Mechanical Engineering Seminar
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Scalable Planning and Learning under Uncertainty for Multiagent Systems

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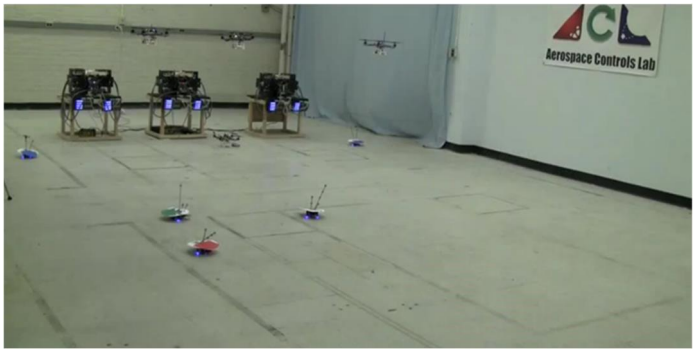
Abstract



Multiagent planning problems are ubiquitous in engineering. The combinatorial and stochastic nature of these problems and the exponential dependency of the planning space on the number of agents render many of the existing algorithms practically infeasible for real-life applications. A standard approach to improve the scalability of planning algorithms is to take advantage of the domain knowledge, such as decomposing the problem to a group of sub-problems and exploiting decouplings among the agents, but such domain knowledge is not always available. In this talk, we focus on development of scalable multiagent planning and learning algorithms for heterogeneous teams by using embedded optimization processes to automate the search for decouplings among agents, thus decreasing the dependency on the domain knowledge. In the first part of the talk, we introduce the Randomized Coordination Discovery (RCD) algorithm, which is a stochastic method for automating the search for finding coordination structures among the agents in Multiagent Markov Decision Processes. The algorithm is guaranteed to converge under mild assumptions and outperforms the compared multiagent planning methods across different large-scale multiagent planning problems. In the second part of the talk, we introduce a multiagent learning framework where the agents learn linear function approximations of environmental dynamics and share these models across each other to speed up the learning process. In the final part of the talk, we examine verification of the algorithms on indoor flight tests conducted at MIT.

Short Bio

Dr. Nazim Kemal Ure obtained his B.Sc. degrees in Aeronautical Engineering and Astronautical Engineering (double major) from Istanbul Technical University (ITU) in 2008. He obtained his M.Sc. degree in Defense Technologies from ITU in 2010. During his studies at ITU he worked on developing motion planning and control algorithms for agile maneuvering aircraft. He obtained his Ph.D. degree in Aerospace Engineering from Massachusetts Institute of Technology (MIT) in 2015. At MIT, he was the leading research assistant in projects funded by Boeing R&T and NASA, which involved developing planning algorithms and conducting hardware experiments for autonomous aerial and ground vehicles. Dr. Ure has been working as an Assistant Professor in ITU Aeronautical Engineering department since 2015. He is currently affiliated with ITU Aerospace Research Center (ARC). His main research interests are decision making under uncertainty and learning for autonomous systems and development of high performance guidance navigation and control algorithms. He has been involved in several projects supported by EC, BOEING, NASA, Turkish Airlines, ASELSAN and TUBITAK as the leading researcher and project manager. He is also a Marie Curie Sklodowska fellow as of 2017.