T2. Dynamic Games, Learning and Distributed Optimization for Wireless Networks

Abstract:

While game theory has been recognized of being one of the dominant paradigms to analyze important problems like congestion, routing, spectrum auction, new areas of applications have appeared recently, which explains a recent surge of game theory in communication networks.

Among the underlying key concepts we find the cognitive radio concept, the case of unlicensed bands, the case of decentralized or distributed wireless networks (e.g., ad hoc networks). When inspecting the corresponding literature, it appears that a significant part of the existing papers using game theory for communication problems is based on static (one - shot) games and strong information and behavior assumptions and quite often exploit the Nash equilibrium notion. One of the purposes of this tutorial is to review the most basic game- theoretic notions which are commonly used in the wireless literature, emphasize their weaknesses, and provide alternative or more advanced notions to deal with typical wireless networks features (e.g, the time-varying nature of communication channels, limited channel state information, QoS constraints, network scalability aspects). More specifically, the emphasis would be on providing:

- a significant number of possible (game) solution concepts;
- a clear presentation on three classes of dynamic games (repeated games, stochastic games, difference games);
- several classes of distributed algorithms related to game theory.

One additional feature of this tutorial is that the presenter will strive to connect game theory to distributed optimization, learning algorithms to games, and game theory to communication theory.

Speaker's Biography:
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Prof. Samson Lasaulce received his BSc and Agrégation degree in Applied Physics from Ecole Normale Supérieure (Cachan) and his MSc and PhD in Signal Processing from Ecole Nationale Supérieure des Télécommunications (Paris). He has been working with Motorola Labs for three years (1999, 2000, 2001) and with France Télécom R&D for two years (2002, 2003). Since 2004, he is also Professor at École Polytechnique. His broad interests lie in the areas of communications, signal processing and information theory with a special emphasis on game theory for wireless communications. Samson Lasaulce is the recipient of the 2007 ACM/ICST International Conference on Performance Evaluation Methodologies and Tools (VALUETOOLS) and 2009 International Conference on Cognitive Radio Oriented Wireless Networks and Communications (CROWNCOM) best student paper awards.He organized (as General Chair) the 5th ACM/ICST International Conference and the 5th Conference on Performance Evaluation Methodologies and Tools (VALUETOOLS) and several workshops on game theory for wireless networks such as the ACM/ICST International Workshop on Game Theory in Communication Networks (GAMECOMM), 2009, Paris, France, the AMC/IEEE International Workshop on Wireless Networks: Communication, Cooperation, and Competition (WNC3), 2008, Berlin, Germany (in conjunction with WIOPT).

He is the main author of the book "Game Theory and Learning for Wireless Networks: Fundamentals and Applications" (Academic Press, August 2011) wrote seven book chapters the topics of wireless games, published about twenty journal papers and fifty conference papers on this topic. Samson Lasaulce is the holder of five patents and is currently an Associate Editor of the IEEE Transactions on Signal Processing.