The Field Robotics Center

Seminar Series

Monday, 18th April **GHC 2109 9:00 – 10:00am**

Breakfast will be served

Joseph Amato
M.S. Student
Robotics Institute

Symbiotic Planning for Planetary Exploration

Abstract: Traditional planetary exploration missions have relied upon a single rover acting as the sole mission asset. As exploration pushes us closer and closer to high-risk high-reward locales on the Moon and Mars, such an approach is no longer ideal. Instead, multiple heterogeneous rovers operating in a symbiotic fashion, complementing each other's strengths and weaknesses, can lead to much greater scientific payout while simultaneously reducing mission risk. This is the core idea behind Symbiotic Exploration.

Symbiotic Exploration offers many benefits, but poses algorithmic challenges within the context of path planning. Such challenges include resource-aware planning and rendezvous and maintaining communications between the rovers for the duration of their plans. While these have been addressed individually through previous work, this research proposes and implements a symbiotic path planning algorithm capable of simultaneously addressing all these constraints while planning routes through highly dynamic planetary environments.

This research shows that routes do exist to high-interest, permanently shadowed sites on the Moon while maintaining symbiotic constraints. The capability set required of each rover to explore these sites is analyzed and determined. Such regions have been previously considered inaccessible but, through the paradigm of Symbiotic Exploration, can be thoroughly explored with significantly reduced risk.

Speaker Bio: Joseph Amato is a M.S. student in the Robotics Institute at Carnegie Mellon University co-advised by Profs. William "Red" Whittaker and David Wettergreen. He received his B.S. in Robotics Engineering at Worcester Polytechnic Institute in 2012 and spent two years working for Army Operational Test Command at Ft Hood, Texas, before beginning graduate school. His current research focuses on path planning for multiple rovers in planetary environments.




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