Seminar

Practice Makes Perfect? Lessons from Human Learning for Robot Learning in Austere Environments

Richard M. Voyles
IEEE Fellow
Daniel C. Lewis Professor of the Polytechnic
Faculty Fellow of the Indiana Manufacturing Institute
Head, Collaborative Robotics Lab
Purdue University, West Lafayette, Indiana, USA

Date: 13 November 2023 (Monday)
Time: 2:00 p.m.
Venue: G5-214, 5/F, Green Zone, YEUNG

Abstract

We tell our children that 'practice makes perfect' but is that really true? Certainly, practice leads to incremental improvement, but what really is the path to 'perfection' for human learners in sensorimotor stills and how does it translate to robot learners? Indeed, humans rarely translate their skills through written instructions (e.g. 'programming'). Humans learn first by imitation and then by repetition and practice. Indeed, much work has advanced the fields of learning by observation in robotics and subsequent practice through reinforcement learning. But humans often plateau in their performance and wind up in local minima. In the human realm, coaching and mentoring are widely encouraged in all sorts of physical and mental endeavors, yet very little literature in robot learning employs these principles. In the Collaborative Robotics Lab, we are engaged in "Learning by Demonstration" and "Coaching by Observation" work that attempts to encompass all three primary forms of human learning of sensorimotor skills: imitation learning, reinforcement by practice, and coaching. This talk will outline such efforts as applied to robots in surgical robotics and emergency response in which we explore novelties in learning that can disambiguate individual style and employ zero-shot learning for coaching. Austere environments come into play when infrastructural constraints demand full autonomy for life-critical tasks, leveraging the symbiosis between human and co-robot.

Biography

Prof. Voyles, the Daniel C. Lewis Professor of the Purdue Polytechnic, is head of the Collaborative Robotics Lab at Purdue University. Previously, he led the National Robotics Initiative at the National Science Foundation. He also served at the White House in the Office of Science and Technology Policy. He is now back to full-time duty at the Purdue Polytechnic. With expertise in electrical engineering, mechanical engineering and computer science, Dr. Voyles' research interest include novel robotic mechanisms, sensors, self-adaptive software, real-time control, and gesture-based human/robot interaction. His professional experience includes IBM, Avanti Optics, Integrated Systems and Dart Controls, tenured academic positions at the University of Minnesota, University of Denver, and Purdue University, positions with the federal government including leading the National Robotics Initiative at the National Science Foundation and Assistant Director for Robotics and Cyber-Physical Systems at the Office of Science and Technology Policy at the White House, and Board of Director positions on The Works, Easton Family Foundation, Minnesota Virtual Simulations and Mark V Automation.