Identification of woodpecker species through their drumming

Juliette Florentin[*][†][1], Olivier Verlinden[1], Thierry Dutoit[2], Francis Moiny[3], Georges Kouroussis[1], and Pierre Rasmont[4]

[1]Faculty of Engineering, Dept. of Theoretical Mechanics, Dynamics and Vibration – University of Mons Place du Parc 20, 7000 Mons, Belgium
[2]Faculty of Engineering, Dept. of Circuit Theory and Signal Processing – University of Mons Place du Parc 20, 7000 Mons, Belgium
[3]Faculty of Engineering, Dept. of Physics – University of Mons Place du Parc 20, 7000 Mons, Belgium
[4]Faculty of Sciences, Dept. of Zoology – University of Mons Place du Parc 20, 7000 Mons, Belgium

Abstract

Because of the potential applications in wildlife monitoring, interest rose in recent years for the automated identification of bird species through audio recordings of their vocalizations. Recent works progressed up to a glass ceiling of roughly 70% of accurate recognitions. This number is most commonly reached by using a combination of Mel-Frequency Cepstral Coefficients (MFCC) and Hidden Markov Models. A reason for the glass ceiling is that some of the specificities of bird songs cannot be captured by MFCCs. Even further, the proper descriptors might be species-specific. In the present study, seven species of European woodpeckers are looked into. Woodpeckers use both vocalizations and drumming on trees for territory marking and partner attraction. For some species, such as the great spotted woodpecker (Dendrocopos major), drumming is the only sound used in that regard. For the purpose of characterization, a database of woodpecker drumming sounds is assembled from the Xeno-Canto online archive (168 recordings, 1520 drumming events). A set of acoustic features is then computed for each recording: the drumming speed, the mean drumming event duration, the duration of the pause between drumming events and a crude description of the spectral content. Using these descriptors, a generic unsupervised clustering algorithm accurately regroups 67% of the sound files according to species. For comparison, a set of MFCCs is computed through the drumming events. The unsupervised algorithm then successfully re-clusters only 29% of the files. A random assignment would yield a 20% success rate.

Keywords: acoustic monitoring, species recognition, bird songs, acoustic features, woodpeckers

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[*]Speaker
[†]Corresponding author: Juliette.FLORENTIN@umons.ac.be