Classification of marine mammal vocalizations in seismic environment

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In partnership with Sercel, this work concerns the implementation of algorithms for recognizing the sounds emitted by mysticetes (baleen whales). These sounds can be studied using passive acoustic monitoring systems. Sercel, through its seismic activities related to oil exploration, has its own software to detect and locate underwater sound energy sources. The challenge therefore consists in adding a recognition module to identify if the detected and localized energy corresponds to a possible mysticete. Since seismic shooting campaigns are expensive, the method used must be able to reduce the probability of false alarms, as recognition can invalidate detection.

The proposed method is based on dictionary learning. It is dynamic, modular, depends on few parameters and is robust to false alarms. An experiment on five types of vocalizations is presented. We obtain an average recall of 92.1% while rejecting 97.3% of the noises (persistent and transient). In addition, a confidence coefficient is associated with each recognition and allows semi-supervised incremental learning to be achieved.

Finally, we propose a method capable of managing detection and recognition together. This "multi-class detector" best respects the constraints of false alarm management and allows several types of vocalizations to be identified at the same time. This method is well adapted to the industrial context for which it is dedicated. It also opens up very promising prospects in the bioacoustics context.