
Fully Distributed Estimation and Control for Cooperative Manipulation with Mobile Robots

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Résumé

Résumé: *In this seminar, I will present a distributed approach for the estimation of all the quantities needed for the cooperative manipulation of an unknown load, i.e., kinematic/inertial parameters, time-varying quantities and dynamic state of the load. We assume the load to be manipulated by a pool of ground mobile manipulators. Each robot retrieves a noisy measurement of its velocity and the contact forces applied to the body. Kinematics and dynamics arguments are used to distributively estimate the relative positions of the contact points and the angular velocity. Subsequently, distributed estimation filters and nonlinear observers are used to estimate the load rotational inertia, the relative position between the geometric center of the contact points and the load center of mass, the center of mass velocity, and the load mass. The manipulation strategy is functional to the estimation process, and is suitably designed to satisfy nonlinear observability conditions that are necessary for the success of the estimation. The seminar will be concluded with the presentation of a distributed control strategy that benefits of the estimated quantities in order to effectively move the load in the space.* **Bio:** *Antonio Franchi is a Permanent CNRS Researcher (CR1) at LAAS-CNRS in Toulouse. From 2010 to 2013 he was a Research Scientist and then a Senior Research Scientist at the Max Planck Institute for Biological Cybernetics in Germany, and the scientific leader of the group “Autonomous Robotics and Human Machine Systems”. He received the Laurea degree (summa cum laude) in Electronic Engineering and the Ph.D. degree in Control and System Theory from the Sapienza University of Rome, Rome, Italy, in 2005 and 2009, respectively. He was a visiting student with the University of California at Santa Barbara in 2009. His main research interests include autonomous systems and robotics, with a special regard to control, planning, estimation, human-machine systems, haptics, and hardware/software architectures. He published more than 60 papers in international journals and conferences and in 2010 he was awarded with the “IEEE RAS ICYA Best Paper Award” for his research on Multi-robot Exploration. He is currently Associate Editor of the IEEE Robotics & Automation Magazine and the IEEE Aerospace and Electronic Systems Magazine. He has served as associate editor for the 2014 IEEE ICRA and 2014 IEEE IROS. He co-organized workshops on Haptic Teleoperation and Multiple-robot Systems at IEEE ICRA 2012, ICRA 2013, ICRA 2014, IROS 2014 and RSS 2015 as well as several UAV Shared Control demos at IAS-12 and IEEE SMC 2012 and RSS 2013 and the 2013 ICRA Technical Tour to the Max Planck Institute for Biological Cybernetics. He has some years of working experience in embedded systems and business consulting companies.*

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