# Software Tools for Automatically Detecting, Measuring and Classifying Animal Sounds

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## INTRODUCTION

Many bioacoustic investigations involve the analysis of large amounts of sound recordings. Reviewing these files manually is often both extremely time-consuming and subject to making mistakes that result from the monotony of that procedure. It is therefore desired to have tools that automate this process.

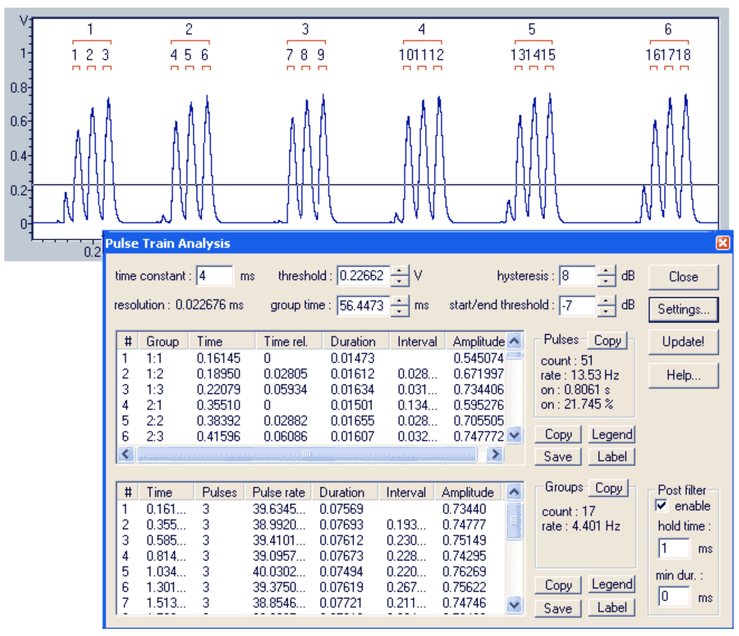
Avisoft Bioacoustics has been working on software tools that accomplish this goal. There are several approaches that are suitable for various analysis requirements. This poster describes the currently available options.

There are tools that are applied either directly to the waveform or to the spectrographic representation of the sound:

## WAVEFORM ANALYSIS

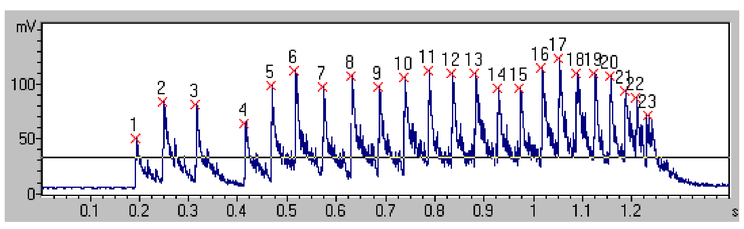
### 1. Waveform-based analysis of temporal patterns (pulse train analysis)

### 1.1 Separation by simple (absolute) amplitude threshold comparisons (gate function)




### 1.2 Separation by adaptive (relative) amplitude threshold comparisons

The advantage of this separation mode is its ability to detect both small and large peaks in situations where a fixed absolute (gate function) threshold would fail.

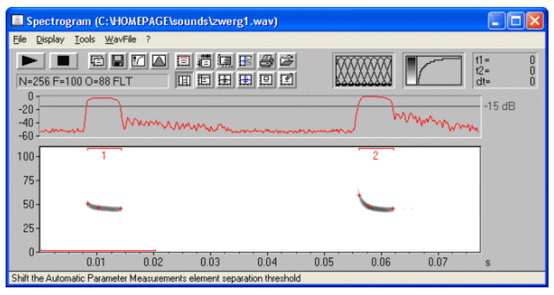


## SPECTROGRAM ANALYSIS

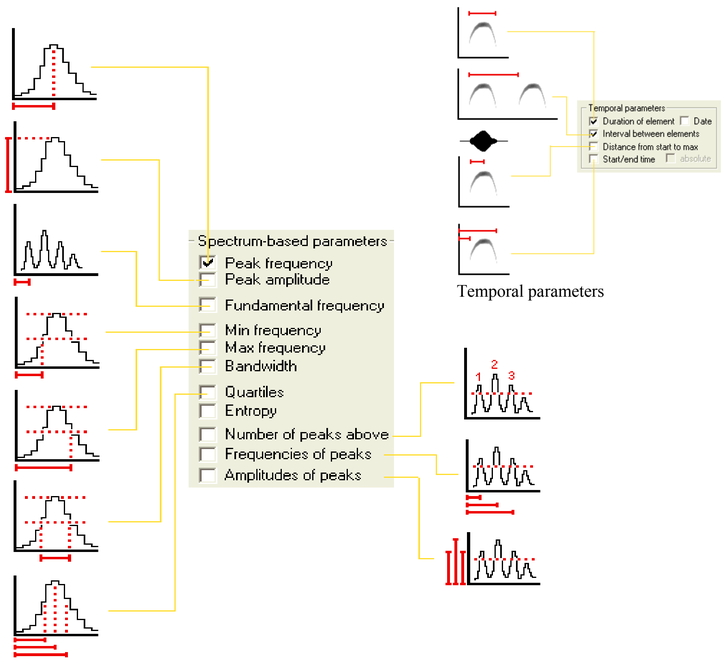
### 2. Spectrogram-based analysis of both time and frequency

### 2.1 Automatic parameter measurements for collecting various time and frequency parameters on automatically detected events with optional subsequent multi-parametric classification

