

Spectrum_2_0.praat

Task:

This script opens all TextGrid files in a directory and associated sound files (if they exist), computes the spectral modes and/or the peak frequency of the spectrum at the center and/or across segments, and writes the results to a text file with the name “spectrum_results_<date>_<time>.txt”. The length of the segment and the (mean) intensity values are reported along with the spectral data.

There are more parameters that control the behaviour of the script than displayed in the form window (the size of the form window fits into a screen with 900+ points vertical resolution). These parameters can be set below the form statement in the script (see the **Programming**) section.

Parameter:

The screenshot shows a dialog box titled "Run script: Spectrum parameters:" with the following fields and callouts:

- Directory path:** A text input field for the directory path.
- Tier number to be analysed:** A text input field containing the value "1".
- Specification of labels:** A text input field containing "kiel". Above it is a list of labels: "<label>, <list>.txt, 'IPA', 'Kiel', 'Sampa', 'TIMIT', '' (= only labelled), or empty (= all)".
- Minimal length of a segment to be analysed:** A text input field containing "25".
- Minimal intensity of a segment to be analysed:** A text input field containing "40".
- High-pass filter frequency:** A text input field containing "300".
- Upper frequency boundary:** A text input field containing "10000".
- Report data from the center of an interval:** A checked checkbox labeled "Center position".
- Report means data of an interval:** An unchecked checkbox labeled "Means".
- Data to be reported:** A text input field containing "m p". Above it is the question "Do you want (m)odes and/or spectral (p)eak?".
- Reporting of skipped intervals:** Radio buttons for "All", "Length, Intensity exclusion" (selected), and "None".
- Symbol to be used for missing data values:** A text input field containing ".".

At the bottom of the dialog are buttons for "Standards", "Cancel", "Apply", and "OK".

Please read the **Programming** section for more internal parameters that can easily be changed.

Directory path:

The script handles all sound files in a directory specified in this field. If this field is left empty, the script will handle all sound files in the directory where the script was started (i.e., the script is placed in the same directory as the sound and TextGrid files).

Tier number to be analysed:

The number of the interval tier to be analysed.

Specification of labels:

The segments (= intervals in PRAAT terminology) that should be analysed can be specified in several ways:

<label>:

Giving a label (e.g. f) or a list of labels separated by commas or spaces (e.g. s, f) will only report segments that have this label. This function is case sensitive.

<list>.txt:

Giving a text file (e.g. label_list.txt) will report all segments that are listed on a line-by-line basis in a raw text file (not a Word or Pages file). Note that the extension .txt must be given in this field. Example of such a text file:

```
f
s
f
```

'ipa':

Writing ipa in this field will use the IPA notation for vowel segments.

List of IPA vowels (additional marks ∴ are possible):

ɸ, β, f, v, θ, ð, s, z, ʃ, ʒ, ʂ, ʐ, ç, j, x, ɣ, ɣ̣, ʁ, h, h̥, ʕ

'kiel':

Writing kiel in this field will use the Kiel-Corpus notation for vowel segments.

List of Kiel-Corpus vowels:

C, S, Z, f, h, s, v, x, z

'sampa':

Writing sampa in this field will use the SAMPA notation for vowel segments.

List of SAMPA vowels (additional mark ∴ is possible)

D, S, T, Z, f, h, j, s, v, z

'timit':

Writing timit in this field will use the TIMIT-Corpus notation for vowel segments.

List of TIMIT vowels (upper and lower case are handled):

ch, jh, s, sh, z, zh, f, v, th, dh, hh, hv

‘.’:

Using a dot (.) will report values for every labelled segment.

empty:

Leaving this field empty will report values for all labelled and unlabelled segments.

Minimal length of a segment to be analysed:

The minimal length of a segment (in milliseconds) to be analysed. Setting this value to '0' will analyse all selected (by the **Specification of labels**) segments.

Minimal intensity of a segment to be analysed:

The minimal RMS-intensity (in dB or as quantile of the whole file) of a segment to be analysed. A value greater equal 1 is interpreted as an absolute dB value (e.g. '50' means a minimal average RMS-amplitude of 50 dB for a segment). A value between 0 and 1 is interpreted as a quantile of the whole file (e.g. '0.1' will use the 10% quantile of all RMS values of the whole file as lower boundary for a segment). Setting the **Minimal intensity** to '0' will analyse all segments that are selected by the **Specification of labels**.

High-pass filter frequency:

The script performs a high-pass filtering, which is usually done to reduce the influence of any voicing. The script filters the audio files internally but will not save them to disk. If this value is set to 0, no filtering is performed.

Upper frequency boundary:

Upper bound for the spectral computation. The script downsamples internally audio files with a higher frequency but will not save them to disk. In case that this upper boundary is set above the Nyquist frequency of an audio file (i.e. half the sampling rate) the script will issue a warning but will proceed. If this value is set to 0, no downsampling is performed.

Report data from a center of an interval:

The data from the middle of each segment specified by **Specification of labels** will be reported.

Report means data of an interval:

The data of the total length of each segment specified by **Specification of labels** will be reported.

