



**THE CHINESE UNIVERSITY OF HONG KONG**  
Department of Information Engineering  
*Seminar*

**Tractable Solutions to Some Game Problems in Complex Cyber-Physical Systems**

by

**Professor Wei Zhang**

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the Ohio State University, USA**

**Date : 20<sup>th</sup> July, 2018 (Fri)**  
**Time : 11:00am – 12:00noon**  
**Venue : Room 833, Ho Sin Hang Engineering Building  
The Chinese University of Hong Kong**

Abstract

I will present our recent results on two classes of game problems. The first one is on mean-field games which involve a large number of dynamic agents whose decision problems are “weakly” coupled. Such games arise naturally in a variety of societal CPSs (e.g. smart grid, intelligent transportation, smart city) and are often very challenging to solve in general. I will briefly discuss the existing theoretical tools in mean-field games, point out the significant gap between theory and applications, and then introduce our recent results that can bridge this gap for an important class of mean-field games. Different from many previous studies, our results are based on a novel optimization perspective that connects a mean-field game to a related (sometimes equivalent) optimization problem in function space. Such a connection can significantly simplify the characterization, analysis, and computation of the mean-field equilibrium, leading to tractable solutions for societal scale applications. I will also discuss the relation between our results and the existing results in potential games.

The second part of my talk will be on differential games. Such game formulation has been widely used to study control and planning problems of multiagent systems under adversarial uncertainties. I will introduce a reachability based approach to study differential games and presents a scalable algorithm to solve a class of multiplayer differential games. The results will be demonstrated through some simulation studies as well as some field experiments for which the proposed strategy is used to provide decision support to human and AI agents in playing some common outdoor games (e.g. capture-the-flag game) and computer games (e.g. StarCraft).

Biography

Wei Zhang is an Associate Professor of Electrical and Computer Engineering at the Ohio State University. He received the B.S. in Automatic Control from the University of Science and Technology of China in 2003, and the M.S. in Statistics and the Ph.D. in Electrical Engineering both from Purdue University in 2009. From January 2010 to August 2011, he was a Postdoctoral Researcher in the EECS Department at UC Berkeley. His research interests include hybrid systems, optimal control, game theory, and their applications in power systems, robotics, and intelligent transportations. He is a recipient of the NSF CAREER award and the Lumley Research Award at OSU. He is currently an Editor of IEEE Transactions on Power Systems and an Associate Editor of the IEEE Transactions on Control System Technology.

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