

Field Robotics Center Seminar Series

Tuesday, May 3, 2011 GHC 2109 noon - 1pm

Pizza will be served.

Please note special time.



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Imitation Learning for Task Allocation

Abstract

At the heart of multi-robot task allocation lies the ability to compare multiple options in order to select the best, a process grounded in the concept of utility. In some domains however, computing utility is not straightforward, for example due to complex underlying dynamics, heterogeneous agents, or an unmodeled adversary. Explicitly modeling these extrinsic influences well enough so that they can be accounted for in utility computation (and thus task allocation) may be intractable, but a human expert may have domain knowledge or previous experience. Though this knowledge may be hard to articulate into an explicit algorithm, policy, or utility mapping, the expert will generally be able to recognize a good solution.

We propose to harness the expert's intuition by applying imitation learning to the multi-robot task allocation domain. Using a market-based task allocation method, we steer the allocation process by biasing prices in the market according to a function which we learn using a set of demonstrated allocations (the expert's solutions to a number of domain instances). Imitation learning provides an intuitive way to utilize the expert's knowledge about the environment, while requiring only a small number of demonstrations and no manual tuning of high-dimensional reward functions. We present results in two distinct domains: a disaster response scenario where a team of agents must put out fires that are spreading between buildings, and an adversarial game in which teams must make complex strategic decisions and reason about their opponents.

Speaker Bio

Felix Duvallet is a third year PhD student at the Robotics Institute, advised by Tony Stentz. His research interests lie at the intersection of Machine Learning and Field Robotics, in order to enable robots to accomplish complex tasks in unstructured environments. He received a B.S. in Electrical and Computer Engineering from Carnegie Mellon University in 2007, where he worked with Sanjiv Singh on the Trestle project as well as the Robot Colony project at the CMU Robotics Club. After that, he spent a year in Brisbane, Australia with the Autonomous Systems Lab of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). There he developed a WiFi localization system for use on an autonomous Hot Metal Carrier, a large forklift-type vehicle used in aluminum smelters.

For more information, please contact:

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