SOCOM222-002: Utilizing ML Algorithms to Track and Identify UAS Threats

ADDITIONAL INFORMATION

N/A

TECHNOLOGY AREAS:

Electronics | Information Systems | Sensors

MODERNIZATION PRIORITIES:

Artificial Intelligence/ Machine Learning | Autonomy | General Warfighting Requirements (GWR)

KEYWORDS:

counter unmanned air systems; unmanned air systems; unmanned air vehicles; lidar; machine learning; artificial intelligence; detection; identification; tracking; radar integration; geolocation; drones; situational awareness; aerial systems; aerial vehicles; autonomous vehicles

OBJECTIVE:

The objective of this topic is to develop applied research toward an innovative capability to conduct the research, development, and assessment of a lidar based system utilizing Machine Learning (ML) algorithms to create electronic signatures for Unmanned Aerial System (UAS) identification and continuous surveillance of UAS threats.

ITAR:

The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

DESCRIPTION:

As a part of this feasibility study, the proposers shall address all viable overall system design options with respective specifications for detection and identification of UAS that provide real-time alerts with geolocation of target objects in the air. The main features for technology development should include range maximization while maintaining accuracy of detection, integration with radar, integration with active mitigation measures, and development of algorithms to create a library of UAS profiles.

PHASE I:

Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraphs entitled “Objective” and “Description.”
The objective of this USSOCOM Phase I SBIR effort is to conduct and document the results of a thorough feasibility study (not to exceed “Technology Readiness Level 3”) to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I SBIR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM SBIR funds during Phase I feasibility studies. Operational prototypes developed with other than SBIR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II:

Develop, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I

feasibility study on the utilization of ML algorithms to track and identify UAS threats. Phase II should result in the proof of concept and prototype development of a lidar based system for UAS identification with a focus on performance, Size Weight and Power (SWaP) goals, and the refinement of the UAS profile library.

PHASE III DUAL USE APPLICATIONS:

This system could be used in a broad range of military applications where the integration of a lidar based system with an operational radar provides accurate identification of different Type 1 and 2 UAS threats, lower false positives from UAS identification, improves UAS defense capability with integration with existing radar capabilities, and provides accurate ability to pinpoint UAS interception for single UAS and/or swarm threats.

REFERENCES:

1. "Target Classification by mmWave FMCW Radars Using Machine Learning on Range-Angle Images", IEEE Sensors Journal - Volume: 21, Issue: 18, Sept 15, 2021 http://cds.iisc.ac.in/faculty/yalavarthy/Gupta_IEEESensors_2021.pdf
2. "Dynamic Multi-LiDAR Based Multiple Object Detection and Tracking", Multidisciplinary Digital Publishing Institute (MDPI) – Mar 26, 2019 https://www.mdpi.com/1424-8220/19/6/1474/pdf

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