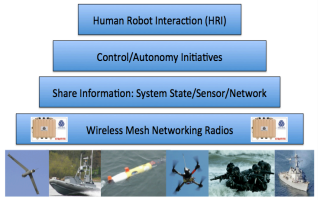
Adaptive Submodularity for Mixed-Initiative Network Control Systems



NCS Architecture

- Example of a NCS partitioned into two subgraph to support mixed-initiative operations

- **Motivation**
  - Develop high-level autonomy for Network Control Systems (NCS) to auto-configure. Given a limited number mobile systems with motion, communication and sensing constraints – what is the best way to support naval mission objectives.
  - Provide input for optimal NCS configuration at all phases of operations including pre-mission planning.
- **Deliverables**
  - Planning software that determines the proper mix of mobile assets to make up the NCS.
  - Software to monitor the NCS for providing recommendations for the distribution of mobile assets to improve mixed-initiative objectives.

- **Methodology**
  - Use the Machine Learning technique of Adaptive Submodularity to develop near-optimal Network Control System (NCS) topologies for supporting real-time, mixed-initiative mission objectives for contested littoral urban environments.
- **Contributions**
  - The novel use of Artificial Intelligence to NCS. Adaptive Submodularity provides a potential real-time framework for determining proper configurations for a networked group of mobile, heterogeneous unmanned (and manned) systems.
  - Incorporation of sensor information, vehicle dynamics and network status and communication constraints provides a more robust solution than previously available.

- **Why**
  - The combination of UAV/USV/UUV/USGs can be used to support simultaneous missions.
  - It is a dynamic environment the network topology needs to be evaluated consistently.
  - A necessary component of an NCS architecture is to evaluate and make recommendations to improve performance.
- **Objective**
  - Develop pre-mission software to determine the proper mix and positioning of assets to support multiple, mixed-initiatives mission scenarios.
  - Develop software to assess in near-real time, the ability to adjust the NCS topology to a dynamic environment to improve performance.

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FY18 Call for Proposals