantaneously change velocity, the problem is posed as a Markov Decision Process and the agents will try to avoid collision with no coordination. Otherwise, coordination is needed and the problem becomes a Partially Observable Stochastic Game. The paper "Planning for Cars that Coordinate with People: Leveraging Effects on Human Actions for Planning and Active Information Gathering over Human Internal State" by Dorsa Sadigh, Nick Landolfi, Shankar Sastry, Sanjit Seshia, and Anca Dragan, addresses the problem of how to incorporate human responses to robot actions for planning in dynamic environments. It poses a particular case of human–robot

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interaction as an under-actuated system approached through methods based on Partially Observable Markov Decision Processes with a policy function that enables pro-active behaviors and aggressive maneuvers. The paper "Routing autonomous vehicles in congested transportation networks: structural properties and coordination algorithms" by Federico Rossi, Rick Zhang, Yousef Hindy, and Marco Pavone, addresses the problem of routing of vehicles in congested road networks proving that rebalancing does not add to congestion in capacity symmetric road networks if there exists a feasible flow of vehicles taking customers to their destination. It also proposes a rebalancing algorithm that decouples routing and rebalancing.

We have two papers under the Sensors and Systems for Manipulation topic. The paper "Integrated proximity, contact and force sensing using elastomer-embedded commodity proximity sensors" by Radhen Patel, Rebecca Cox, and Nikolaus Correll, presents an integrated proximity-force tactile sensor based on an IR emitter detector. This sensor could enable new approaches for grasping and manipulation. It describes in detail the sensor design and its manufacturing and calibration processes. The paper "Four aspects of building robotic systems: lessons from the Amazon Picking Challenge 2015" by Clemens Eppner, Sebastian Höfer, Rico Jonschkowski, Roberto Martn-Martn, Arne Sieverling, Vincent Wall, and Oliver Brock, describes the approach followed by the winning team to the 2015 Amazon Picking Challenge. It splits the design decisions into four dimensions offering guidelines and comparing their design choices to those made by other teams.

We have two papers under the multi-robot systems topic. The paper "Solving the task variant allocation problem in distributed robotics" by José Cano, David R. White, Alejandro Bordallo, Ciaran McCreesh, Anna Lito Michala, Jeremy Singer, and Vijay Nagarajan, addresses the problem of task allocation in distributed heterogeneous robotic systems while optimizing the tradeoff between quality of service and average resource usage. It introduces the notion of task variants and presents three different methods. The paper "Probabilistic approaches to the AXB = YCZ calibration problem in multi-robot systems" by Qianli Ma, Zachariah Goh, Sipu Ruan, and Gregory S. Chirikjian, addresses the problem of calibration of multi-robot systems when some transformations among the reference frames on different robots are known and the others need to be computed. It uses a combination of deterministic and probabilistic solvers for the AXB = YCZ problem.

We would like to thank the reviewers whose reviews and comments on the papers selected for this edition were really outstanding. We would also like to thank Gaurav Sukhatme for providing us the opportunity to assemble this edition, Sarvagnan Subramanian for helping at all the stages of the process and in the interactions with reviewers and authors, and Janani Ganesan and Katrina Turner for helping in the final stages of the production process. We hope the readers will enjoy the papers selected for this special edition of Autonomous Robots devoted to RSS 2016.