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Title:

B-COHRINT: Bayesian Cooperative Human-Robot Intelligence

Abstract:

Truly intelligent autonomous robots must be able to reason about uncertainty on their own. This is difficult in many applications due to inherent physical and computational limitations, which often means that human supervision must enter at some level. As robotic systems become more sophisticated and complex, the problem of keeping humans in the loop also becomes more challenging, though no less critical. Indeed, research in human factors and robotics strongly suggests that truly intelligent automation should understand, support and exploit human intelligence whenever possible to avoid misunderstandings or unsafe behaviors.

This talk will focus on cooperative human-robot intelligence (COHRINT) in the context of information-driven applications such as search and rescue. In particular, I will discuss how novel Bayesian hybrid probabilistic modeling and state estimation techniques allow us to define a rigorous statistical framework for combining human-robot perceptual reasoning abilities. I will show how generalized Kalman filters for robotic perception can be designed to operate on conventional robotic sensor data as well as on "human sensor data" in the form of semantic language observations about the world. I will also briefly describe recent work with cognitive science researchers at George Mason University on predictive probabilistic modeling of human supervisory control performance as a function of cognitive traits, such as working memory capacity. I will present experimental results from multiple target search missions with both real and simulated human-robot teams which demonstrate the effectiveness of these statistical modeling approaches and suggest interesting paths for future work.