

Adaptive Agent Seeker Field of View Management (AASFOVM)

FORELL Enterprises, Inc. (Buena Park, CA)

Phase II Abstract

For our National Defense, countermeasures remain one of the fundamental technical challenges facing ballistic missile defense programs. The NMD has achieved its initial discrimination successes against defined threats by allocating architectural, elemental, and algorithmic requirements onto initial capability systems. NMD's initial success does not mean that the countermeasure problem is solved. Current discrimination techniques and capabilities of the initial deployment systems have not been evaluated against the breadth of countermeasures available to the offense. Discrimination algorithms have not been designed for all possible combinations of countermeasures. Sensor requirements for diverse threat and decoy populations have not been defined. Diversity of countermeasure approaches available to the offense is central to these problems. FORELL wishes to take up the diverse threat challenge. Phase I AASFOVM demonstrated an agent based capability to discriminate early in the seeker decision window with concurrent optimization of KV divert management. AASFOVM Phase II proposes to (1) extend the Phase I work to Enhance the fidelity of the demonstration/test environment and (2) apply the FORELL agent technology in a Sensor and KV Architecture Design Analysis Framework for next generation NMD missile designs that are robust to countermeasures.

Benefits

The benefits incurred by accomplishing AASFOVM II are several. AASFOVM is a significant step in establishing credibility for use of Agent Based Technology in target discrimination with KV divert optimization and in building an understanding in the fundamental relationships between system components; and providing a methodology for design trades in novel engagement regimes.

In providing demonstration of the Phase I proof-of-concept FORELL is validating AASFOVM technology in a synthetic environment that includes non-idealized conditions and that: 1) Provides a mission context

for AASFOVM technology refinement, 2) establishes credibility at the system level for the concept approach, 3) demonstrates technology robustness against single feature countermeasures, and 4) demonstrates capability for fast and accurate discrimination and combined seeker FOV and divert management.

In exploring the limits of AASFOVM technology as applied to missile seeker discrimination and guidance, Phase II will: 1) Provide understanding of AASFOVM technology as it applies to a broad range of realistic engagement conditions and 2) validate technology that provides capability with reduced algorithm design and development risk.

In constructing an AASFOVM based design search engine capable of supporting missile system design trades, Phase II will provide: 1) a mechanism to identify key missile performance drivers and trades, 2) an economical framework for Sensor and Kill Vehicle Design Trades (sensitivity analysis of design and performance parameters may be examined without expensive algorithm developments), 3) a demonstration of tool, and process capability to quickly evolve missile designs in anticipation of an evolving threat 4) a methodology for structuring missile system technology trades.

In exploring sensor, missile, and decision technologies related to the heterogeneous threat discrimination problem, Phase II AASFOVM will: 1) identify missile component performance that holds promise of broad countermeasure immunity and 2) develop explicit relationships between missile component technologies as feature extraction maps.

In conducting experiments involving different engagement regimes and reactive threat components, Phase II AASFOVM will: 1) provide understanding of engagement regime trades, 2) identify required missile components and technologies, and 3) demonstrate capabilities to structure component technologies for operation in novel regimes against responsive countermeasures.

Keywords: Kinetic weapon, kill vehicle, infrared, target discrimination, evolutionary algorithm, missile seeker, seeker field of view, reinforcement learning

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Principal Investigator:

Mr. Lary Smith
FORELL Enterprises, Inc.
6061 Dale Street, Suite N
Buena Park, CA 90621
Phone: (714) 690-7720