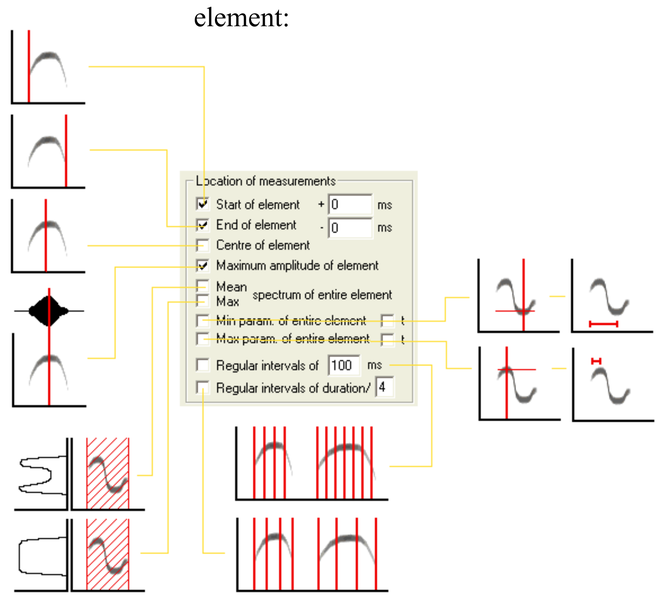
This tool first detects the sound elements (syllables) on the spectrogram and then logs up the selected parameters.




The element detection threshold can be adjusted interactively.

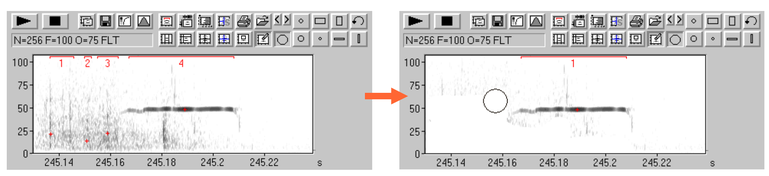



The above spectrum-based parameters can be taken from the spectrogram at various locations within each detected element:



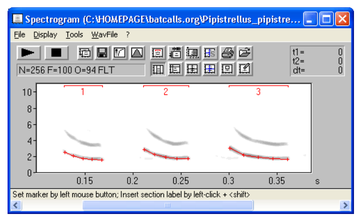

Secondary analysis options include group analysis (for characterizing series of sound elements or pulses that are separated by significant breaks) and statistics on the acquired measurements.

Depending on the quality of the sound recordings and the structure of the vocalizations, the implemented automatic analysis tools might not always work satisfying. It is therefore possible to edit the automatically determined results or to run the analysis in a semi-automatic way.



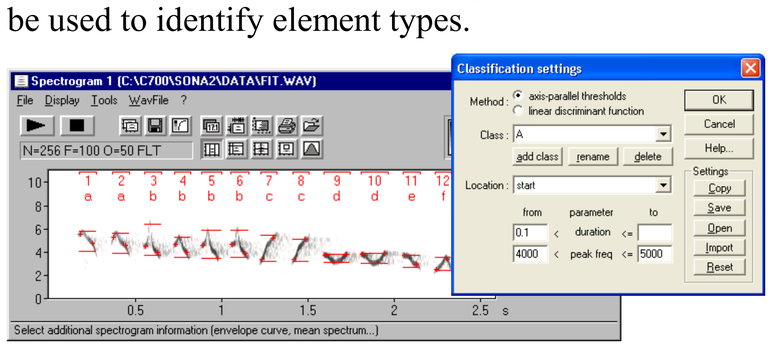
Manually erasing disturbing noise enables automated measurements in noisy recordings.

There are a few alternative approaches for scanning simple (more or less pure-tone) sound elements.

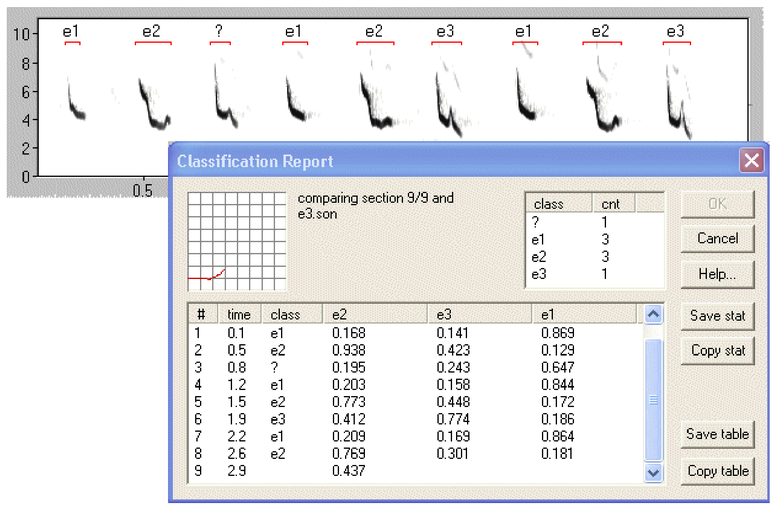


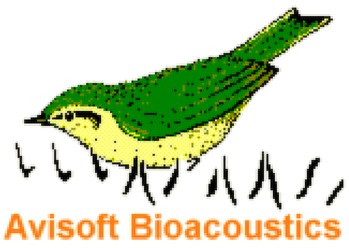

## SYLLABLE CLASSIFICATION

The acquired time and frequency parameters can futher be used to identify element types.




### 2.2 Template spectrogram comparison (using cross-correlation) for identifying and labeling certain spectrogram patterns either continuously over the entire sound file or limited to manually or automatically detected sound events



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