CRUSER (Consortium for Robotics and Unmanned Systems Education and Research) Faculty and Researchers' Publications

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BION - Behavior Integration and Optimization for Networked Control Systems (NCS)

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BION – Behavior Integration and Optimization for Networked Control Systems (NCS)

Software-defined Systems Behaviors

Human-on-the-loop (HOTL) FlexBE Pareto POMCP

Gain recommendations, system constraints → Pareto optimal solutions, NCS positions

Near-real time, near optimal UxV NCS positioning

Next position Current position

Unmanned Systems – Waypoint Navigation
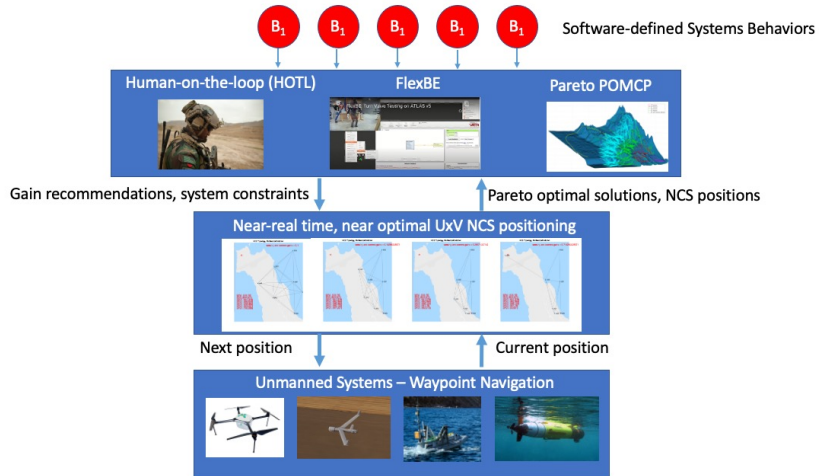
A **software-defined behavior** specifies how a robot interacts with its environment (e.g. obstacle avoidance, search, coverage)

Problem Statement

- **How rapidly improve UxV NCS autonomy to support diverse DoD mission areas?**

- **How to integrate and optimize system behaviors?**

- **How to ensure system performance while integrating many potential behaviors (scale up)?**

> Research Goal: Develop a methodology for integration of composable, interoperable behaviors into an open source, autonomy architecture for a collaborative, multi-vehicle, Networked Control System.

Impact

- **The ability to rapidly integrate software-defined behaviors offers the potential to rapidly increase autonomy in UxV NCS across ALL DoD.**

- **Applies to a wide set of DoD warfare specialties and mission areas.**

- **"Commoditizes" the behavior as an app. Enables independent behavior development.**

- **Addresses fundamental "scaling up" problem – integration and optimization of multiple behaviors to generate composable well-behaving NCS**

Transition

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

- **PMS-406/408/340 have 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 (MCTSSA)**

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