Topic: N152-084

Barron Associates, Inc.

Test and Certification Techniques for Autonomous Guidance and Navigation Algorithms for Navy Air Vehicle Missions
Advanced outer-loop algorithms are currently under development that allow rapid replanning based on changing mission requirements and environmental factors, enabling tighter integration between manned and unmanned vehicles. The greatest obstacle to the operational use of such algorithms is the lack of methodologies to assess algorithm performance during the certification process. INSPECT is a software tool that enables analysts to answer the question: does an algorithm meet Navy requirements? By automating simulation-based testing, INSPECT requires minimal human intervention -- saving time and money. The INSPECT tool will efficiently determine both worst-case and expected performance over the set of expected operating conditions, even in presence of nondeterministic and discontinuous behavior. The ultimate goal is to work with the Navy to certify new autonomous capabilities on unmanned platforms.

Technology Category Alignment:

Fixed Wing Vehicles (includes UAS)
Test, Evaluation, Validation, and Verification
Unmanned Ground and Sea Vehicles
Modeling, Simulation & Test Infrastructure

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SYSCOM: NAVAIR
Contract: N68335-17-C-0108
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0108

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2017-744

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WHO

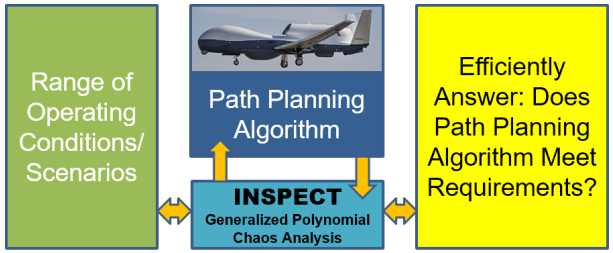
SYSCOM: NAVAIR

Sponsoring Program: PMA-262

Transition Target: Triton

TPOC:
(301)995-2038

Other transition opportunities:
PMA-263 (Small Tactical UAS)
PMA-266 (Multi-Mission Tactical UAS)
PMA-268 (Unmanned Carrier Aviation)
PMA-201 (Precision Strike Weapons)
PMA-281 (Strike Planning & Execution Systems)



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WHAT

Operational Need and Improvement: Greater UAS operational flexibility is desired by the Navy
- Advanced, autonomous UAS path planning algorithms will enable desired operational flexibility
- Efficient, reliable certification methods are needed to transition advanced path planning algorithms to fleet

Specifications Required: New techniques are needed to validate the airworthiness of advanced outer-loop algorithms
- Reduce time required by certification analyst
- Reduce computational requirements

Technology Developed: INSPECT (INtelligent Simulation for Planning algorithm Evaluation and CerTification) is a software package that supports efficient simulation-based testing to enable airworthiness assessment. INSPECT uses probabilistic modeling methods to build high confidence that path planning algorithms meet requirements throughout the range of expected operating conditions.
- Automatically and efficient construct global performance models
- Accurately estimate average performance
- Identify regions of poor performance
- Explicitly capture probabilistic behavior
- Handle "black box" algorithms

Warfighter Value: Robustness and operational flexibility of UAS will be greatly enhanced by next-generation path planning algorithms
- Reduce mission planning time
- Allow flexible real-time replanning of missions
- Enable tighter integration with manned aircraft
- Reduce manpower requirements for UAS operations

WHEN

Contract Number: N68335-17-C-0108 **Ending on:** January 1, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Algorithm Enhancements	N/A	Perform Simulation Evaluation using Representative Airspace Integration Problem	5	January 2018
Software Package (Option)	N/A	Perform Algorithm Validation of UAS Path Planning Algorithm in Matlab/Simulink Environment	5	January 2019
Evaluation on Navy Platform (Option)	N/A	Demonstrate Benefit over Existing Algorithm Validation Process	6	January 2020

HOW

Projected Business Model: INSPECT is a software package that supports the certification of UAS at several points in its life cycle. It is intended to be distributed with a Right-to-Use License and a Maintenance Agreement. Use of the software will be supported with Engineering Services to assist with initial integration and tool customization. Barron Associates will offer services directly to the Navy and to prime contractors.

Company Objectives: Company objectives are to transition the INSPECT software package to the Navy as part of a Phase III effort, working with a PMA and RT&E groups. Barron Associates will seek licensing and engineering support contracts to support the warfighter through the type certification cycles of UAS.

Potential Commercial Applications: INSPECT is applicable to all advanced autonomous systems including non-military and non-government UAS. INSPECT is part of a group of applications that have been developed to support safe autonomous operation of UAS with reduced human oversight. Barron Associates envisions selling software licenses and engineering services to the DoD, manufacturers of UAS aircraft, airframers, and guidance, navigation and control (GNC) systems.

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