

Industrial and Systems Engineering Seminar

Analyzing Scrip Systems

Wednesday, February 26

3:15 PM – Refreshments before the Seminar

3:30 PM – Graduate Seminar

Mechanical Engineering Room 4125 A & B



Professor Peng Sun

Associate Professor

Duke University – The Fuqua School of Business

Scrip systems provide a non-monetary trade economy for exchange of resources. We model a scrip system as a stochastic game and study system design issues on selection rules to match potential trade partners over time. We show the optimality of one particular rule in terms of maximizing social welfare for a given scrip system that guarantees players' incentives to participate. We also investigate the optimal number of scrips to issue under this rule. In particular, if the time discount factor is close enough to 1, or trade benefits one partner much more than it costs the other, the maximum social welfare is always achieved no matter how many scrips are in the system. When the benefit of trade and time discount are not sufficiently large, on the other hand, injecting more scrips in the system hurts most participants; as a result, there is an upper bound on the number of scrips allowed in the system, above which some players may default. We show that this upper bound increases with the discount factor as well as the ratio between the benefit and cost of service. Finally, we demonstrate similar properties for a different service provider selection rule that has been analyzed in previous literature.

Bio: Peng Sun is an Associate Professor in the Decision Sciences area at the Fuqua School of Business, Duke University. His research interests lie primarily in the areas of mathematical theories and models for resource allocation decisions under uncertainty, and incentive issues in dynamic environments, with applications in marketing, operations management, economics and finance. He serves an Associate Editor at *Operations Research*, and an Associate Editor at *Management Science*. At the Fuqua School, he teaches MBA courses *Decision Models* and *Strategic Modeling and Business Dynamics*, and PhD course *Dynamic Programming and Optimal Control*. Professor Sun received his B.E. from Tsinghua University in China in 1998, and PhD in Operations Research from MIT in 2003.