



SDSU
presents
a thesis defense for
Master of Science
degree in
Computer Science

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GMCS 405

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*Determining Dolphin Species by Their Echolocation Clicks:
A Study of the Effects of Site Variability, Noise,
And Recording Equipment Differences*

Abstract

Detecting and classifying odontocete species through their echolocation clicks has been proven successful by other studies, but the differences between the recordings can impact the accuracy of the classification. This thesis studies the means of properly removing background noise from the recordings and the effects of the detection and classification algorithm on the resulting echolocation clicks, using the species of Pacific White-Sided Dolphins and Risso's Dolphins. Differentiating between echolocation clicks and ambient noise is done using a function of the relative energy in the recording. An inverse transfer function is retrieved from a separate server based on the location and time at which the recording was taken, and applied to each recording in order to undo the changes made by the recording equipment's preamplifier. Echolocation clicks are further validated based on their length, energy, and frequency values to eliminate false detections. Echo sounders are also detected and removed through auto-correlating the times of the detected echolocation clicks and removing those found at regular intervals. The remaining detected clicks were grouped based on various criteria, including sighting, preamplifier setting, and recording site, and subjected to a 3-fold experiment that trains GMM's with the clicks of a few groups and tests the remaining groups using the probabilities of the models. The results show that in all groupings, removal of the background noise from the echolocation clicks improves the error rate over 100 tests. The baseline grouping, by sighting, showed an improved error rate from 1.9% to 0.4%.

Thesis Committee

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