

Power Distribution System for Continuous Operation

Nina Mahmoudian

Goal

Develop innovative mobile power distribution systems that lower deployment and operating costs, while simultaneously increasing mission efficiency, and supporting the network's need to be responsive to changing physical conditions and diverse environment.



Approach

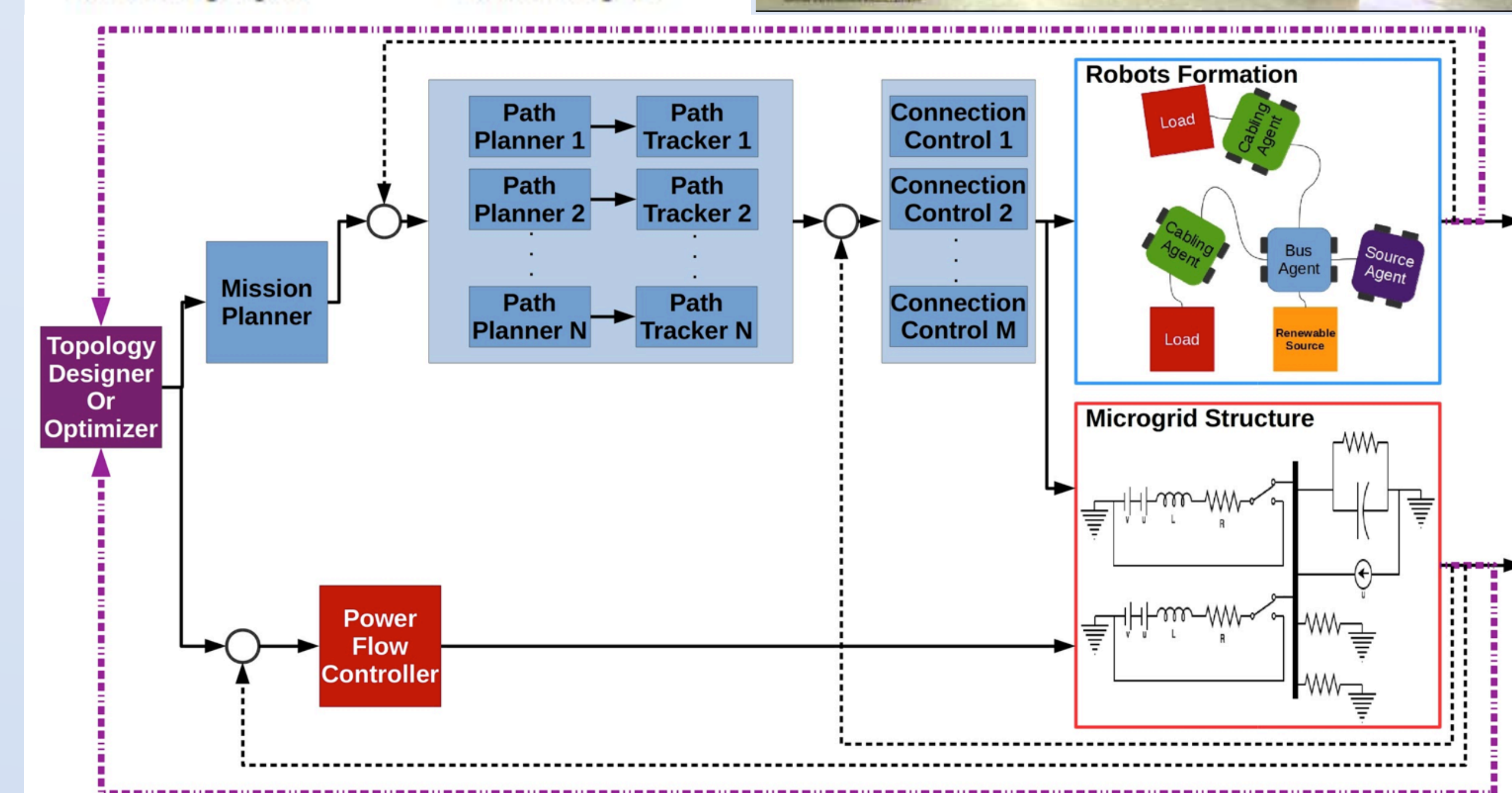
