PRESS RELEASE

LUXOR research project gets underway

Laser scanners to aid in detecting explosive ordnance on the seabed

World War II left its mark on the seas, with around 1.6 million tons of ammunition and explosive ordnance from this period remaining in German marine waters alone. As part of the LUXOR research project, Fraunhofer IPM is teaming up with international research partners to develop an automated, digital system that will facilitate the identification of explosive ordnance on the seabed and improve the safety and efficiency of its removal.

Large quantities of chemical weapons, ammunition and explosive ordnance remain on the seabed – relics of the war that have long been ignored. As corrosion progresses, these weapons are releasing more and more chemicals and contaminating the fragile maritime ecosystem. In addition, some of the ordnance is still live, and the risk of explosion poses a huge problem for the construction of offshore wind farms or the laying of submarine cables and pipelines. Clearing explosive ordnance is far more complex underwater than it is on land. Metal detectors, sonar measuring devices, cameras and human divers are all used to search the seabed. Each method comes with its own drawbacks – some are too expensive or time consuming, others are not reproducible or involve significant risks to safety, and still others are simply ineffectual in turbid water.

With the LUXOR (long-range underwater explosive ordnance revelation) project, which has received 1.5 million euros in funding from the EUREKA network and the European Commission as part of the Eurostars program, the research partners are taking an alternative approach based on LiDAR (light detection and ranging) technology and automated object recognition software using artificial intelligence (AI). The project partners from Germany, Denmark and the Netherlands aim to develop an automated process that collects and fuses data, automatically identifies objects and makes the digital mapping data available in a cloud-based database. This approach will make mapping explosive ordnance more reliable and far less expensive, thereby simplifying its removal.

Digital data from a safe distance

Reliably identifying objects such as mines, bombs or torpedoes on the seabed requires the consistent recognition of their typical forms. The underwater LiDAR system (ULi) developed by Fraunhofer IPM optically detects objects underwater from a safe distance,

enabling the creation of a 3D picture of the environment at a distance of 50 meters in clear water. This system is now being developed for the specific measuring task at hand and a video mode is being added, which will make it possible to perform both a line scan and a field scan of the environment using the laser scanner. As a result, ULi will be able to provide 3D video data in real time, even in turbid water.

The scanner system will be integrated into a measurement platform provided by one of the project's industrial partners and will record the marine environment from a remotely operated underwater vehicle. In addition to the laser scanner, the measuring platform will be equipped with orientation and positioning sensors, magnetometers, cameras and sonar. The hardware is part of a comprehensive process chain that includes the analysis as well as the digital provision of georeferenced measurement data in a cloud-based database. This will make it possible to analyze the data on land, practically in real time, thereby simplifying the removal of the objects discovered and improving the safety of this process.

Research project LUXOR (Long-range underwater explosive ordnance revelation)

- Funding: Eurostars program
- Duration: December 1, 2019 to May 31, 2022
- Project volume: approx. 1.5 million euros
- Project partners:
    - Oktopus GmbH, www.oktopus-kiel.de
    - Alexandra Institute https://alexandra.dk/uk
    - I-GIS https://i-gis.dk/en-us/
    - N-Sea Group https://www.n-sea.com/en

Fraunhofer IPM at Oceanology International

Fraunhofer IPM will present the ULi underwater LiDAR system at Oceanology International in London from December 1 to 3, 2020 (originally scheduled for March 2020)

More about measurement techniques for underwater at Fraunhofer IPM

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