DEVELOPING THE IDENTIFICATION SYSTEM FOR ANURAN VOCALIZATIONS

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Abstract. *An intelligent identification system for anuran vocalizations is developed in this work to provide the public to easily consult online. The raw anuran vocalization samples are first filtered by noise removal, high frequency compensation, and discrete wavelet transform techniques in order. An adaptive end-point detection segmentation algorithm is proposed to effectively separate the individual syllables from the noise. Seven features, including spectral centroid, signal bandwidth, spectral roll-off, threshold-crossing rate, delta spectrum magnitude, spectral flatness, and average energy, are extracted and serve as the input parameters of wrapper feature selection method. Selected features are used to assisting in separating the anuran calls from non-anuran sounds. Then k-nearest neighbor classifier (kNN) and Gaussian mixture model are used to classify the anuran species based on another chosen feature set. A series of experiments were conducted to measure the outcome performance of the proposed work. Experimental results exhibit that the recognition rate of k-nearest neighbor classifier using GMM non-anuran detection method with two different feature sets can achieve up to 80.42%. The effectiveness of the proposed identification system for anuran vocalizations that uses the combination with anuran detection and classification is thus verified.*

Keywords: Data mining, Pattern recognition, Anuran detection, Outlier detection, Wrapper feature selection

1. **Introduction.** In speech recognition, a source model is assumed and the signal is expected to obey the laws of a specific spoken language with vocabulary and grammar. Anuran vocalization is a representative instance of a category of natural sounds where a vocabulary and other structural elements are expected. In comparison with the human speech recognition problem, animal sounds are usually simpler to recognize. Speech recognition often proceeds in a quiet and similar environment, while anuran's sounds are usually recorded in a much noisier environment, under which we must recognize simpler vocalizations.

In this work, an automatic identification system for anuran vocalizations is proposed to recognize the anuran species based on the recorded audio signals that were sampled from recordings of anuran sounds in an outdoor environment. The sampled signals were first converted into frequency signals. Then syllable segmentation and feature selection methods are employed to separate the original anuran calls into syllables and to derive the input feature sets for the classifiers. Notably, a non-anuran sound detection module that