SpeechRhythmExtractor (version 1.02)

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This script was implemented by Leônidas SILVA JR. (State University of Paraiba / University of Campinas - Brazil) & Plínio A. BARBOSA (University of Campinas - Brazil). It aims to build rhythmic multidimensional models of vowel, consonant, phonetic syllable and higher units computed from rhythmic metrics and prosodic-acoustic parameters.

This script can be used in a cross-section of diifferent languages and dialects.

- Audio/TEXTGRID files are required and have to be in the same directory of the script.
- Script under updating process.

HOW TO CITE THIS SCRIPT
SILVA JR., L.; BARBOSA, P. A. (2022). **SpeechRhythmExtractor.** Computer program for Praat (version 1.02). URL: https://github.com/leonidasjr/SpeechRhythmCode

GETTING STARTED...
We will start from the point having in mind that you have already installed Praat in your computer.

BEFORE RUNNING THE *SpeechRhythmExtractor* SCRIPT (examples at the right margin)

Preparing METADATA

- For the sake of an appropriate *linguistic target* (LANGUAGE; DIALECT; ACCENT; etc.), and *sex* (FEMALE; MALE; OTHER, etc.), we strongly recommend that the audio (and TextGrid) files are named in the following sequence:
  - ✓ the first to third letters = the *language target*; and;
  - ✓ the fourth to sixth letters = the *sex* of the speaker. Additional characters may represent the speaker.

→ e.g., **AmEFEM001**
AmE = *linguistic target* (**Am**erican **E**nglish);
FEM = *sex* (**FEM**ale);
001 = *order* (the very first speaker)

- You will need a couple of **Audio**/**TextGrid** files;

→ Example **.wav**
Example.**TextGrid**

- The audio, TextGrid files and the script **MUST BE** in the SAME DIRECTORY;
- The TextGrid files must be segmented into the following units:
- vowel onset-to-vowel onset (VV), vocalic (V) consonantal (C), silence ("#" or "_" or "PAUSE") and chunk (CH) intervals as showed in Figure 1.

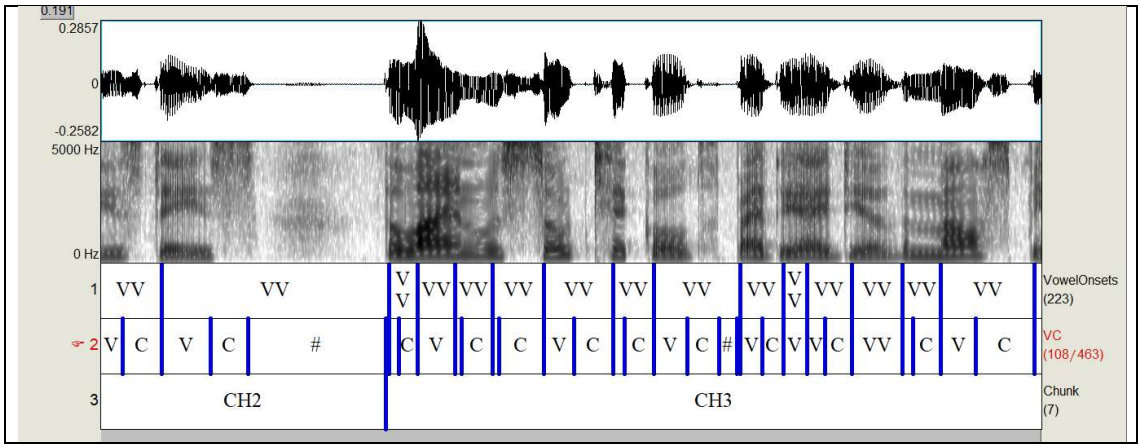

Figure 1.

RUNNING THE *SpeechRhythmExtractor* SCRIPT

Now that your audio, TextGrid files and script are in the same folder and the textgrids are properly segmented (see Figure 1), you will need to "call the script" into Praat object's window. On Praat's drop-down menu, click **Praat >> Open Praat script...** as shown in Figure 2. Now choose the directory you have your files and the *SpeechRhythmExtractor* script in.

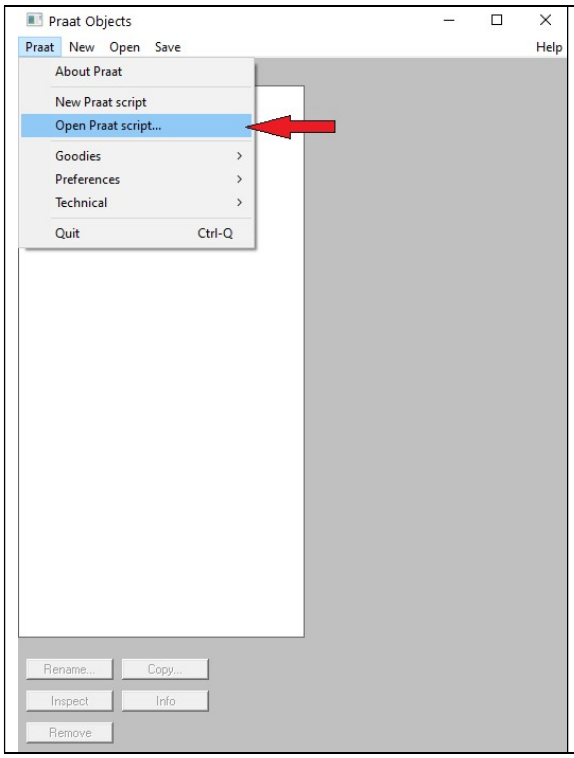

Figure 2.

