

Praat Basics - A Tutorial for Manual Segmentation of Phonemes

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Overview

1 Introduction to Praat

- The Objects Window
- The Picture Window

2 The Editing Window

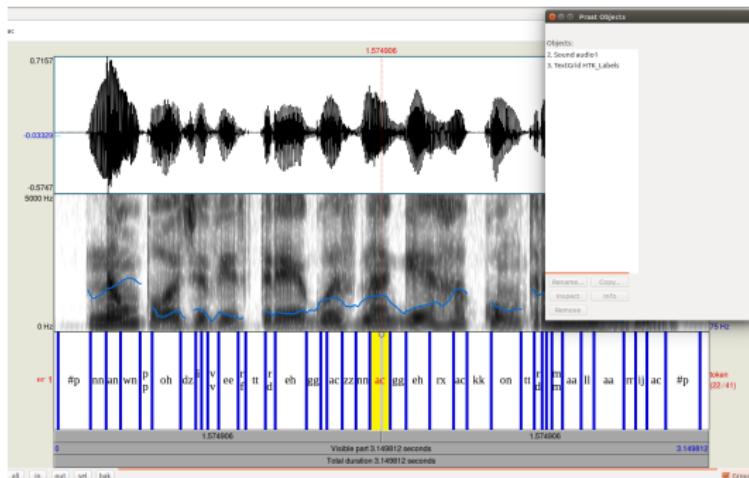
- Waveforms
- Spectrum
 - Vowels
 - Consonants
- Textgrid
- Other editing windows and useful information

3 htklabel plugin for Praat

- Description
- Usage

References

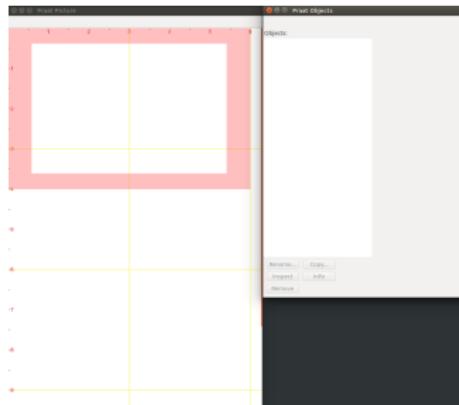
Praat - Doing Phonetics by Computer



An open-source tool for analysis of information derived from waveform and spectral representations - useful for segmentation. It includes built-in pitch, formants and energy algorithms.



Opening Praat



When you first open Praat (by clicking on the icon or typing in the command line), you will see two windows:

1. the objects window and
2. the picture window.

The Objects Window



The Objects Window permits:

load;

open;

play;

manipulate;

annotate;

modify;

and save files you have edited using PRAAT.

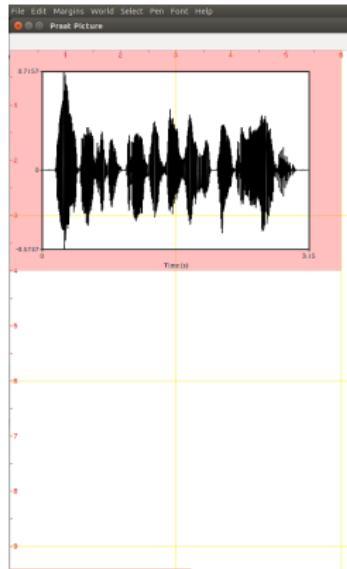
TextGrid within the Objects Window



TextGrids can be manipulated from the object window where one may:

extract information in isolation;
view & edit with a sound file;
and modify its contents

The Picture Window



The PRAAT picture window allows you to create high quality drawings or figures and save them in a variety of formats.

