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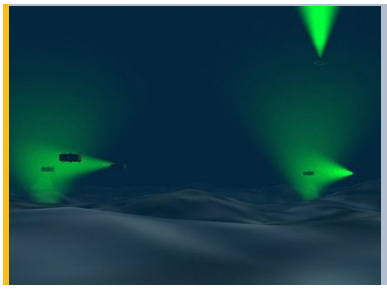
DEPARTMENT OF THE NAVY

NAVY SBIR/STTR SUCCESS STORY



HIGH FIDELITY FRONT END SIMULATION FOR COMPLEX PHYSICS-BASED PROCESSING SYSTEMS

Establish an advanced sonar simulator/stimulator suite for current and future systems with fidelity comparable with recorded at-sea data

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THE CHALLENGE

As a component of the Navy's effort to maintain undersea asymmetric advantage, the fleet highlighted a requirement for a high-fidelity ocean environment to support training. The challenge was to use simulation and stimulation as an efficient means to provide sonar performance verification and human-in-the-loop training without undue burden on operational assets. This capability would significantly increase operator proficiency by training to detect and track targets in a high clutter environment. Additional challenges identified include generation of high-resolution, high-fidelity data to serve as collected data set substitutes. The goal was to provide a physics-based simulation that accurately models environment phenomenology which can be leveraged by sensor and algorithm designers during test and analysis.

THE TECHNOLOGY

Bringing together existing simulator designs to provide high-fidelity simulation data to support system certification; advanced algorithm development; and development of high-fidelity training system scenarios are required. Two systems, All World Environment Simulation (AWESIM) and Common Acoustic Simulation Environment (CASE) were developed to provide physics-based sensor level high fidelity simulation interfaces and open architecture solutions including common processing across multiple sensors and combat systems.

THE TRANSITION

Initially, SBIR-developed solutions were incorporated into the AN/SQQ-89A(V)15 Combat System. This technology transitioned via Phase III funding from the AN/SQQ89 program for Surface AntiSubmarine Warfare (ASW) Synthetic Training (SAST) production. Currently, SAST supports all shipboard sensors including hull-mounted; towed array; pulsed (PAS) and constant (CAS) Active; and Light Airborne Multi-Purpose System (LAMPS) sensors. In a similar manner, the Integrated Computer Program Training Device (ICPTD) was developed for the SURTASS community.

THE NAVAL BENEFIT

Advanced phenomenology-based simulation provides the antisubmarine warfare (ASW) mission with a physics-based model that represent targets, sensors, the ocean environment, and the propagation and reverberation of sound energy in seawater. Principal benefits to the warfighter include the design and development of mission capabilities that result in higher probabilities of detections, and lower false alarm rates; and enhanced training capabilities, increasing fleet readiness in the ASW domain.

THE FUTURE

The simulated environment could be used to further build quantitative measures; performance of the simulation relative to the currently collected data. SAST, with continued enhancements, will be part of all current and future surface combatant sonar systems. Additionally, this open architecture supporting front-end capability development and human-in-the-loop training on the back-end is actively transitioning to the submarine community. This effort has provided high-value capabilities to the fleet at speed. Through an open, sensor-agnostic approach, the developed architecture will provide the required agility to respond to Fleet ASW requirements for great power competition against an increasingly capable adversary.

"HIGH FIDELITY SIMULATION, ORIGINALLY DEVELOPED UNDER SBIR FUNDING, HAS FACILITATED NAVY'S ABILITY TO CONDUCT REALISTIC UNDERSEA TRAINING IN FLEET SYNTHETIC TRAINING EVENTS WITHOUT IMPACTING MARINE SPECIES. THE QUALITY AND EXTENSIBILITY OF THE SIMULATION HAS ALSO MADE IT POSSIBLE TO CONDUCT REALISTIC MULTI-PLATFORM EVALUATIONS OF PROTOTYPE CAPABILITIES IN SIMULATED COMBAT SITUATIONS FOR WHICH WE DO NOT HAVE RECORDED DATA."

Pete Scala
Advanced Development Director
PEO-IWS5 Undersea Systems, PEO-IWS5A Advanced Development

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