Aerospace and Mechanical Engineering Seminar

Paul Reverdy

Postdoctoral Fellow
Electrical and Systems Engineering
University of Pennsylvania
paul.reverdy@gmail.com

Tools for Physical Human-Machine Intelligence

Recent technological advances have made robotic platforms cheaper and increasingly capable of performing basic tasks such as navigation. Given this explosion of raw capability, the next major challenge in robotics will be to develop methods to appropriately compose low-level behaviors in the service of a high-level task. Such methods must admit reasonable guarantees of correctness and facilitate human-machine interaction.

For many tasks, human experts have relevant knowledge that allow them to achieve significantly higher performance than general but naive machine learning algorithms, including those used in robotics. By developing methods to transfer the relevant human knowledge to machine learning algorithms, we could develop more capable human-machine systems. In this talk I develop two tools in the service of this goal, one by studying human decision making under uncertainty, the other by constructing a bio-inspired decision-making system. I develop a model of human decision-making behavior which depends on parameters that capture the human's prior knowledge about the task, as well as a corresponding observer which solves the parameter estimation problem; performing the estimation quantifies the human's prior knowledge. For the second tool I use a bio-inspired model of decision making to develop a dynamical systems method for task planning and prioritization. I derive conditions under which the method exhibits a stable limit cycle, corresponding to persistently carrying out sequences of low-level behaviors. I close by showing how these decision-making models can be used in several tasks in robotics, including spatial search and gait optimization for legged robots.

Bio
Paul Reverdy received a BS degree in engineering physics and a BA degree in applied mathematics from the University of California, Berkeley in 2007, and MA and PhD degrees in mechanical and aerospace engineering from Princeton University in 2011 and 2014, respectively. From 2007 to 2009, he worked as a research assistant at the Federal Reserve Board of Governors in Washington, D.C.

Reverdy is currently a postdoctoral fellow with the University of Pennsylvania Department of Electrical and Systems Engineering. His research interests are in the areas of control and robotics with current interests in human and automated decision making, machine learning, engineering design, and navigation.

AME Lecture Hall, Room S212
Thursday, April 20, 2017
4 p.m.
Refreshments and socializing 3:45 p.m. at the east end of the AME Courtyard