The Hong Kong Polytechnic University
Department of Applied Mathematics
Colloquium

Estimation Theory for LQG and Nonlinear Major-Minor Agent Systems : Part II

by

Prof. Peter E. Caines

McGill University

A distinctive feature of the mixed agent system MFG theory (introduced by M. Huang in the LQG case in 2010), where there are Major (non-asymptotically negligible) and Minor agents, is that the presence of the Major agent causes the system's mean field to become stochastic. Consequently, when Minor agents have only partial (i.e. noisy) observations on the Major agent, the Minor agents must recursively estimate both the Major agent's state and the system's mean field in order to generate the feedback control actions yielding epsilon-Nash equilibria. Results for this situation in the LQG case will be presented in this talk.

In the non-linear case, the infinite population MM-MFG equations become a pair of backward stochastic Hamilton-Jacobi-Bellman (SHJB) and a pair of stochastic McKean-Vlasov (SMV)-FPK equations characterizing the state distribution measure of the Major agent and the measure determining the mean field of the Minor agents.

To analyze the non-linear MM-MFG problem when the Major agent's state is partially observed we first develop nonlinear filtering theory for partially observed stochastic dynamical systems described by McKean-Vlasov stochastic state equations.

We then consider the nonlinear Partially Observed (PO) MM-MFG problem where (i) each Minor agent has partial observations on the Major agent's state and (ii) the Major agent has complete observations on its own state. By application of the standard separation methodology of stochastic control, the existence and uniqueness of epslion-Nash equilibria are then analyzed in the framework where the best response control law of any Minor agent depends on the individual agent's state and its local conditional distribution of the Major agent's state.

Work with Arman Kizilkale, Mojtaba Nourian and Nevroz Sen.

Date : 12 November, 2014 (Wednesday)
Time : 10:30a.m. – 12:00noon
Venue : HJ610, The Hong Kong Polytechnic University

*** * * ALL ARE WELCOME * * ***