NRI: FND: Connected and Continuous Multi-Policy Decision Making

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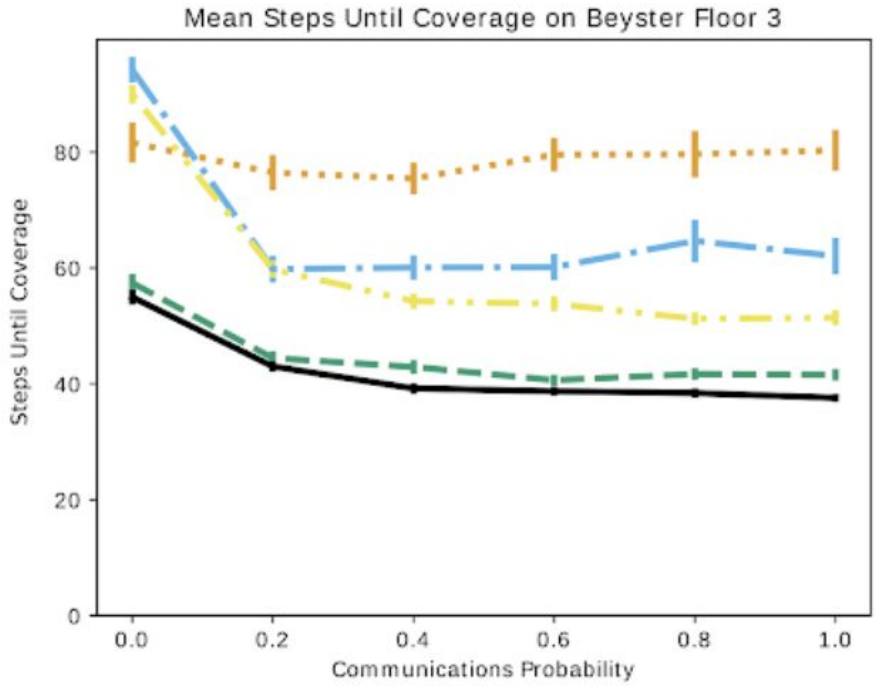
Award # 1830615, Award Date September 2018

Challenge

- How can teams of robots coordinate over long time scales with poor communications?

Solution

- Plan in policy space, rather than action space
- Use Monte-Carlo simulations to dynamically select *which* policies to use



Versus picking a single policy (shown in different colors), dynamically switching between policies (black) results in faster mission completion time than any other policy.

Scientific Impact

- Policy-space planning using monte-carlo simulations for evaluation is promising for its ease-of-implementation, high performance, and good generalization to new environments.

Broader Impact

- Applications: Robot teams for search/rescue; agriculture; autonomous driving
- Versions of these algorithms gaining commercial interest

