Mapping 3D Indoor Environments with Heterogeneous Robot Teams

John Rogers, (301) 394-1811
john.g.rogers59.civ@mail.mil

Research Objective
• Perform autonomous navigation and exploration using UAVs and UGVs in unknown environments
• Scenarios considered relate to reconnaissance and persistent surveillance using heterogeneous teams of mobile robots

Challenges
• Demonstrate UAVs and UGVs working together to build a pose-graph map using existing mapping algorithms
• Demonstrate 3D Mapping with heterogeneous robots using 2D and 3D sensors
• Develop frontier-based as well as novel information-gain based autonomous exploration strategies for multiple robots
• Develop new techniques for coordination between heterogeneous robots, leveraging the strengths of each modality
• Develop multi-floor mapping capability
• Deploy small “MAST relevant” sized robots capable of running existing mapping algorithms

ARL Facilities and Capabilities Available to Support Collaborative Research
• Indoor urban test facility with full-size multi-story buildings for air and ground autonomous systems experimentation
• Heterogeneous robotic platforms
• Research codebase built on Robot Operating System (ROS) for easy integration

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration
• Effectively increase scalability in order to conduct larger scale experiments
• Methodology to efficiently share and distribute global map computation in real time
• Extend task allocation mechanism to reason about capabilities of heterogeneous platforms in executing exploration task

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED