IEEE WOMEN IN ENGINEERING DISTINGUISHED LECTURER PROGRAM

Multi-Criteria Decision-Making Algorithms: From Individual to Collective Autonomous Decision-Making

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Abstract

This talk is about the recent advances in decision-making techniques and their applications in autonomous systems. Decision-making is usually required when we are confronted with conflicting objectives and is in fact a very challenging task even for human decision-makers, since we first need to find all the possible optimal alternatives and then make the right choice using a decision policy.

In this talk, we replace the human decision-maker with an autonomous system and intend to provide novel methodologies for multi-criteria decision-making on a range of scenarios in which the autonomous systems are confronted with conflicting objectives. This will enable such systems to change their (pre-defined) decision policy according to the unforeseen circumstances. This ability can contribute to their applicability in critical missions, such as rescue robotics where the intervention of a human-controller is not always possible. The challenge is not only in finding and selecting the best alternative, but also in acting in a limited timeframe during the mission. One more focus of the talk is on the individual vs. collective decision-making algorithms. We will show that collective learning of a decision policy can help both the individual and the collective to act in an efficient way. Furthermore, individual decision-making and its interplay with a collective decision-making is being addressed and various forms of decision-manipulations using the environment are described and discussed.

Bio

Sanaz Mostaghim is a full professor of computer science at the chair of Computational Intelligence and the founder and head of SwarmLab at the Faculty of Computer Science, Otto von Guericke University Magdeburg, Germany. She holds a PhD degree (2004) in electrical engineering from the University of Paderborn, Germany. Sanaz has worked as a postdoctoral fellow at ETH Zurich in Switzerland and as a lecturer at Karlsruhe Institute of Technology (KIT), Germany, where she received her habilitation degree in applied computer science. Her research interests are in the area of multi-criteria decision-making, collective learning and decision-making, and their applications in robotics and science. Sanaz is the deputy chair of the Informatics Germany and a member of the advisory board on Digitalization at the ministry of Economy, Science and Digitalization, State Saxony-Anhalt, Germany. She is an active member of IEEE Computational Intelligence Society (CIS) and serves as a member of the CIS Administration Committee. She is associate editor of IEEE Transactions on AI, IEEE Transaction on Evolutionary Computation and member of the editorial board of several international journals on Robotics and AI. Since 2020, she is appointed as a distinguished lecturer at IEEE CIS.