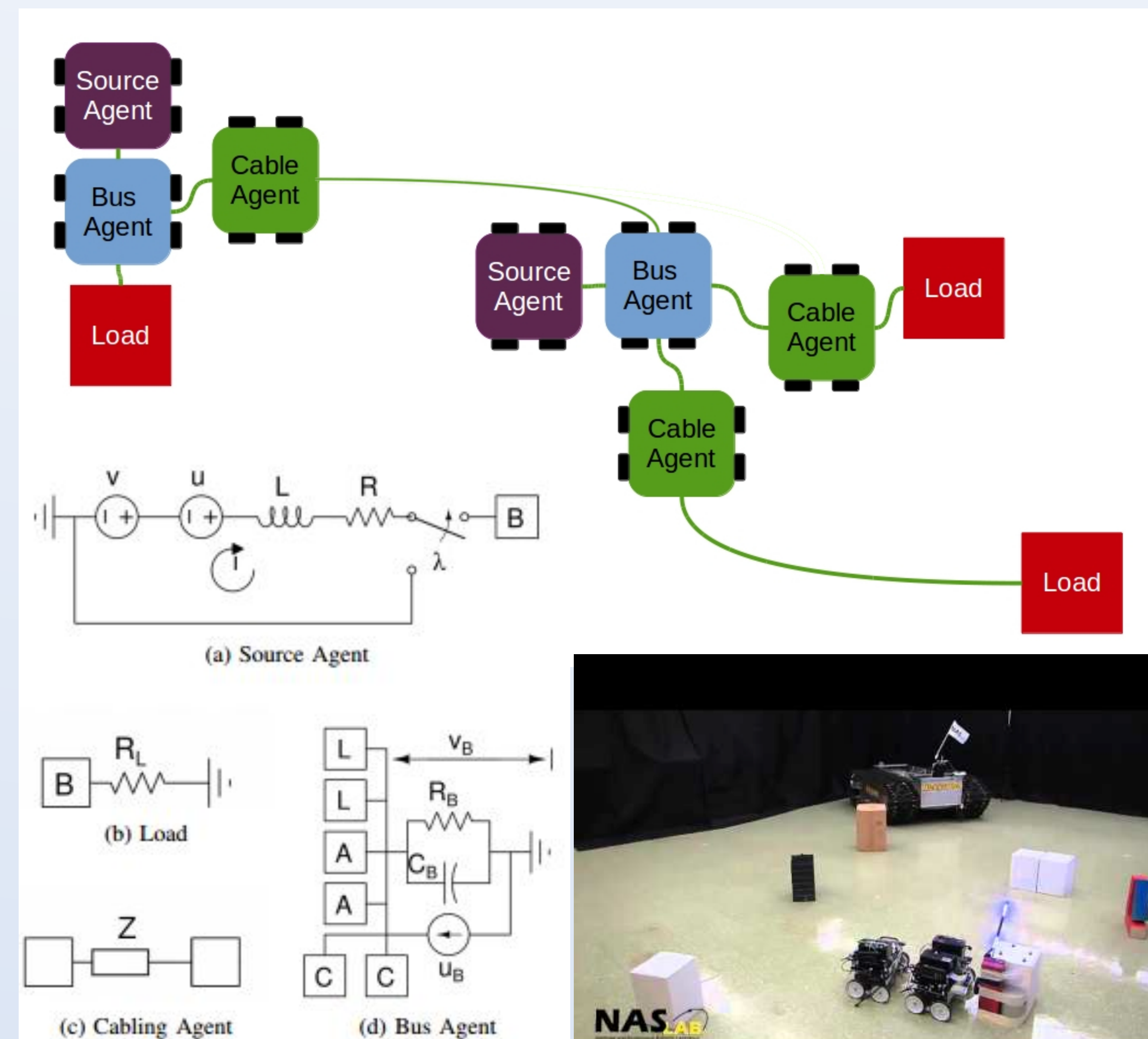
- 1) Create network optimization and formation strategies that enable a system to reconfigure itself to meet overall mission specification, network size, individual energy needs, and situational needs.
- 2) Develop an experimental test-bed that utilizes wireless energy transfer for laboratory and marine settings.



