

Absolute Ocean: A Cloud-based Platform with Automatic Detection of Targets in Sonar Data

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Improvements in SONAR systems within recent years has led to a dramatic increase in the volume and resolution of data collected during hydrographic surveys. This influx of data has drastically improved our understanding of the benthos as well as helped facilitate important commercial operations. However, due to the vast quantity of data collected the conventional practice of manual target identification is quickly becoming impractical. Therefore, in an effort to maximize the efficiency of existing commercial workflows and reduce human error we introduce Absolute Ocean (AO), a cloud-based platform with automatic target recognition (ATR) capabilities. Using an internet browser or application program interface (API) users can upload processed sonar data to AO, which then gets passed to our ATR pipeline as input. Potential objects of interest are first identified and then visualized in-browser where images, labels, and comprehensive target reports can be automatically generated and downloaded. AO uses open-source vision-based machine learning algorithms (i.e., convolutional neural networks) fine-tuned to perform object detection on either sidescan or bathymetric data. Models are trained on data originating from private and publicly available sources—including over 10K curated samples from the National Ocean Service (NOS) Hydrographic Database—to identify general objects of interest such as wreckage, infrastructure, and boulders. In our study we first give a detailed overview of AO, its features, and how it can be integrated into an existing workflow. We then outline each step of the ATR pipeline by providing a high-level description of the preprocessing techniques, model architectures used, training, and implementation. Finally, we discuss our methods for acquiring samples and creating their corresponding labels. Knowing the challenges associated with obtaining a well-curated dataset, we make available to the public a subset to serve as a community benchmark in an effort to encourage collaboration and push for the advancement of ATR.