Cyber Virtual Training

NDIA CYBER AUGMENTED OPERATIONS SYMPOSIUM

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Cyber Innovations

LOCKHEED MARTIN
Ambrose Kam

• Over 24 yrs in Modeling & Simulation (M&S) and Operations Analysis (OA) with broad expertise in communications, networking, mission planning, renewable energy, radar, cyber, etc.

• Pioneer in applying M&S and OA techniques to cyber threat analysis.

• MIT Fellow in Systems Design & Management since 2002

• LM Fellow in Cyber

• 2017 Asian American Engineer of the Year (AAEOY)

• Published over 30 research papers on a variety of subjects; guest lecturer @ MIT and Georgia Tech; industry internship sponsor/project lead on research projects with military academies

• MEng from Cornell; Dual Master’s Degree from MIT (Systems Engineering & Management) Bachelor of Science from University at Buffalo
Cyber Virtual Training in a Multi-Domain Op (MDO) Environment

Real-Time Simulation-Based Operator-in-the-Loop

Motivations

• Objectives
  • Develop an operator-in-the-loop capability to support a wargaming environment; the goal is to determine how EW/Cyber TTPs affects mission effectiveness for both Red/Blue teams

• Problem Statement
  • Multi-domain Operations (MDO) is a big challenge; EW/Cyber will only make MDO more complicated given the quick advancement of the EW/Cyber techniques. Recent conflicts in Georgia and Ukraine showed how EW/Cyber can compliment traditional weaponry. US cannot afford to be left behind.

*Disclaimers: The example shown in this presentation is unclassified; it is not intended to represent any domestic or foreign systems/platforms.
The Cyber Attack Network Simulator (CANS) is a discrete event simulation that allows analysts to study the effect of various cyber events against a model of a planned or operational network system.

**CANS models cyber events and their impacts to a system**
CANS Example

Operator Consoles

Sensor Systems

Weapon Systems

CANS System Models are Highly Modular

Satellite / Ground Station

Destroyer

Fighter Plane
What is AFSIM?

- Advanced Framework for Simulation, Integration & Modeling
- Government Owned object-oriented C++ library
- Discrete Event Simulation
- Can run at, faster and slower than real time
  - Can be Human-in-the-loop

The intent of AFSIM is not to provide all encompassing models, but rather to provide the framework for incorporating the necessary models*

*from AFRL
AFSIM Warlock Operator Interface

Distributed Operator Stations

Blue Cell Player

CANS/AFSIM DIS

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EW/Cyber Wargaming: A Madden Football Analogy
CANS/AFSIM Software Architecture
This sample scenario shows the benefits of a multi-sided, multi-player wargaming engine that leverages real-time operator-in-the-loop virtual simulation.
Conclusion

• CANS/AFSIM Multi-Domain Wargaming Framework
  • Low Cost, Real-Time, Operator-in-the-Loop Wargaming Engine
  • Flexible scenario implementations to expose operational & capability gaps
  • Experiment with new Tactics, Techniques and Procedures (TTP)
  • Large variety of EW/Cyber exploits (offensive/defensive)

• Future Work
  • UCI messaging to bring in tactical systems
  • Mission planning tool integration
  • Artificial Intelligence, machine learning and optimization via AFSIM plug-ins
Questions?