Power Distribution System Architecture

Autonomous networks capable of decision making that are robust to topological changes.

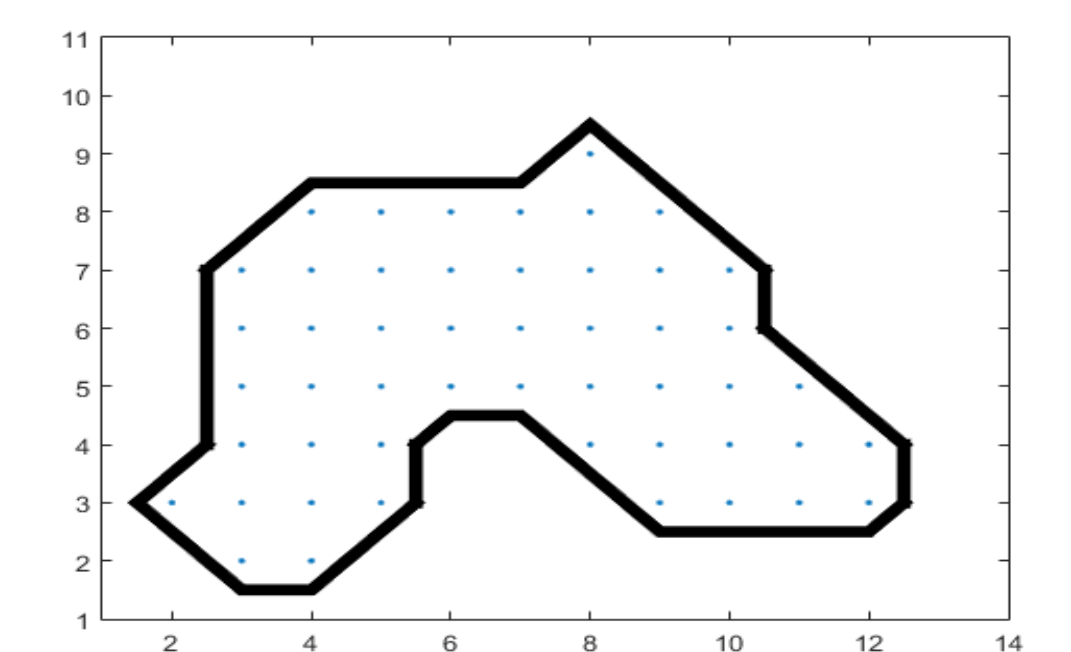
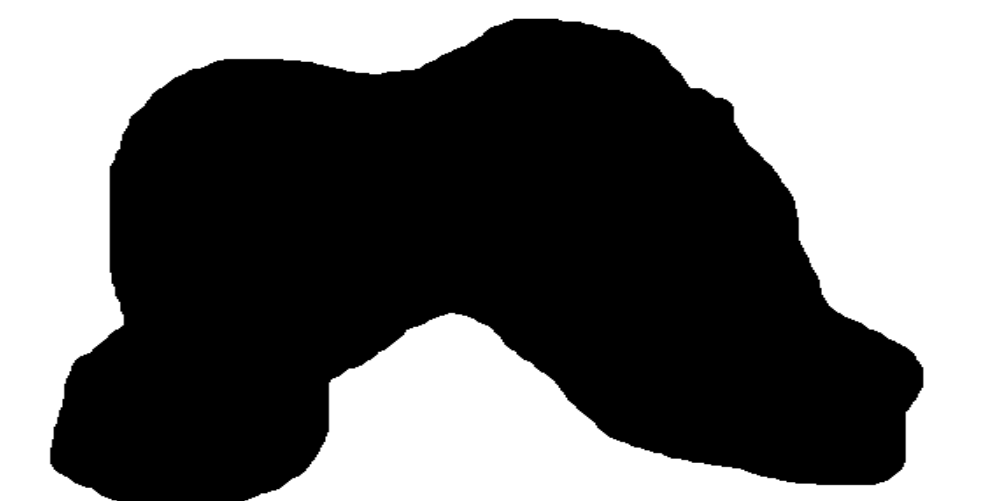
- Compute an optimized microgrid topology
- Navigate to different targets
- Make electrical connections
- Regulate electric power flow
- Mobile power delivery from sources to loads



