Multiagent Coordination for Electricity Demand Management in Consumer Cooperatives

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Two key issues in creating a sustainable and energy efficient society are reducing peak energy demand and increasing the penetration of renewable sources of energy. Recent technological advances in smart meters (that can communicate hourly energy consumption), smart appliances, renewable generation, and storage technologies have the potential to reduce energy costs for an individual (as well as produce societal benefits) by enabling direct and real time participation of an individual consumer in the energy market. However, there are two key problems in realizing this potential. First, despite the presence of small pilot programs where the utilities have direct control over user appliances through smart meters, the end users are not usually of sufficient size for the utilities to care about them for demand response and ancillary services, and also users are concerned about ceding control of their appliances to utility companies. Second, if end users participate in the markets directly, without control by the utility companies, the stability of the system may be compromised due such uncontrolled distributed interactions. One way to overcome these challenges is to allow partial centralization of the consumers to form consumer groups that participate in the market through a group coordinator (mediator) agent. Such consumer configurations have the potential to increase energy efficiency via aggregation of demand to reduce peak power consumption, and direct participation in the energy markets. Additionally we consider that such a consumer group could have both renewable energy generation and storage capabilities. In this talk, I will present the model of consumer cooperatives and theoretical results of decentralized coordination algorithms to optimize electricity demand side management in such cooperatives.

Short Bio of Dr. Katia Sycara

Dr. Katia Sycara is a Research Professor of Robotics at Carnegie Mellon University and holds the Sixth Century Chair in Computing (part time) at the University of Aberdeen, UK. She holds a PhD in Computer Science from Georgia Institute of Technology and an Honorary Doctorate from the University of the Aegean, Greece. She is a Fellow of the Institute of Electrical and Electronic Engineers (IEEE), Fellow of the Association for the Advancement of Artificial Intelligence (AAAI) and the recipient of the 2002 ACM/SIGART Agents Research Award. She is the co-recipient of the Semantic Web Scientific Association most influential 10-year paper awards (two years in a row) for the years 2011 and 2012. She has served as a member of various industry and government Scientific Advisory Boards, and as member of organization committees for numerous conferences. She has authored or co-authored more than 500 technical papers, and has received many best paper awards. Her robot team has won various awards in the Robocup Rescue competitions. Her research interests include multi-robot systems, complex dynamic networks, decentralized optimization, multi-agent coordination,

negotiation, games, semantic web technologies She has applied her research to multiple application areas. She is a founding member and has served on the Board of Directors of the International Foundation of Autonomous Agents and Multiagent Systems (IFAAMAS). She is a founding member of the Semantic Web Science Association. She founded the journal “Autonomous Agents and Multiagent Systems”, and served as Editor in Chief (1998-2007). She is on the editorial board of 6 other journals