Deep Learning Surface Object Classifier (DLSOC)

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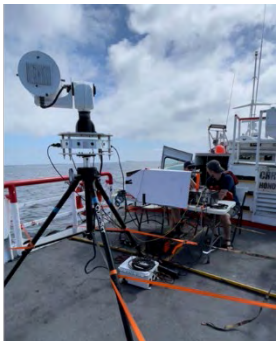

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SYSCOM: Naval Sea Systems Command (NAVSEA)

Program Sponsor: Naval Air Warfare Center, Aircraft Division

Other Potential Programs:
Large USV Program of Record, Medium USV and Optionally USV (OUSV), PMS 406, PMS 420

Current TRL: 6
Projected TRL: 7 / Q4 2023

Keywords:
Computer vision, deep learning, target detection, tracking, classification

THE CHALLENGE

Many naval tasks, particularly in autonomy, require complete situational awareness (SA) of surroundings through detection of objects of interest in the vicinity of a vessel. But Maritime surveillance represents a challenge due to the complexity of the observed scene and also the targets having different shapes and sizes. Camera systems with advanced computer vision and deep learning methods can be leveraged to achieve robust target recognition and tracking.

THE INNOVATION

The DLSOC leverages another UtopiaCompression (UC) Navy SBIR Phase II capability to provide a 360o passive perception (using only cameras - EO/IR) to detect, track, and classify objects of interest (i.e., identify threats). The system uses a combination of deep learning and traditional techniques to classify objects from camera images in real time. These classifications can be used to identify threats and other actionable contacts. Classification of tracks will increase track robustness and can also help in station keeping. The system is capable of fusing optical and radar tracks to improve track robustness. Potential target defense applications are SA for Large-Unmanned Surface Vehicle (LUSV), Medium-Unmanned Surface Vehicle (MUSV), Optionally-Unmanned Surface Vessel (OUSV), and Mine Counter Measures-Unmanned Surface Vehicle (MCMUSV).

THE NAVY BENEFIT

DLSOC, a camera agnostic software solution, can augment the capabilities of installed cameras on many Navy vessels. The system can inform autonomy directions or assist in decision making for manned bridge operations - providing improved capability and saving manpower and cost. DLSOC was demonstrated in live testing on civilian vessels with prototype hardware. It leverages state-of-the-art deep learning methods and can continually improve with training data provided by the Navy over the course of deployment. This project was funded by a Phase II SBIR. PMS 406 and 420 are sources of transition and investment.

THE FUTURE

DLSOC has been identified for potential Phase III transition by PMS 406 and 420, planning for installation on various sizes of USV platforms. Part of the system's capabilities has already been commercialized and licensed by an IR camera manufacturer. It is receiving further commercialization interest from other camera manufacturers for infrared and low-light imaging solutions. Further testing and optimization are ongoing, both with the re-incorporation of live testing data for algorithm training and the development of modules for reporting and correlating results with radar data.

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