Optimal Deployment of Robotic Sensor Networks for Spatial Estimation

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Abstract
This talk considers optimal deployment problems for networks of autonomous robotic sensors and examines their connection with spatial estimation. Given a spatial random field over a region of interest, robotic sensors can improve the efficiency of data collection, adapt to changes in the environment, and provide a robust response to individual failures. We illustrate ways in which systems and control can help us design coordination algorithms to cooperatively optimize data collection, minimize the uncertainty of the estimation, provide individual agents with criteria to help determine when updated information is necessary to positively contribute to task completion, and account for individual failures in communication. Our technical approach provides correctness and performance guarantees by combining ideas and tools from geometric optimization, spatial statistics, self-triggered control, and nonsmooth analysis.

Biography
Jorge Cortes is an Associate Professor with the Department of Mechanical and Aerospace Engineering at the University of California, San Diego. He received the Licenciatura degree in mathematics from the Universidad de Zaragoza, Spain, in 1997, and the Ph.D. degree in engineering mathematics from the Universidad Carlos III de Madrid, Spain, in 2001. He held postdoctoral positions at the University of Twente, The Netherlands, and at the University of Illinois at Urbana-Champaign, USA. He was an Assistant Professor with the Department of Applied Mathematics and Statistics at the University of California, Santa Cruz from 2004 to 2007. He is the author of "Geometric, Control and Numerical Aspects of Nonholonomic Systems" (New York: Springer-Verlag, 2002) and co-author of "Distributed Control of Robotic Networks" (Princeton: Princeton University Press, 2009). He received a NSF CAREER award in 2006 and was the recipient of the 2006 Spanish Society of Applied Mathematics Young Researcher Prize. He has co-authored papers that have won the 2008 IEEE Control Systems Outstanding Paper Award, the 2009 SIAM Review SIGEST selection from the SIAM Journal on Control and Optimization, and the 2012 O. Hugo Schuck Best Paper Award in the Theory category. He is a IEEE Control Systems Society Distinguished Lecturer (2010-2012).