WORKSHOP AT THE 2013 IEEE CONFERENCE ON DECISION AND CONTROL

On December 9, 2013, Girish Chowdhary (Oklahoma State University), Tansel Yucelen (Missouri S&T), Frank Lewis (University of Texas Arlington), Warren E. Dixon (University of Florida), Alborz Geramifard (Massachusetts Institute of Technology), Jonathan P. How (Massachusetts Institute of Technology), andThomas Walsh (Massachusetts Institute of Technology) organized a workshop entitled "**Intelligent Planning and Control: Bringing Together Adaptive Control and Reinforcement Learning for Guaranteeing Optimal Performance and Robustness**" at the 2013 IEEE Conference on Decision and Control. Below you will find this workshop's abstract. Please let Dr. Yucelen know by e-mail if you need a copy of our presentations and/or simulation files that we used in our talks.

Abstract

The problem of selecting the best set of decision actions in order to maximize the expected obtained cumulative reward is common to both biological and mechanical systems. Both autonomous planning and automatic control are concerned with choosing the right set of actions/inputs to maximize the obtained cumulative reward or minimize the incurred cumulative cost. At the heart of several control and planning algorithms are mathematical models that capture the underlying physical phenomena in various engineering applications. The challenge in solving this problem arises from uncertainties that are not captured by the available mathematical models; often introduced due to approximations made while deriving physical models from the first-principles, unforeseen increase in system complexity, time-variations, nonlinearities, disturbance, measurement noise, health degradation, and environmental uncertainties. Adaptive control is a leading methodology intended to guarantee stable high performance controllers in the presence of uncertainty. The problem of making decisions in the presence of uncertainties has also been widely studied in the planning literature. The typical approach there is to formulate these problems in the Markov decision processes (MDP) framework and search for the optimal policy. Solving MDPs without knowing the underlying model using reinforcement learning methods has become popular within the optimization community. The diminishing boundaries between individual fields of engineering and a greater emphasis on performance requirements of the system as a whole are bringing the problems of planning and control under uncertainties closer than ever. This has motivated several researchers to start searching for commonalities between adaptive control and reinforcement learning. The purpose of this workshop is to provide a detailed review of a number of well-established and emerging methods in both adaptive control and reinforcement learning by leading experts in the field. The goal is to create a venue for opening a pathway to merging ideas from these disciplines and allow for a unified presentation of planning and control under uncertainties in a data-rich world.