THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Department of Computing
電子計算學系

Research Seminar

Holistic Control for Cyber-Physical Systems

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Date : 14 July 2020 (Tuesday)
Time : 11:00 a.m. - 12:00 noon

▶ Abstract

The industrial internet of things (IIoT) is leading a new industrial revolution, powered by the emerging technologies of wireless sensor-actuator networks, edge computing, and machine learning. In traditional industrial control, plant control and network management operate in isolation, ignoring the significant dynamic interactions between networks and physical plants. In sharp contrast, a cyber-physical systems (CPS) approach closely integrates cyber (i.e., computation and communication) and physical processes. To enhance IoT-driven plant control performance, and network efficiency, and to improve the resiliency of the system to cyber and physical interferences, we propose holistic control -- a CPS approach. The holistic control framework closes the loop of plant control, networks, and computation at run-time. In this talk, I will present three aspects of my recent work on CPS holistic control: holistic wireless control, holistic edge control, and hybrid simulation tools for holistic control. First, I will describe the design and evaluation of holistic control that exploits a range of wireless network reconfiguration strategies, and will introduce novel network reconfiguration protocols tailored for holistic control. Next, I will explore holistic edge control for multi-tier CPS, using a learning-based approach to illustrate the trade-offs between computation and communication in terms of control performance. Finally, I will discuss hybrid simulation tools for holistic control. These real-time wireless cyber-physical simulators integrate real wireless sensor-actuator networks (WCPS-RT), edge computing platforms (WCPS-EC), and simulated physical plants.

▶ About the Speaker

Yehan Ma is a Ph.D. candidate under the supervision of Chenyang Lu in the Department of Computer Science and Engineering, Washington University in St. Louis, USA. She earned B.S. and M.S. from Harbin Institute of Technology in 2013 and 2015. Ma's research focuses on the design and analysis of Cyber-Physical Systems (CPS) approaches for the Industrial Internet of Things (IIoT), integrating wireless sensor-actuator networks, edge computing, machine learning, and physical plant control. She is the recipient of a Washington University Fullgraf Fellowship (2015-2020) and a Chinese National Scholarship (2011).

ALL are welcome!

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