OBJECTIVE: Develop innovative techniques to mine big data sources for information to use as reference knowledge by Situational Awareness (SA) applications for improving Maritime Situational Awareness (MSA).

DESCRIPTION: MSA applications have a need for sustainable sources of reference knowledge. A robust tactical surface picture requires the mining and effective utilization of massive amounts of information suitable for ingestion by machine learning (ML) engines. Gathering the desired understanding of the tactical situation can be resource intensive and difficult to sustain without the assistance of ML engines to make sense of it. This SBIR topic seeks to explore the feasibility of satisfying this need through the exploitation of big data sources. For U.S. Navy maritime operations, the MINOTAUR Family of Services (MFoS) is the means by which we plan to correlate and fuse sensor data, producing an integrated display shared across air, sea and subsurface platforms, and command centers. The desired result is a coherent battlespace awareness, fusing tactical sensors with national data to support synchronized actions in the maritime environment. Optimally leveraging this huge amount of information at the individual platform level to contribute to this shared tactical picture is extremely challenging without additional tools to make sense of it all. This is particularly true on airborne platforms where operators must manage multiple sensor systems simultaneously. MFoS populates and maintains a Tactical All Source Repository (TASR) containing vessel tracks derived from multiple cooperative and non-cooperative sensors, associated radar and optical imagery and electronic warfare information. In addition, MFoS captures, as available, vessel classification and identification information made by cooperative broadcast, by electronic interrogation, by operators or operator aids. While the accumulation and display of all of this information is quite efficient, quickly understanding its tactical relevance is challenging particularly with regard to detecting or predicting threatening or anomalous behaviors. Ultimately, the goal is to understand who is operating in your area of responsibility, what they are doing, and if they pose a threat, in the most efficient manner possible.

Work produced in Phase II may become classified. Note: The prospective contractor(s) must be U.S. owned and operated with no foreign influence as defined by DoD 5220.22-M, National Industrial Security Program Operating Manual, unless acceptable mitigating procedures can and have been implemented and approved by the Defense Security Service (DSS). The selected contractor and/or subcontractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances. This will allow contractor personnel to perform on advanced phases of this project as set forth by DSS and NAVAIR in order to gain access to classified information pertaining to the national defense of the United States and its allies; this will be an inherent requirement. The selected company will be required to safeguard classified material IAW DoD 5220.22-M during the advanced phases of this contract.

PHASE I: Design and demonstrate the ability to interface with one or more existing sources of big data and examine/demonstrate the feasibility of the following: • Algorithms for automating the curation of knowledge from big data sources • Algorithms for automating the aggregation of curated knowledge • Algorithms for automatically extracting the information types required by MSA applications.

Detailed knowledge of MFoS TASR data sources and presentation is unnecessary during Phase I to develop and assess proposed approaches. Only a general understanding (comparable to that provided in the Description above) on the nature of data contained within TASR is needed. Use publicly available sources of big data, not necessarily maritime in nature, as a surrogate in Phase I. The
Phase I effort will include prototype plans to be developed under Phase II.

PHASE II: Mature the Phase I-developed algorithms and architectures and apply them for use with the MFoS TASR. The Government will provide exemplar data files to support this development. Utilize the style guidelines provided to maintain uniformity of information presentation with the MFoS operating environment. Establish a lifecycle maintenance plan. Develop requirements for and conduct performance assessments of the tool. Work in Phase II may become classified. Please see Note in Description section.

PHASE III DUAL-USE APPLICATIONS: Integrate the technology into the Navy’s MFoS application utilizing its TASR as the source of big data. Big data mining would benefit a wide range of commercial applications ranging from exploring trends in social media to analysis of financial systems.

REFERENCES:


KEYWORDS: Big Data; Information Analysis; Analytics; Minotaur; Tactical All Source Repository; Maritime Situational Awareness