Hamilton Institute

The Nash Certainty Equivalence Principle in Large Population Stochastic Control: Connections to Statistical Mechanics, Biology and Economics

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Abstract

We first consider linear quadratic Gaussion dynamic games in large population systems where the agents are coupled via their individual cost functions and their dynamics. A state aggregation technique is developed to obtain a set of decentralized control laws for the individuals which possesses a *NASH* equilibrium property. These results then generalize to classes of nonlinear stochastic dynamic games.

The central notion of the Nash Certainty Equivalence Principle is the existence (proved by fixed point theory) of a mutually consistent pair of (i) the mass effect of the overall population behaviour and (ii) the set of individual trajectories optimally controlled by each agent with respect to the mass effect (treated as an exogenous quantity) so that the latter collectively produce that effect. The methodology extends to the control of point process call requests and assignments in large communication networks.

The connections between this formulation and methods in statistical mechanics (in particular McKean-Vlasov systems), biology (e.g. flocking, vaccinations) and economic behaviour (e.g. many firm industries) will be indicated.

Work with Minyi Huang (Carleon U.,Ottawa) and Roland Malhamé (École Poly.,Montreal).

Venue: Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

Time: 2.00 - 3.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

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