Operations Research Seminar

Autonomous Systems for Optimal Probabilistic Search and Identification

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14:50-15:15 Refreshment outside GL-239
15:15-16:15 Seminar at GL-115

Autonomous systems are a key component of many current and future operations in both civilian and defense contexts. Methods for probabilistic search, a classic problem in operations research, can leverage today's advances in computation and information processing to employ autonomous elements ranging from unmanned search platforms to real-time decision making control algorithms. Interesting challenges include searching for multiple dynamic objects, determining their respective identities, and coordinating the team of heterogeneous agents performing these tasks. In this talk, we present a framework combining recursive Bayesian probability and mixed integer linear program optimization models to address such challenges. Real-time feedback of gathered information autonomously drives the timely re-optimization of searchers' routes, thereby improving the overall knowledge of object locations and identities in the search environment. We provide some insights derived from both numerical studies and field experiments at Camp Roberts, California using multiple unmanned aerial vehicles (UAVs) and ground teams, and highlight their relevance to other application areas such as models for human visual search.
