Mobile Actuator and Sensor Networks (MAS-net) for Cyber-Physical Systems (CPS)

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Abstract
Computational thinking and integration of computation around the physical dynamic systems form the Cyber-Physical Systems (CPS) where sensing, decision, actuation, computation, networking, and physical processes are mixed. CPS's will "transform how we interact with the physical world just like the Internet transformed how we interact with one another." And CPS "will be everywhere, used by everyone, for everything." [1] CPSs will be mostly infinite-dimensional spatial-temporal complex dynamic systems. Therefore, when we consider the measurement and control of distributed parameter systems (DPS), we need first to consider the spatial domain of interest and then to consider the actuator/sensor configurations. We should consider 1) if the sensor/actuators are collocated or noncollocated; 2) sensor/actuators are point, filament, regional, whole domain, or boundary; 3) sensor/actuators are movable or static 4) sensor/actuators are communicating to the neighbors or not. So, there are totally 2x5x5x4x4 = 800 possibilities. There are obviously rich and exciting research questions with today's technology. In this lecture, summarizing research efforts on mobile actuator and sensor networks (MAS-net) at CSOIS (Center for Self-Organizing and Intelligent Systems) since 2002, the speaker expects to demonstrate that MAS-net for CPSs is exciting. Movie clips will be shown from some preliminary results of mobile actuator and sensor networks (MAS-net) for cyber-physical systems.
[1] http://www.nsf.gov/attachments/111601/public/cps-summit.ppt

Biography
YangQuan Chen is an Associate Professor of Electrical Engineering at Utah State University. He earned his Ph.D. from Nanyang Technological University, Singapore in 1998. His current areas of research interests include: distributed measurement and distributed control of distributed parameter systems using mobile actuator and sensor networks, smart mechatronics and controls (intelligent, optimal, robust, nonlinear and adaptive), applied fractional calculus, UAV cooperative control for remote sensing and real time water management and irrigation control. He holds 13 granted and 2 pending US patents. He is an author of two research monographs (Springer-Verlag 1999, 2007), 6 textbooks (SIAM Press 2007; Taylor & Francis/CRC 2008 and Tsinghua University Press 2002, 2004, 2007, 2008) and over 100 refereed journal papers and book chapters. His latest research monograph is "*Optimal Observation for Cyber-Physical Systems: A Fisher-information-matrix-based Approach*" (Springer, 2009). He was and will be the Program Chair for ASME/IEEE Int. Conf. on MESA (Mechatronics and Embedded Systems and Applications) 2007 and 2009, respectively. He has been an Associate Editor for IEEE CSS Conference Editorial Board since 2002. He is a senior member of IEEE, a member of ASME, AUVSI, AMA (Academy of Model Aeronautics), AWRA (American Water Resources Association) and ASEE (American Society of Engineering Educators).