The Draw option can be used to draw a waveform from the editing window into the picture window

Understanding waveforms

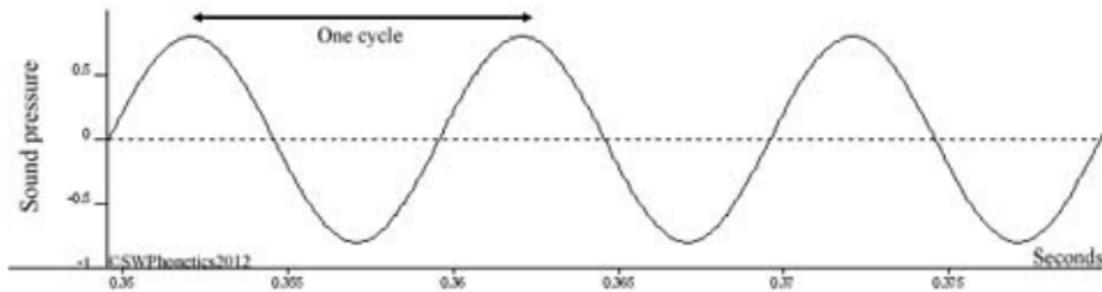
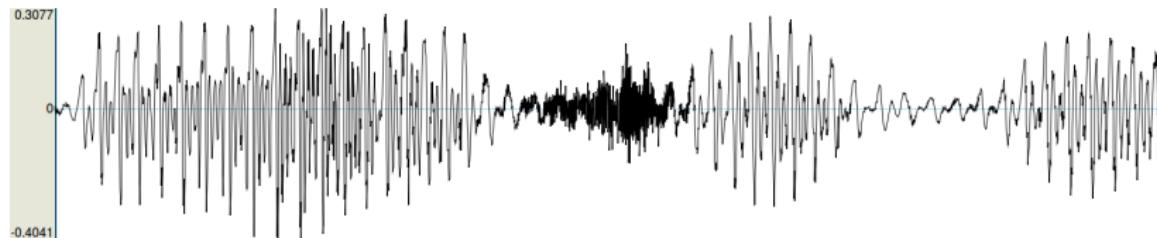


Figure: (Wood, 2014)

- The vertical scale = sound pressure, the horizontal scale = time.
- Sound pressure varies with time.
- The values of the sound pressure scale (-1 to +1) are arbitrary.
- Zero crossing occurs when the 0 sound pressure mark is crossed.

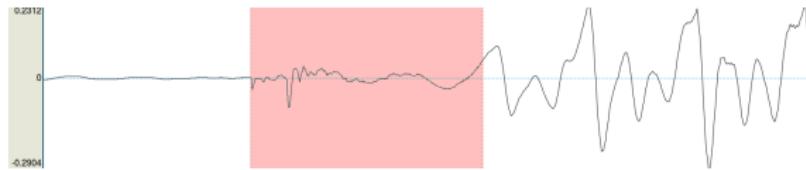
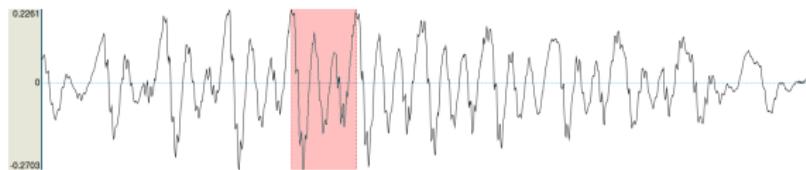
The Waveform in Praat



Important information:

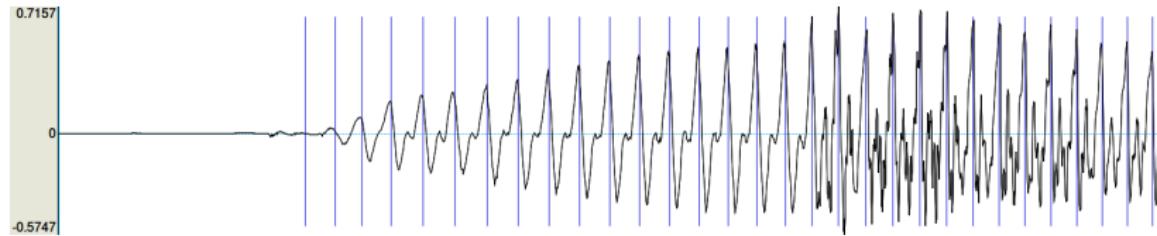
1. Periodicity
2. Amplitude
3. Frequency
4. Transients/Bursts

