Sound Identification of Loons

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Introduction
Loons are a group of aquatic birds found in many pairs of North America and northern Eurasia (Europe, Asia and debatably Africa). The loons are the size of a large duck or small goose, which they somewhat resemble in shape when swimming. The focus of this project is sound identification of loons through their calls or songs. Most sound identification schemes that exist today are constrained by the fact that they either require individuals to have similar call types or do not take into account the change in vocal characteristics over time. The objective is to determine a scheme of sound identification with feature extraction that is stable over time and location, which would greatly increase the ease with which these birds are studied.

Issues
• Call independent identification: The loon yodel changes with a change in location, hence a scheme of feature extraction has to be devised that is not dependent on the yodel itself.
• Temporal stability: Although the variability in loon yodels due to changes over time are not as great as the variability caused due to a change in location, this remains a factor in identification and must be appropriately handled.
• Background Noise: The scheme to be used for feature extraction, MFCC - is not very robust in the presence of additive noise. Hence, the proposed solution should contain some scheme that would sufficiently mitigate the effect of background noise without a significant loss in the quality of the recording.

Approach
• MFCCs: Physiological studies have shown that human auditory system does not follow a linear scale. Thus, for each tone with an actual frequency, fHz, a subjective pitch is mapped on a scale called the mel scale. The mel-frequency scale is a linear frequency spacing below 1000 Hz and a log spacing above 1000 Hz. The main advantage of using mel frequency scaling is that it approximates the frequency response of human auditory systems and can be used to capture the phonetically important characteristics of speech.

Results and Conclusions
- Noise Removal

Figure 5. Recording before and after noise removal

References
Fox, Elizabeth J. Call-independent Identification in Birds. Thesis. University of Western Australia, 2008

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