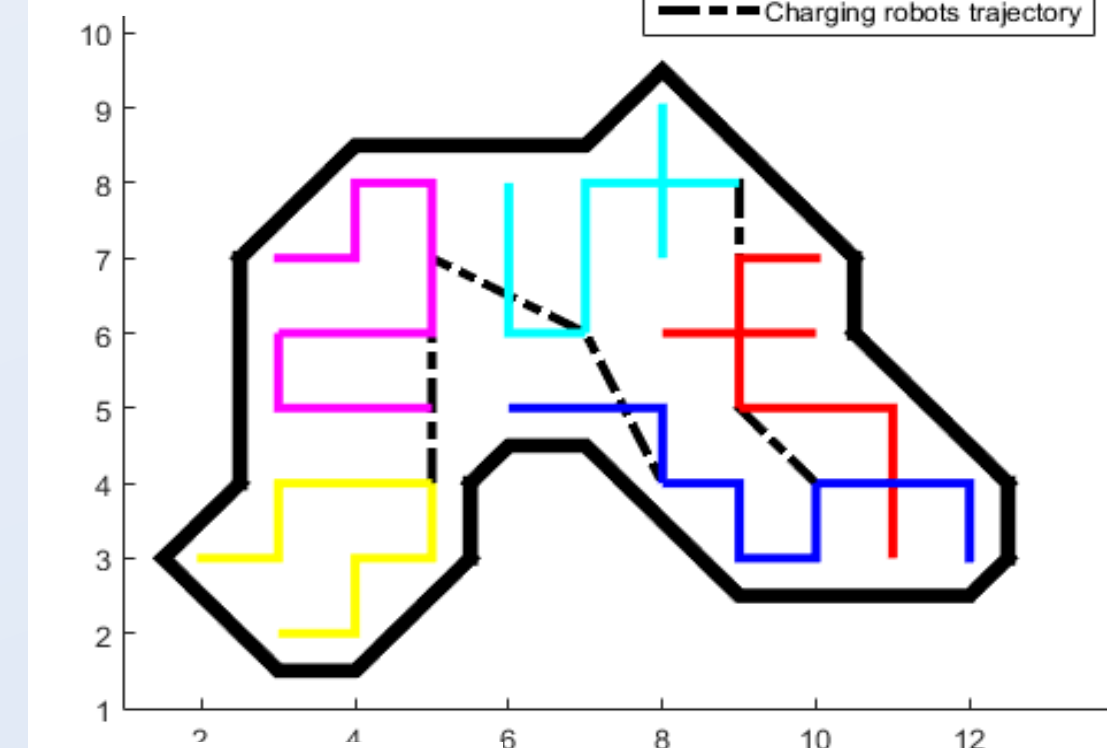
Energy Routing

A charge aware system and energy maintenance that is collectively autonomous.

