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Heuristic Classification of Hydrophone Recordings

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Abstract : An unsupervised machine listening system is constructed and applied to a dataset of 17,195 30-second marine hydrophone recordings. The system is then heuristically supplemented with anecdotal listening, contextual recording information, and supervised learning techniques to reduce the number of false positives. Features for classification are assembled by extracting the following data from each of the audio files: the spectral centroid, root-mean-squared values for each frequency band of a 10-octave filter bank, and mel-frequency cepstral coefficients in 5-second frames. In this way both time- and frequency-domain information are contained in the features to be passed to a clustering algorithm. Classification is performed using the k-means algorithm and then a k-nearest neighbors search. Different values of k are experimented with, in addition to different combinations of the available feature sets. Hypothesized class labels are 'primarily anthrophony' and 'primarily biophony', where the best class result conforming to the former label has 104 members after heuristic pruning. This demonstrates how a large audio dataset has been made more tractable with machine learning techniques, forming the foundation of a framework designed to acoustically monitor and gauge biological and anthropogenic activity in a marine environment.

Keywords : anthrophony, hydrophone, k-means, machine learning
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