seminar

Cognitive Modeling and Design of Shared Autonomy

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abstract

Shared human-machine autonomy brings together the memory and computational power of machines with the cognitive abilities of human operators in complex and information-rich environments. Realization of efficient shared autonomy will lead to unprecedented possibilities in broad areas, including environmental monitoring, healthcare, manufacturing, and defense. I will present major challenges in design of shared autonomy and highlight my research directions that address these challenges. I will focus on shared human-robot search and surveillance using the multi-armed bandit (MAB) framework. This framework rigorously addresses the fundamental explore-exploit trade-off in decision-making and can be used to systematically study and integrate human and robotic decision-making. I will present an MAB decision-making model that captures human behavioral data and admits performance that can be rigorously analyzed. The model can also be leveraged to learn human expertise. I will use a similar MAB decision-making model to develop distributed algorithms for multi-agent robotic search and surveillance. The common MAB framework facilitates fusion of human decisions with sensor data towards efficient design of shared autonomy.

biosketch

Vaibhav Srivastava received the B.Tech. degree in mechanical engineering from the Indian Institute of Technology Bombay, Mumbai, India, in 2007; the M.S. degree in mechanical engineering and the M.A. degree in statistics from the University of California at Santa Barbara, Santa Barbara, CA, in 2011 and 2012, respectively; and the Ph.D. degree in mechanical engineering from the University of California at Santa Barbara in 2012. Dr Srivastava is currently an Associate Research Scholar with the Mechanical and Aerospace Engineering Department, Princeton University, Princeton, NJ. He received the best paper award (as coauthor) at the 2014 European Control Conference. His research interests include design of shared autonomous systems, information-theoretic design of robotic systems, networked multi-agent systems, and mathematical neuroscience with emphasis on decision-making and animal locomotion.

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