2019-12

Using Virtual Environments to assess Human-Robot Teams during MAGTF Operations

Brutzman, Donald P.; Fitzatrick, Christian

Monterey, California: Naval Postgraduate School

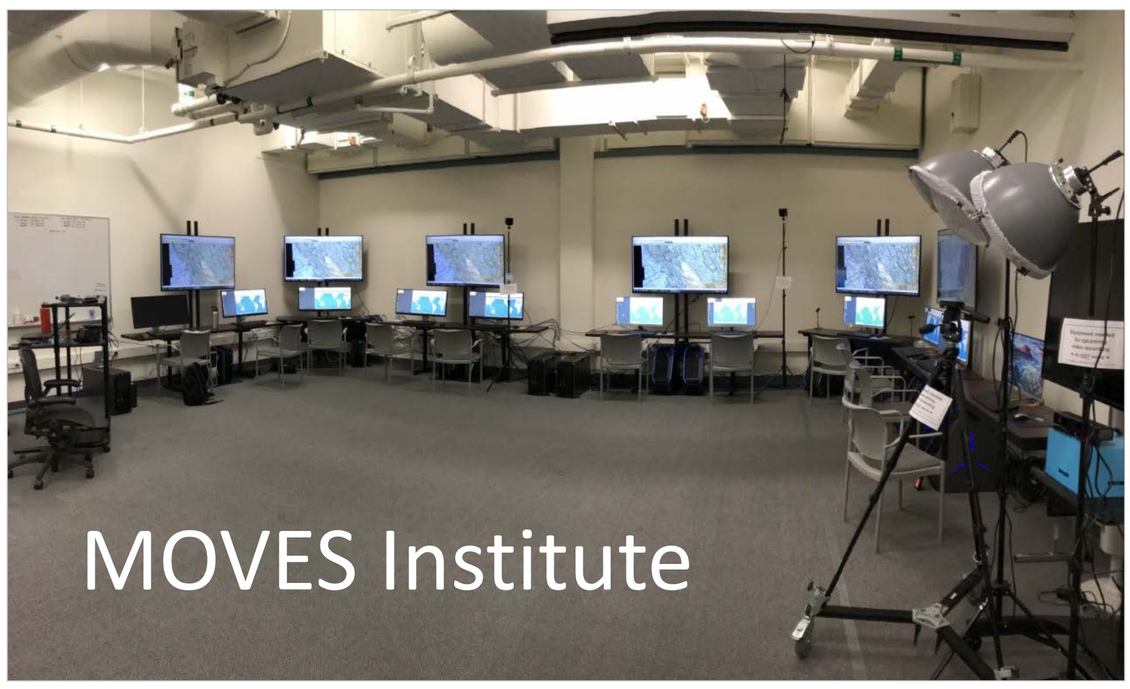
Creating a Virtual Environment to Analyze Human Machine Teaming

Naval Postgraduate School

Human Machine Teaming

- Emerging deployment of robots on the battlefield makes tactical integration of manned and unmanned assets critical for MAGTF operations.
- Concept of Operations (CONOPS) capability gaps for future systems cannot depend solely on live field testing, which is intermittent and costly.
- This effort demonstrates use of virtual environments (VE), virtual reality (VR) and agent-based modeling to conduct scenario-based assessments of human machine teaming (HMT).

US Marines patrol with Unmanned Ground Vehicle (UGV)



MOVES LVC Lab offers networked VEs for analysis

Research Questions

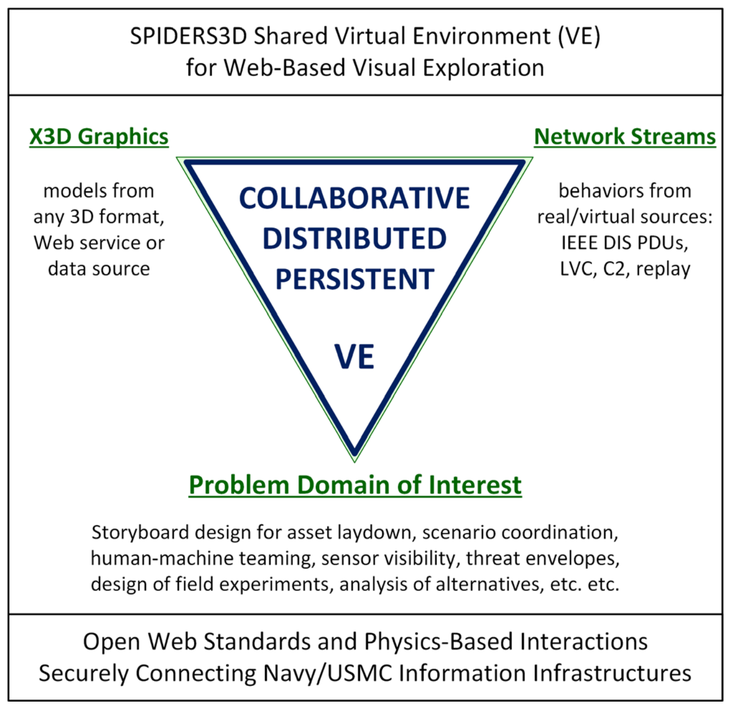
- How can Web-based VE visualizations and VR interfaces help assess effectiveness HMT augmentation of existing combat units?
- How can HMT complement existing combat units so that tasked roles and corresponding orders are well understood by humans and robots alike?
- Can open standards for networked VEs and VR repeatably portray various HMT mission sets within the MAGTF?
- How can collaborative Live Virtual Constructive (LVC) simulations rehearse, observe and replay HMT operations?

Virtual Environment: SPIDERS3D

SPIDERS3D is an easy-to-use browser based application on the NAVFAC Portal www.navfac.navy.mil that offers users a variety of ways to employ three dimensional (3D) visualization to better understand how new platforms could potentially impact facilities.

- Provides a venue to test planning concepts and give context to discussions.
- Allows users to quickly create a variety of ship berthing and aircraft parking scenarios online at highly accurate virtual representations of Naval Installations worldwide. Users can virtually walk along a pier or inside the maintenance bay of a hangar.
- Offers a tremendous library of diverse 3D models for use including existing platforms as well as those being planned or currently in the acquisition pipeline. Users can visualize new weapon platforms as they would interact within an existing naval base environment.
- Affords multi-discipline working groups the ability to collectively collaborate in real-time within a spatially accurate, common virtual environment. Participants log in from their individual computers and communicate onscreen in real-time.

SPIDERS3D developed by NAVFAC for the Navy and Marine Corps



Conceptual diagram describing a methodology to create dynamic VEs for tactical system evaluation

Using VEs to develop HMT TTPs in the Future Battlespace

- The initial development and assessment of HMT TTPs ISO MAGTF operations.
- The initial application of VEs and VR to explore the interdependence of MAGTF units with autonomous systems.
- The expansion of LVC simulations to help define the future MAGTF battlespace.
- To better understand the digital interoperability required to execute HMT within MAGTF operations

Researchers: Dr. Don Brutzman and Mr. Christian Fitzpatrick Modeling Virtual Environments and Simulation (MOVES) Institute, Graduate School of Operations and Information Sciences (GSOIS)
Topic Sponsor: Marine Corps Warfighting Laboratory (MCWL)

NRP Project ID: NPS-19-M285-A