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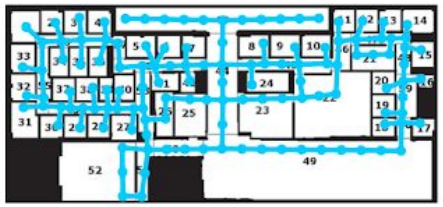
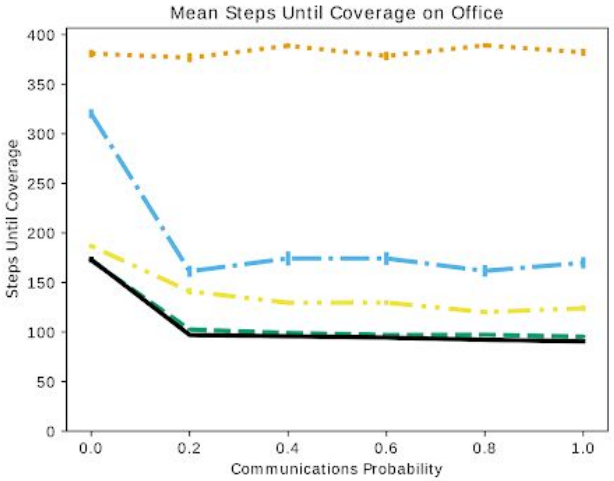
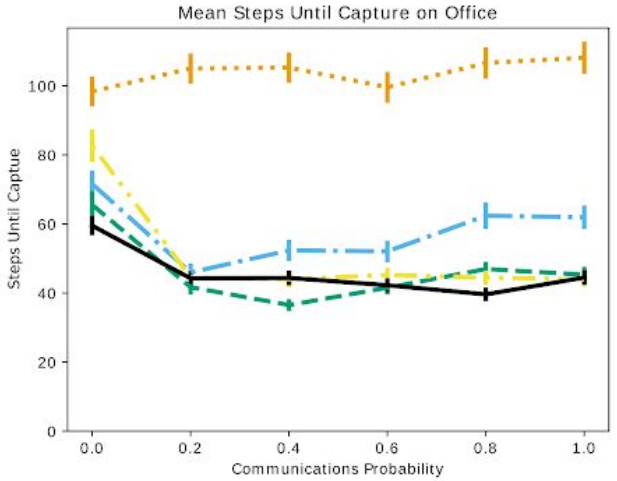
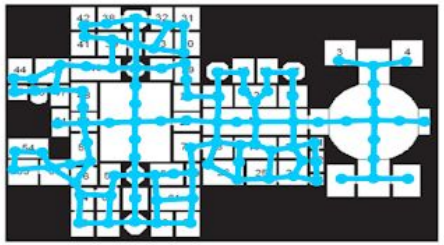
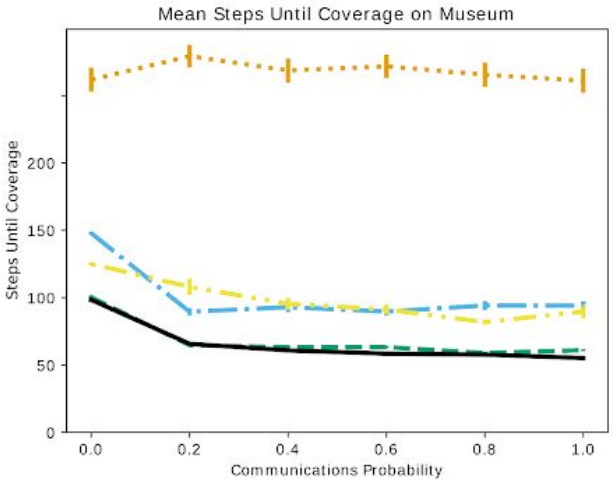


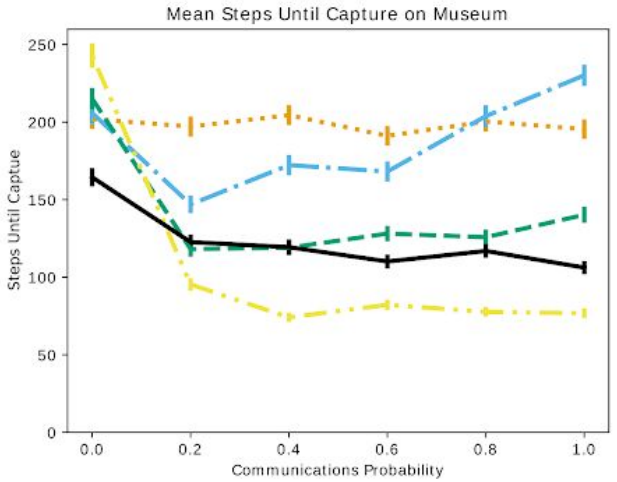




Museum







Why I'm excited about this work--

- The best strategy for a team of robots is often environment dependent.
  - It's often hard to predict what strategy will work best a priori!
- By dynamically picking strategy/policy, MPDM shows good generalization performance over a range of not only environments, but also *tasks*.

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The PI has a financial interest in a company that may have rights to foreground or background technology described here.