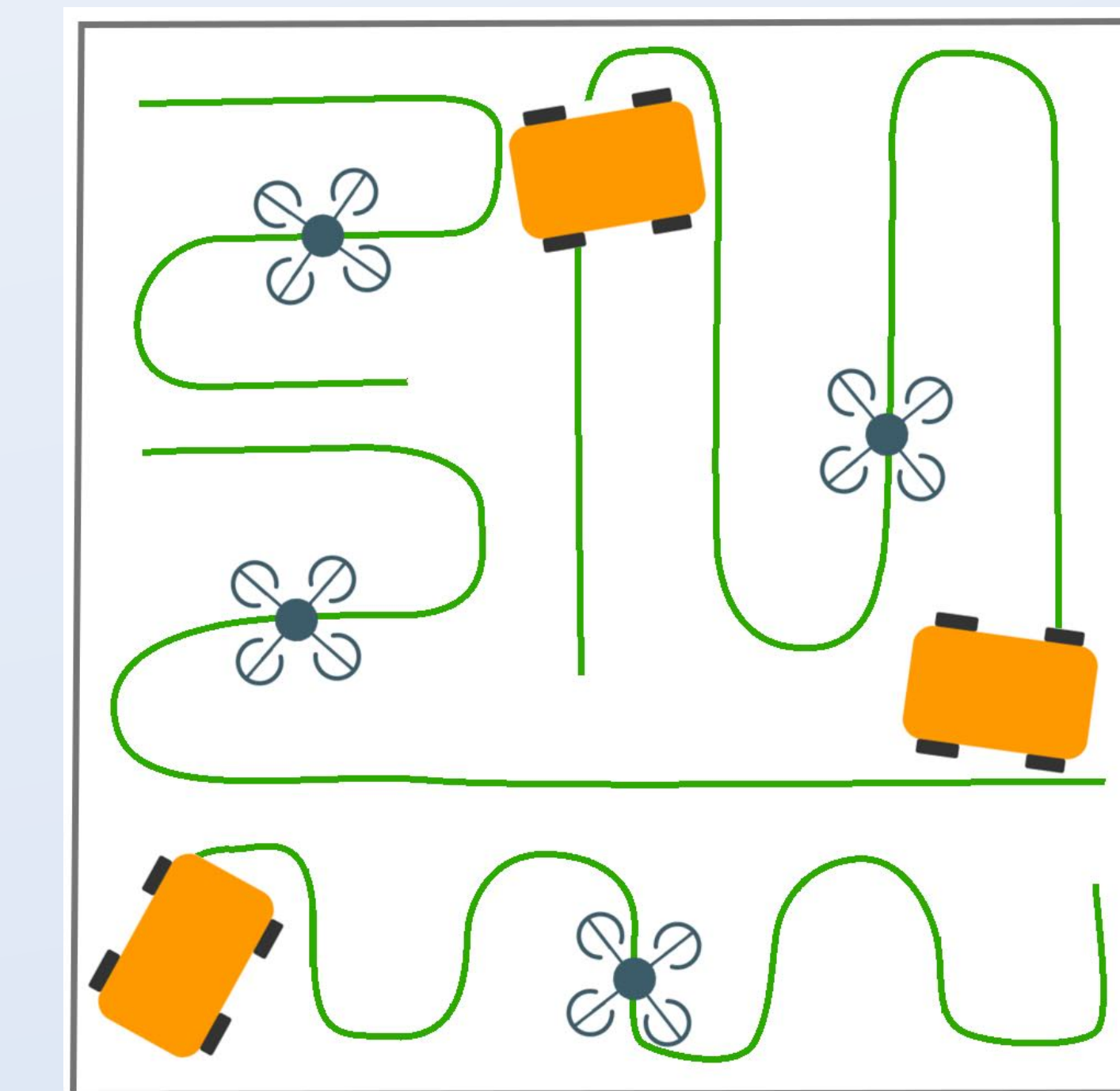
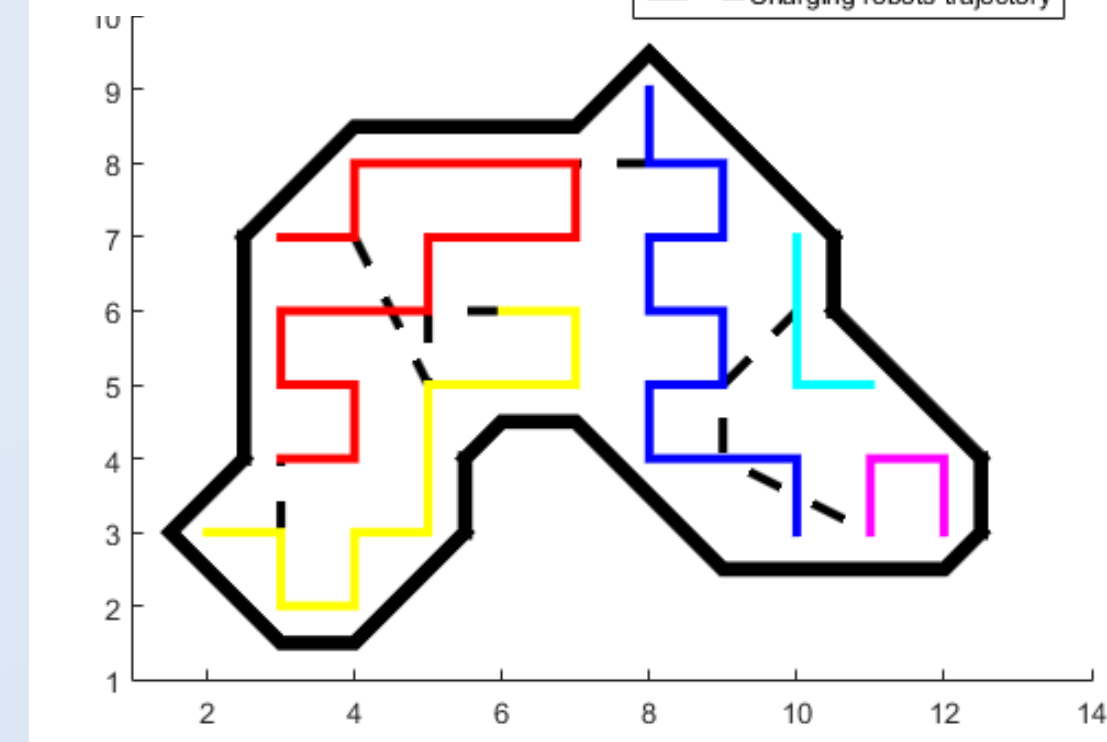
- Extend battery life by using mobile chargers.
- Collective autonomous operation of the network.
- Multi-objective optimization with multiple constraints.
- Building scalable software architecture.



GA results



LKH results



Recent Related Publications

- [1] Moridian B., Mahmoudian N., Weaver W., and Robinett R., "Robotic Power Distribution System for Post-Disaster Operations", 2015 IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR 2015), West Lafayette, IN October 18-20, 2015.
- [2] Aramizo Riberio G., Pinar A., Wilkening E., Ziaee Fard S., and Mahmoudian N., "A Multi-level Motion Controller for Low-cost AUVs", *International Conference on Robotics and Automation*, Seattle, WA, May 25-30, 2015.
- [3] Ziaee Fard S., Aramizo Riberio G., and Mahmoudian N., "GUPPIE, Underwater 3D Printed Robot a Game Changer in Control Design Education", *American Control Conference*, Chicago, IL, July 1-3, 2015.