

UTC Institute for Advanced Systems Engineering Seminar Series



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HIERARCHICAL MULTI-OBJECTIVE PLANNING FOR AUTONOMOUS SYSTEMS

Friday, April 25, 2014

4:00 – 5:00 p.m.

Storrs Campus, UTEB 150

Abstract: In this talk we will describe a hierarchical planning framework for mission planning and execution in uncertain and dynamic environments. We consider missions that involve motion planning in large, cluttered environments, trading off mission objectives while satisfying logical/spatial/temporal constraints. Our framework enables the decomposition of the planning problem across different layers, leveraging the difference in spatial and temporal scales of the mission objectives. Of the hierarchical planner we will describe, more specifically, a novel motion planning algorithm that, starting from a probabilistic roadmap, efficiently constructs an expanded graph used to search for the optimal solution of a multi-objective problem. The primary cost is the shortest path from start to goal and the secondary cost is related to the state estimation error covariance. This needs to be optimized as we assume the navigation to be in a GPS denied environment. The proposed algorithm is efficient as it relies on a scalar metric, related to the largest eigenvalue of the error covariance, and adaptively quantizes the secondary cost, yielding a graph whose number of vertices and edges provides a good tradeoff between optimality and computational complexity.

Speaker Bio: Alberto Speranzon received the “Laurea” degree in computer engineering from University of Padova, Italy in 2000, the Tech. Lic. and Ph.D. in automatic control from the School of Electrical Engineering, Royal Institute of Technology, Stockholm, Sweden in 2004 and 2006, respectively. Since 2008 he is a Research Scientist at United Technologies Research Center, in East Hartford, CT, USA. At UTRC, Alberto served as project manager and principal investigator for DARPA's ASPN program on novel methods for distributed localization of multiple vehicles in GPS degraded/denied environments combining adaptive filtering, graph theoretical and algebraic topological methods. His research interests are mainly in the area of distributed control, estimation and optimization, with particular focus on multi-vehicle systems and wireless sensor networks. Alberto's received the Outstanding Achievement Award in 2009 from United Technologies Research Center. Before joining UTRC, between October 2006 and September 2008, he was a Marie Curie Research Fellow at Unilever R&D, Port Sunlight, UK. During 2006-2008 he was a regular visitor at University of California at Berkeley, USA working on decentralized estimation over sensor networks.