

Topic: N171-093

Metron, Inc.

Theater Anti-Submarine Warfare Contextual Reasoning

The Theater Antisubmarine Warfare (ASW) Contextual Reasoning application (TASW-CR) presents a set of threat submarine mission objectives to watch floor analysts, enabling them to use available information to evaluate and weight likely mission objectives. Using these mission objectives and contextual information such as weather, geographic features, state of hostilities, and location of blue forces, combined with sparse contact information on submarine and other hostile forces, TASW-CR produces constrained estimates, probability distributions, on the threat submarine's present and future state. Probability distributions are produced by a non-linear Bayesian tracker, capable of employing probabilistic motion models representing the mission objectives identified by the analyst. Incorporating contextual information with sparse contact information reduces the area of uncertainty (AOU) for the present and future state of the threat submarine.

Technology Category Alignment:

Human/Autonomous System Interaction and Collaboration

Synthesis/Analytics/Decision Tools

System Interfaces & Cognitive Processes

Acoustic, Seismic and Magnetic

Undersea Weapons

Contact:

Dr. Doug Marble

marble@metsci.com

(703) 467-5609

<http://metsci.com/>

SYSKOM: ONR

Contract: N68335-18-C-0536

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0536

WHO

SYSCOM: ONR

Sponsoring Program: ONR Code 32
Ocean Battlespace Sensing

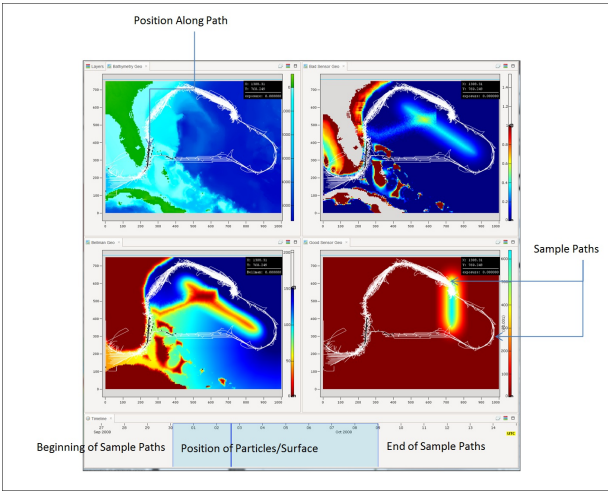
Transition Target: AN/UYQ-100
Undersea Warfare Decision Support
System (USW-DSS)

TPOC:

Mr. Michael Vaccaro
michael.vaccaro@navy.mil

Other transition opportunities: The Theater Anti-Submarine Warfare Contextual Reasoning (TASW-CR) application is a theater-command-level decision support tool and has not been designed for individual unit use in ASW.

Notes: USW-DSS is an Anti-Submarine Warfare (ASW) command and control (C2) system installed in carrier strike group (CSG) platforms (CVN, CGs/DDGs), Surveillance Towed Array Systems (SURTASS) ships, embarked Destroyer Squadron Staffs, and select shore nodes to include the Naval Oceanographic Processing Facilities (NOPF), and Commander Task Force (CTF)/Theater USW Operations Centers (TUSWOC) that enable the networking of ASW forces to collaboratively plan and execute ASW missions.



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WHAT

Operational Need and Improvement: Theater Anti-Submarine Warfare (TASW) planning is driven by complex variables – enemy intent, composition, and location, assigning limited resources over large and environmentally variable regions for extended time periods. This effort advances TASW warfighting capabilities through contextually aware, mathematically rigorous aids offering additional, realistic planning capability to the Command team, projecting a current tactical picture forward in time into distributions of most likely or most effective enemy actions and Blue Force options, balancing risk versus reward.

Specifications Required: Context, the ASW command team experience, insight, and intuition, is transformed into mathematically meaningful expressions which, when combined with performance predictions, tactics, techniques and procedures, environmental conditions, guide projections of enemy force actions within the planning aid to inform Blue’s response planning. These Navy-Decision-Support-System-compatible aids produce multiple realistic threat submarine behaviors toward achieving a given objective and quickly evaluate hundreds of Blue Force options to counter or mitigate expected enemy actions. Identifying fleet user and intelligence analyst assumptions regarding threat intent, we developed a general framework for defining a cost-benefit model representing a threat submarine commander’s decision space for maneuvering.

Technology Developed: This model of costs and benefits, obstacles, goals, constraints, preferences, and other aspects of enemy submarine operations produce efficient plans consistent with the objective model and working models for predicting threat submarine paths conditioned on assumed intelligence, environment and threat conditions. Leveraging our technology base, employing probabilistic and physical principles (Stochastic Dynamic Programming, Markov Decision Processes, and Bellman Equation) to express and compute threat distributions we reduced the computational complexity to ensure accurate threat forecasts can be produced within reasonable computing footprints.

Warfighter Value: TASW-CR offers the Commander an opportunity to look forward in time and ‘what-if’ enemy and own force actions, responses and counters by projecting a current tactical picture forward into distributions of most likely or most effective enemy actions and Blue Force options, balancing risk versus reward. TASW-CR advances TASW warfighting capabilities through developing contextually aware, mathematically rigorous planning aids offering Commanders additional, realistic planning capability.

WHEN

Contract Number: N68335-18-C-0536 **Ending on:** December 1, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase II Model Improvements / Build 2	Low	Functioning Developmental Model	5	1st QTR FY20
Final Model / Build 3	Med	Functioning Prototype System	6	4th QTR FY20
End to End Assessment	Med	Demonstrated Warfighter Utility in TASW planning	6	1st QTR FY21
PHII Final Report	Low	Completed Report	6	2nd QTR FY21
Option - Design Sprints with Fleet Activities	Med	Model updates driven by Fleet user input	6	1st QTR FY22
Option - Transition to TASW BaM TDA FNC and USW-DSS	Med	Integrated into TASW BAM TDA FNC and USW DSS	6+	1st QTR FY22

HOW

Projected Business Model: Metron will develop the algorithms and software to perform the Contextual Reasoning functions for the government. We will maintain close working relationship with ONR, NAVSEA and Fleet experts to keep design and development cycles focused on providing usable and mathematically sound solutions to hard Navy problems.

Company Objectives: Metron’s objective is to provide a set of applications that together provide the Fleet Undersea Warfare mission planner an easy to use yet mathematically rigorous set of tools which enable strategic thinking and planning, shifting planner duties from powerpoint presentation preparation to actual planning.

Potential Commercial Applications: This application is being purposefully designed and built for the Theater ASW problem unique to Navy.