Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2022-0352

Topic # N20A-T014
Machine Learning for Simulation Environments
Arete Associates

WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO IWS 5.0

Transition Target: Submarine Multi-Mission Team Trainer (SMMTT): PSIM within Submarine Training Systems - OPN 5661 Submarine Training Device Mods

TPOC: (760) 939-1440

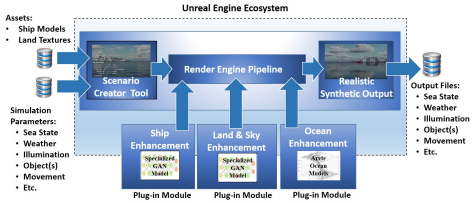

Image courtesy of Areté

Other Transition Opportunities:
1. Other trainers for the Integrated Submarine Imaging Systems (ISIS, AN/BVY-1)
2. Programs with realistic synthetic data generation needs for training machine learning (ML) applications.
3. Commercial game engine plug-in sales.

Notes:
The figure illustrates Areté's solution as a set of realism-enhancing plug-in modules demonstrated within an interactive scenario development tool.
Key Advantage: By creating the plug-in modules with a platform agnostic implementation of our technology, we can provide a Render Engine Specific Interface for any rendering application.

WHAT

Operational Need and Improvement:
As part of the Chief of Naval Operations Navigation Plan 2022, the U.S. Navy built the Navigation Plan Implementation Framework (NIF) to guide advanced development and problem-solving across 18 coordinated objectives.
Through innovative solutions in this program, Arete brings dynamic realism to training systems and simulators, enabling sailors to experience circumstances as close to real as what may be encountered while deployed. This capability directly addresses needs found in two of the NIF's objectives: Live Virtual Constructive Training (LVC) and Ready, Relevant Learning.

Specifications Required:
The Navy utilizes many simulators to train and conduct experiments. Increasing the realism of these simulations will increase the capabilities and fidelity of these simulators.
Scene-generation tools are available in the commercial industry. However, existing tools are not sufficient: to develop dynamic periscope scene content covering 360 degrees and at least 60 frames per second (fps) across the world's range of weather lighting conditions.
Innovation is required to support the real-time generation of synthetic dynamic scenes that represent phenomena associated with: weather, the surface of the ocean, different lighting, sea states, any viewable terrain or infrastructure when near land, attributes of shipping, and combat effects.

Technology Developed:
Areté's solution is to create a set of realism-enhancing modules demonstrated within an interactive scenario development tool. These modules incorporate the latest advances in generative adversarial networks (GANs), texture enhancement, non-linear ocean modeling, and Areté's experience in developing periscope technologies.

Warfighter Value:
Providing realistic synthetic data will improve operator responses, reduce operator uncertainty under stress, and improve decision-making. All of which contributes to Fleet mission readiness by improving Sailor performance, ensuring they have the knowledge and skills to compete and win across the spectrum of conflict.

WHEN

Contract Number: N68335-22-C-0011 **Ending on:** Oct 25, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
RealSim Alpha Application Delivered	Low	Scenario Generation Tool Integrated with first version of enhancement modules.	4	1st QTR FY23
RealSim Beta Application Delivered	Low	Scenario Generation Tool Integrated with completed enhancement modules achieving customer specified realism metric threshold.	6	1st QTR FY24
If Option exercised, Technology Seminal Transition Event (TSTE)	Low	Demonstration of Realism Enhancement Module usable within SMMTT	7	4th QTR FY24

HOW

Projected Business Model:
Areté plans to retain the SBIR data rights for the developed realism-enhancing modules and enabling algorithms. Areté will work with the Navy and large primes to integrate their solution into SMMTT or AN/BVY-1.

Company Objectives:
Areté is an advanced science and engineering company that provides innovative solutions — from scientific discovery through production. Areté's smart systems include active and passive sensors, real-time processing, software, and complex algorithms that operate from seafloor to space.
Areté provides multi-domain, multi-discipline expertise and applications supporting the U.S. Navy, the U.S. Army, the U.S. Air Force, the U.S. Marine Corps, the Missile Defense Agency, the intelligence community, the U.S. Department of Energy, and commercial energy exploration companies.

Potential Commercial Applications:
1. Technology developed under this effort has the potential to provide an alternate means to creating the large volumes of training data that are needed to train deep learning algorithms. (i.e., synthetic data generation) for advanced machine learning (ML) applications
2. Explore commercial game engine plug-in opportunities.

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