Behavior/Task Integration

Atomic primitives:
- Path planning
- Obstacle Avoidance
- Position Estimation

UxV NCS ⟷ Human-Robot Interaction

- Hierarchy Protocol – manages vertical conflict resolution
- Priority Protocol – manages horizontal conflict resolution
- Behavior Tree manages execution

Components for Behavior Automation of a UxV NCS

Problem Statement

- **With a hybrid autonomous/semi-autonomous UxV Networked Control System is it possible for rapid integration of user-defined behaviors?**

- **How to define abstract behaviors for a UxV NCS?**

- **How to simultaneously retain system performance while integrating many potential behaviors?**

Candidate Solutions:

- **AI/ML Behavior Trees and Robust Logistical Dynamic Systems**

Impact

- **The ability to rapidly integration horizontal and vertical behaviors offers the potential to rapidly increase autonomy in UxV NCS.**

- **While designed initially for expeditionary forces this applies to a wide set of DoD missions.**

- **Abstract behavior with UxV NCS specification permits permits independent behavior development.**

Transition

- **USSOCOM is aggressively looking at integrating UxV NCS into Special Operations missions**

- **PMS-406 Unmanned Systems has a variety of systems that can be combined to form an UxV NCS to improve a wide selection of maritime mission objectives**

- **USMC is actively pursuing UxV teaming for expeditionary mission objectives**

Seed Research Program 2021

PI: Douglas Horner MAE
Co-PI: Ruriko Yoshida, OR
Co-PI: Geoffrey Xie, CS