

Coordinated Multi-Robot-Chain for Terrain Estimation and Exploration

Early Career Faculty Award (ECF):

Topic 1 – Coordinated Multi-Robots for Planetary Exploration

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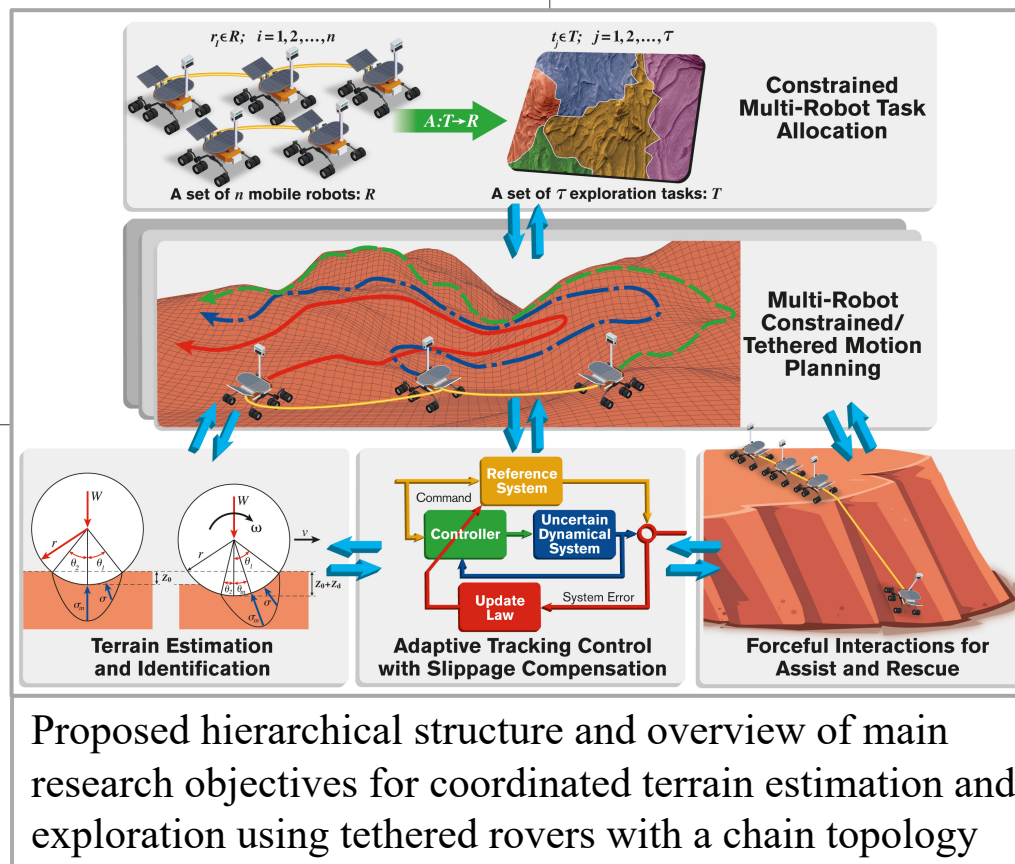
Approach

Design computationally efficient algorithms for:

- Multi-robot task allocation & robust RRT* with invariance tubes and topological constraints
- Terrain estimation with unknown sinkage and parameters & adaptive tracking control with slippage compensation
- Rover arrangement & constrained control with tether management for forceful cooperative object transport

Research Objectives

- Make advances in algorithm design for tethered multi-robot teams for terrain exploration and estimation
- Innovation:** Teamwork improves efficiency & tether enables assist (e.g., steep descent) and rescue (e.g., entrapped rover)
- Synergy of navigation, terrain estimation and forceful interaction
- Start TRL: 1 (algorithm design)
- End TRL: 3 (tested in simulation and lab-scale experiments)



Potential Impact

- Planetary terrain estimation and exploration missions can be enhanced with teamwork
- Valuable rovers that temporarily fail need not be abandoned
- Tethers that enable rescues allow rovers to take calculated risks to reach and study an otherwise unattainable science location
- Technology applicable to other cooperative autonomous missions with or without human supervision