Data to be reported:

By default, the script reports (see **Result file** below) the file name, name of the segment, starting time of the segment, duration of the segment and the mean intensity of a segment of the data selected. Up to 2 additional data can be reported by specifying letters separated by commas or spaces in this field (e.g. m p) to report data for the particular point in time or the length of an interval where a measurement takes place:

- m** Modes, i.e. Center of gravity (CoG), Standard Deviation (StDec, SD), Skewness and Kurtosis.
- p** Frequency of the spectral peak.

Reporting of skipped intervals:

Handling of segments which are either excluded by the **Specification of labels** or because they do not fulfil the **Minimal length** or **Minimal intensity** criteria:

All:

All segments excluded from the computations are reported with File, Label, Start(s) and Duration(ms) only (see **Result file** below), all other values are set to the missing value symbol (see below). This function can be helpful to see the context of a particular segment analysed, e.g.

the listing will show the data for a vowel, but also the labels of the segments before and after it, which are not vowels.

Length, Intensity exclusion:

All segments that fulfil the **Specification of labels** are reported, but fail either the length or pitch criteria. Only File, Label, Start[s] and Duration[ms] are reported (see **Result file** below), all other values are set to the missing value symbol (see below).

None:

No segments that are excluded because of any criteria are reported.

Symbol for missing values:

When PRAAT cannot compute a value it uses internally the string “- undefined -”. This script replaces this string by the string given in this field. For a subsequent analysis of the data with JMP, the dot indicate missing values, for R it would be NA.

Result file:

The script generates a raw text file with tab-delimited data and a header line. The file name is of the form “spectrum_<date>_<time>.txt” with <date> of the form ‘yymmdd’ (i.e. 2-digit year, 2-digit month, 2-digit day) and <time> of the form ‘hhmmss’ (i.e. 2-digit hour in 24 hour format, 2-digit minutes, 2-digit seconds). For example, a file with the name ”spectrum_190322_150110.txt” was created on the 22nd of March 2019 at 3pm, 1 minute and 10 seconds. The parameters controlling the computation are listed at the end of every result file.

The result file for a parameter setting to report the parameters at the center of an interval; data for the mean of an interval will have an additional “m” in front, e.g. “mCoG(Hz)”:

File	Label	Start(s)	Duration (ms)	Intensity _mean (dB)	time(s)	CoG(Hz)	StDev(Hz)	Skewness	Kurtosis	Peak(Hz)
D071a000	x	1.2279	38.6	64.5	1.2472	1131.24	540.95	1.59	7.23	843.75
g071a000	f	1.4718	115.3	58.6	1.5294	5555.83	1768.71	-0.67	-0.24	6500.00
g071a000	C	1.7322	37.2	62.5	1.7508	4288.23	1462.60	0.90	-0.41	3500.00
g071a000	f	1.9294	56.1	59.5	1.9574	7011.77	456.68	-5.46	50.38	7000.00
g071a000	x	2.0143	38.3	59.6	2.0334	1099.48	730.15	4.51	27.42	968.75
...										

```

Analysis started: 19-May-20 12:42:31
Tier: 4
Labels: kiel
Minimal length: 25 ms
Minimal intensity: 40 dB
High pass filter frequency: 300 Hz
Highest frequency: 8000 Hz
Window size for spectrograms: 0.005 s

```

Information for programming:

Some parameters can be set underneath the ‘form’ section in the script. These are:

Directories:

The script uses internally separate strings for sound, TextGrid, result and support directories. Users who use separate directories for these can adjust these names in the script (or put them into PRAAT’s ‘form’ window).

Sound file names:

The default extension for sound files is “.wav”. This parameter can be changed in the script.

User feedback:

The script reports which file is being handled and the percentage of all files in a directory that have been handled. By setting this switch, any output (other than error and warning messages) will be suppressed. This will decrease processing time, but there is no feedback other than an increasing size of the result file.

user_feedback = 0 Gives user feedback

user_feedback = 1 No user feedback

Noprogress string:

PRAAT itself reports its activity when computing pitch, intensity and formants. All these outputs can take substantial processing time, sometimes longer than the actual computation time. (This string is actually positioned where in PRAAT the `noprogress` is written.)

np_string\$ = "" (= empty string) normal PRAAT feedback

np_string\$ = “noprogress” No PRAAT feedback

Dummy data header line:

Statistic programs like JMP decide the type of data for each column on basis of the first data line. To force correct data-type assignment (due to missing data in the first data row) a dummy data line of text, 0 and 0.0 can be generated to force correct data-type assignment.

dummy_data_header = 0 No dummy data line

dummy_data_header = 1 Dummy data line with “Dummy” for strings and “0.0” for numerals

Duration reporting:

duration_in_ms = 1 Duration is reported in milliseconds

duration_in_ms = 0 Duration is reported in seconds

Spectrogram computing parameters (only used for ‘Center position’):

window_size = 0.005 (in seconds)

Current version and date:

2.0, 15-may-2020

Known problems:

None

Planned extension:

Handling of point tiers

Reporting of energies and slopes in frequency bands

Dumping of data in text files for additional statistical processing

Generating of graphs and optional automatic saving

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