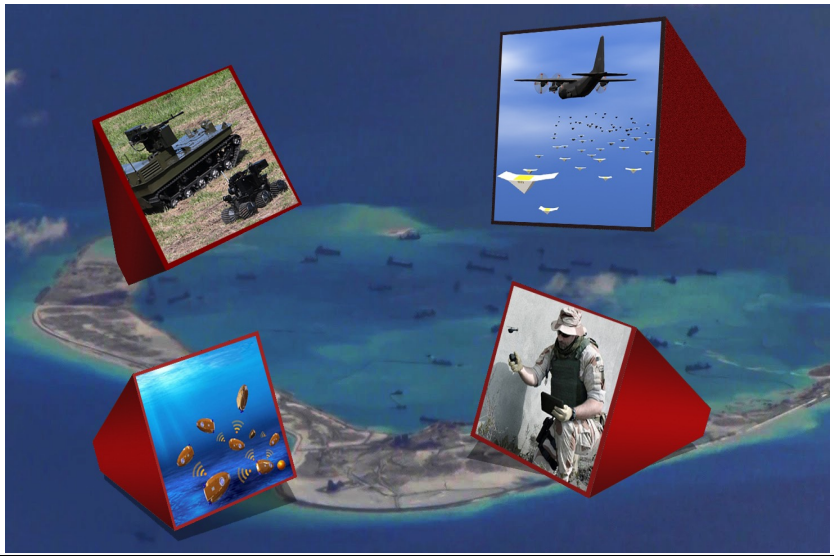
Multi-Domain Super Swarm: Robust Tactics for Engaging an Attacking Large-Scale Swarm

CRUSER
Consortium for Robotics and Unmanned Systems Education and Research



Approach

- Extend existing computational optimal control framework to super swarm challenges by integrating the following components:
  - Air, surface and sea motion models.
  - Multi-domain communication modalities (RF and ACOMMS).
  - Multi-domain damage models.
- Simulation-based and experimental evaluation of the following scenarios:
  - Countering red team through exploitation of super swarm fragility
  - Composition of blue team super swarm for offensive engagement
- Leverage existing and future NPS facilities for experimental assessment of multi-domain autonomy, including CAVR at present and SLAMR in the future.

Motivation

- Composing and countering super swarms (overwhelming numbers and multi-domain) will require new distributed, real-time algorithms.
- These methods must provide predictable performance, be scalable to large numbers of agents and address the challenges of multi-domain communications, observations and actions.

Deliverables

- New super swarm optimal control formulation for composing and countering large numbers of autonomous agents operating simultaneously above, on and under the ocean.
- Demonstrate the capabilities and limitation of the approach through analysis and experimentation consideration of high value asset protection scenarios

Operational Impact

- As identified by ONR, super swarms present both a risk and an opportunity for a variety of naval operations.
- The proposed analytical and computational methods for composing and countering super swarms generate provable and repeatable performance, which yields the following operational advantages relative to other methods:
  - Commander's intent is mapped directly to all levels of command and control
  - Operator's trust is enhanced by transparent performance predictions for each scenario
  - System test and evaluation feasibility is improved through performance predictions that are robust with respect to scenario conditions

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FY19 Call for Proposals

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