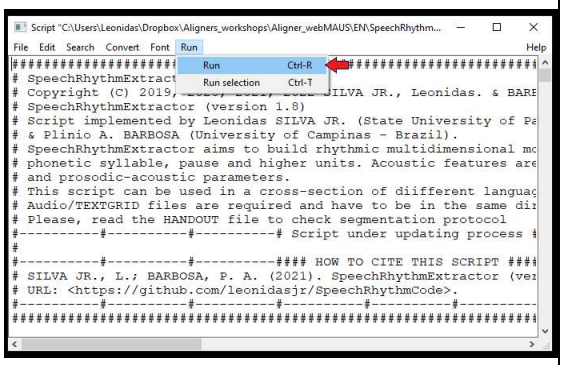

Figure 3.

Once the script is uploaded from Praat objects' window, you will need to run it. For running the script, click **Run >> Run** as showed in Figure 3.

When you click **Run**, the script will pop-up a window (a form contaning the settings for the input parameters) as showed in Figure 4. Click the **Ok** button to run the script.

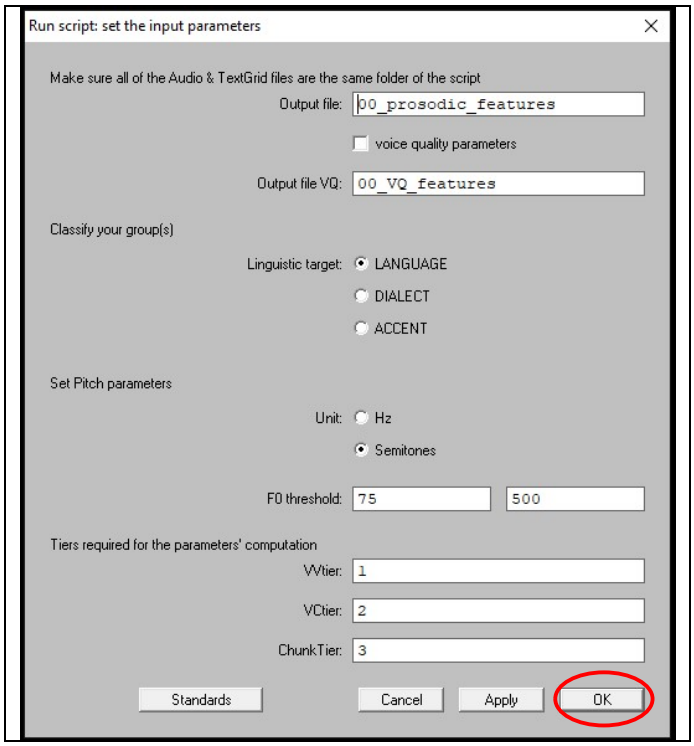

Figure 4.

The script automatically returns an **in-tab-delimited .txt file** named '*metrics*' to the same directory where the script, audio and TextGrid files are in. The **metrics.txt** file contains:

- The string vectors (audio file ID, linguistic category and the speaker's sex), and;
- The numerical vectors (the rhythm metrics and the prosodic-acoustic parameters).

You can change the name of the .txt file right before clicking the **Ok** button in the form as shown in the argument line <*Extension*> in Figure 3.

The rhythm metrics and the acoustic parameters extracted from *SpeechRhythmExtractor* script for speech rhythm analysis can be seen in Chart 1.

METRICS		ACOUSTIC PARAMETERS	
Parameter	**Segment of application**	**Parameter**	**Segment of application**
Proportion (%)	V, C	F0 median	CH
Standard deviation (s)	V, C, (V or C), VV	F0 peak	CH
Variation coefficient (Varco)	V, C, (V or C), VV	F0 minimum	CH
Raw pairwise variability index (r-PVI)	V, C, (V or C), VV	F0 standard deviation	CH
Normalized pairwise variability index (n-PVI)	V, C, (V or C), VV	F0 skewness	CH
Rhythm ratio (RR)	V, C, (V or C), VV	F0 semi amplitude between quartiles	CH
Variability index (VI)	V, C, (V or C), VV	F0 rate	CH
Yet another rhythm determination (*z-score duration*) (YARD)	V, C, (V or C), VV	F0 peak rate	CH

	F0 min. rate	CH
	F0 slope mean	CH
	+ F0 slope mean	CH
	- F0 slope mean	CH
	St.Dev. of F0 slope	CH
	+ St.Dev. of F0 slope	CH
	- St.Dev. of F0 slope	CH
	Skewness of F0 slope	CH
	Spectral emphasis	CH
	LTAS slope (phonation type)	CH
	LTAS slope (L1-L0: phonation type)	CH
	LTAS slope (breathiness)	CH
	jitter	CH
	shimmer	CH
	HNR	CH
	Mean duration of pause	VV, CH
	Pause rate	VV, CH
	St.dev. of Pause	VV, CH
	Silent pause duration	VV, CH
	Speech rate	VV, CH
	Articulation rate	VV, CH
	Cepstral Prominence Peak (CPP)	V
	H1 – H2	V

Chart 1.
Adapted from Silva Jr. & Barbosa, (2019, 2020)[1] based on the phonetic literature since the mid-1990s (see References for details).
*Derivative measures of F0, articulation rate, CPP and H1-H2, LTAS alpha value and for the detection of breathinessare based in *ProsodyDescriptorExtractor* algorithm (BARBOSA, 2020),

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[1] SILVA JR, L.; BARBOSA, P. A. (2020). Um algoritmo para extração automática de parâmetros métricos e acústicos do ritmo da fala em L1 e L2. In. L. CIDRIM W. LOPES, F. MADEIRO. **Tecnologias e Ciências da Linguagem: vertentes e novas aplicações**, volume 2. São Paulo: Pá de Palavra, p. 11-26.
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