

Enhancing Safe Autonomous Navigation at Sea Using Deep Learning Techniques



ASV Global (ASV) is leading a new £1.2million research project in partnership with BMT to enhance the safety and reliability of autonomous navigation. The project team will use deep learning machine vision systems trained with a unique combination of simulated and real-world data. Partially funded by Innovate UK, the UK's innovation agency, this project will enhance situational awareness enabling the unmanned surface vehicle (USV) to operate in extreme and congested marine environments.

The Synthetic Imagery training for Machine Vision in Extreme Environments (SIMVEE) project will build upon ASV's existing, [COLREGs](#) cognisant, autonomous collision avoidance and path planning capability. The project will use BMT's REMBRANDT simulator to train and validate ASV Global's vision algorithms to detect and classify objects

at sea.

A key project output will be improved situational awareness for both the autonomy onboard and the remote human supervisor. The unique combination of real world and simulated data to train deep learning algorithms will improve the reliability of the existing system extending safe operations into complex environments with a wide range of objects to detect, classify and avoid.

COLREGs compliant autonomous navigation

Richard Daltry, R&D director at ASV Global said: "This work will provide a significant step in the capability of ASV Global's ASView autonomous control and navigation system. Today we use a remote human supervisor and AIS to classify objects and ensure safe operations. The addition of machine vision that detects and classifies objects extends our COLREGs compliant autonomous navigation, enabling operations in limited bandwidth with reduced supervisor workload."

Phil Thompson, managing director at BMT commented: "We're delighted to be partnering with ASV on this project. This research will play a pivotal role in helping to accelerate the wider adoption of unmanned systems and increase trust in their feasibility by mariners around the world."

Utilising data gathered by BMT's *REMBRANDT* ship manoeuvring simulator as well as real world onboard camera data will allow the team to train the autonomy system with large quantities of data. This method provides a cost-effective solution to generating the data and accelerates the machine learning process. The project will not only allow ASVs to operate in the same way as traditional manned vessels at sea but will also open up new use cases and applications with the added use of BMT's Search and Rescue Information System, (SARIS).