Title

Past, Present, and Future of Simultaneous Localization and Mapping

Presenter

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Abstract

Simultaneous Localization And Mapping (SLAM) consists in the concurrent construction of a model of the environment (the map) and the estimation of the state of the robot moving within it. The SLAM community has made astonishing progress over the last 30 years, enabling large-scale real-world applications and witnessing a steady transition of this technology to industry. While a number of problems in SLAM can be considered solved, there is still a huge gap between humans and robots when it comes to world understanding: robot perception can be easily fooled by adversarial instances, requires a large amount of computational resources, and provides a very sparse and fragmented view of the environment in which the robot moves. In this tutorial, I briefly review the algorithmic foundations of SLAM, and I outline a number of open problems that need to be solved in order to bridge the gap between robot and human perception. In particular I discuss key questions like: how can we make SLAM algorithms more robust and reliable? is it possible to run SLAM on a palm-sized drone? what is the role of (deep) learning in the future of SLAM?

Bio

Luca Carlone is the Charles Stark Draper Assistant Professor in the Department of Aeronautics and Astronautics at the Massachusetts Institute of Technology, and Principal Investigator in the MIT Laboratory for Information & Decision Systems (LIDS). He received his PhD from the Polytechnic University of Turin in 2012. He joined LIDS as a postdoctoral associate (2015) and later as a Research Scientist (2016), after spending two years as a postdoctoral fellow at the Georgia Institute of Technology (2013-2015). His goal is to enable human-level perception and world understanding on mobile robotics platforms (micro aerial vehicles, self-driving cars, ground robots) operating in the real world. Towards this goal, his work involves a combination of rigorous theory and practical implementations. In particular, his research interests include nonlinear estimation and probabilistic inference, numerical and distributed optimization, and geometric vision applied to sensing, perception, and decision-making in single and multi-robot systems. His work includes seminal results on certifiably-correct algorithms for localization and mapping, as well as approaches for visual-inertial navigation and distributed mapping. He is a recipient of the 2017 Transactions on Robotics King-Sun Fu Memorial Best Paper Award, and the best paper award at WAFR 2016.

978-1-7281-6211-9/20/$31.00 ©2020 IEEE