Topic: N131-037

Prometheus Inc.

Real time classification of sea mines using MIRK processing in Fleet MCM sonars

Prometheus is an Applied Mathematics company that develops and integrates proprietary sensors (SONAR, RADAR) algorithms to significantly improve systems performance without hardware changes. Efficient algorithms have been developed for radar and sonar which provide real-time target classification improvements with significantly reduced false alarm rates. The sonar algorithms provide target material differentiation which has been shown to reduce the false alarm rates with MK 48 torpedoes, submarine sonars and mine detection sonars. We are executing a Navy phase II SBIR on mine countermeasure sonars with a large defense contractor partner. We seek relationships with Government activities and radar/ sonar companies to expand the utility of your systems. We will be pleased to review the applicability of our algorithms to your system at our expense.

Technology Category Alignment:

None
None
None

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SYSCOM: NAVSEA
Contract: N00024-15-C-4026

Department of the Navy SBIR/STTR Transition Program

Statement A: Approved for Release. Distribution is unlimited.

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WHO

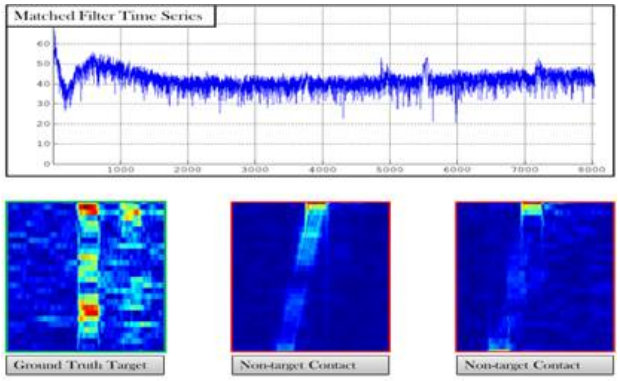
SYSCOM: NAVSEA

Sponsoring Program: PMS 495

Transition Target: AN/AQS-20A and AN/SQQ-32(V)4 SONARS

TPOC:
(202) 781-5079

Other transition opportunities: Submarine and ship active sonars, other MCM sonars such as employed by mine neutralizers, active sonobuoys, torpedo sonars and COTS sonars that are used for locating man-made objects



MIRK Detection Images

WHAT

Operational Need and Improvement: The Navy sea mine clearance operational timeline is largely driven by the high false alarm rate; therefore, all of the mine warfare active sonars, such as the AN/SQQ-32 and AN/AQS-20A sonars urgently need the reduction in false alarm rates that MIRK can provide. MIRK provides single pass mine discrimination which can eventually lead to detect-to-engage MCM operations, eliminating post mission analysis and target re-acquisition, all timely, costly, and sometime dangerous propositions. In addition, as the Navy transitions to unmanned systems, MIRK will allow a UUV to operate with a much greater degree of autonomy. We anticipate a near-term scenario in which a UUV using MIRK will autonomously map the extent and mine density of a minefield.

Specifications Required: When matured, MIRK will be a low cost software-only mod to existing sonars that can discriminate in real time between mines and non-mine mine-like objects thereby reducing the false alarm rates of the sonars by an order of magnitude.

Technology Developed: We have developed revolutionary algorithms for identifying the material of undersea objects detected using sonars. The phenomenology has been proven mathematically, implemented in a simulation, and demonstrated with limited sonar data sets. We have shown that the reflectivity kernel of a material is completely and directly recoverable from the sonar return using a special, realizable class of algorithms. Real-world implementation of the algorithms and software, in the context of undersea warfare, is in the process of being accomplished as a Phase II SBIR effort.

Warfighter Value: The Navy's current MCM force capabilities are outstanding with respect to their capability to locate and neutralize mines. However, MCM is a slow onerous process that needs new technologies to reduce the mine clearance timeline by an order of magnitude. The only viable approach to achieving this goal is to replace the current tactics with a immediate sequential detect-to-engage tactic. The new tactic requires real time mine identification with accompanying very low false alarm rate. MIRK is the only technology known to be able to provide these characteristics.

WHEN

Contract Number: N00024-15-C-4026 **Ending on:** December 27, 2016

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate that MIRK software can work seamlessly with AN/AQS-20A data.	Low	Real time MIRK processing of data from AN/AQS-20A sonar.	6	May 2015
Show the software can discriminate mines from false targets using AN/AQS-20A test data.	Med	Demonstrate a 50% reduction in false alarm rate.	5	November 2015
Demonstrate that MIRK software can work seamlessly with AN/SQQ- 32(V)4 data.	Med	Real time MIRK processing of data from MCM ship sonar.	6	June 2016
Show the software can discriminate mines from false targets using AN/SQQ-32(V)4 test data.	Med	Demonstrate a 50% reduction in false alarm rate.	5	December 2016

HOW

Projected Business Model: Prometheus works with the U.S. government, prime contractors, and software and hardware vendors through contracts, software licensing, joint ventures, and collaborative agreements. We license our algorithms for specific applications in government and industrial markets and offer on-going support to modify, improve and extend the utility of the algorithms. To expand commercialization of Prometheus algorithms, we strive to identify other applications and funding sources to support defense programs, and are working to identify potential non-defense applications and clients.

Company Objectives: Increase the awareness of the defense and acquisition community of Prometheus sonar, radar and image processing enhancing technology for target discrimination. We seek to build relationships and secure funding to assist in testing and integrating our technologies into additional defense and industrial systems and platforms.

Potential Commercial Applications: There are many undersea activities that need to discriminate made-made items, such as well heads and cables, from the natural undersea clutter. MIRK software can assist in these quests by providing real-time object discrimination. In addition, modified MIRK software has the potential to find leaks in undersea pipelines, discriminate contraband targets in baggage and/or shipping containers and discriminate early onset tumors in MRI and ultrasound procedures. MIRK may also be tailored to detect the existence and degree of delamination and rust under hull coatings.

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