Periodicity



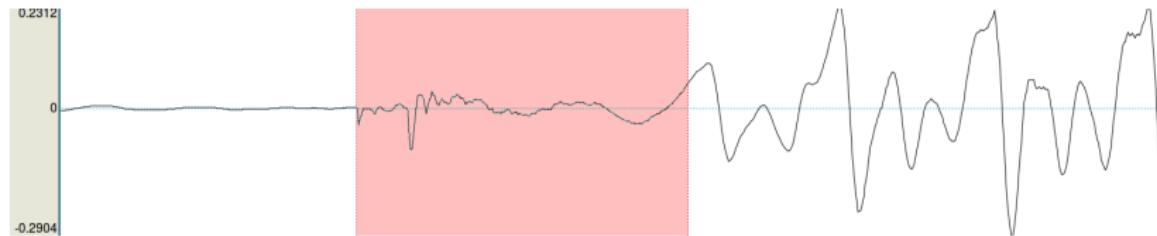
- Periodicity comes from the glottal vibrations of the voice.

Pulses



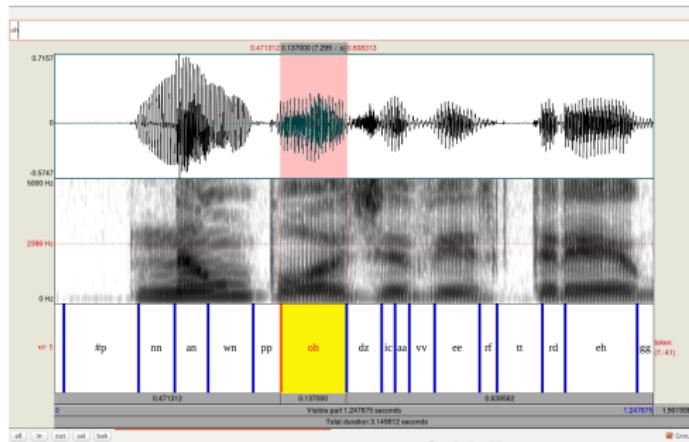
- Pulses are used to mark each cycle of a periodic waveform
- "Unvoiced sections" are not marked

Bursts



Voice Onset Time (VOT): The time that elapses between the burst of a plosive and the onset of phonation

Some helpful commands to Zoom, Play and Scroll



Ctrl-A: Zoom all

Ctrl-N: Zoom to selection

Alt-Arrow-left: move to last segment

Shift-Tab: Play window

Arrow-up: Select earlier

Shift-Arrow-down: move start of selection right

Ctrl-Arrow-down: move end of selection right

Page-down: Scroll page forward

Ctrl-I: Zoom in

Ctrl-O: Zoom out

Tab: Play selection

Arrow-up: Select earlier

Shift-Arrow-up: move start of selection left

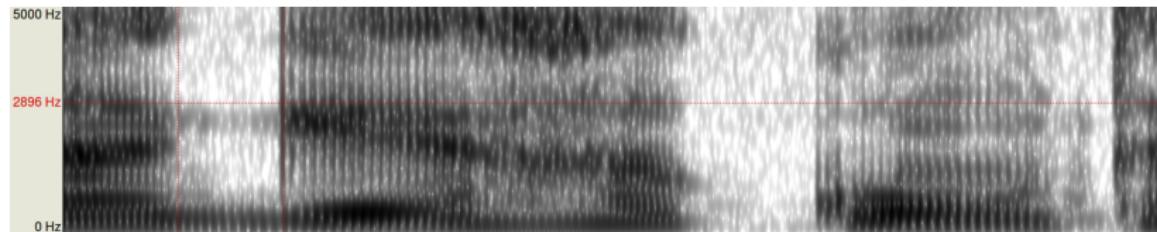
Ctrl-Arrow-up: move end of selection left

Page-up: Scroll page back

Escape: Interrupt playing



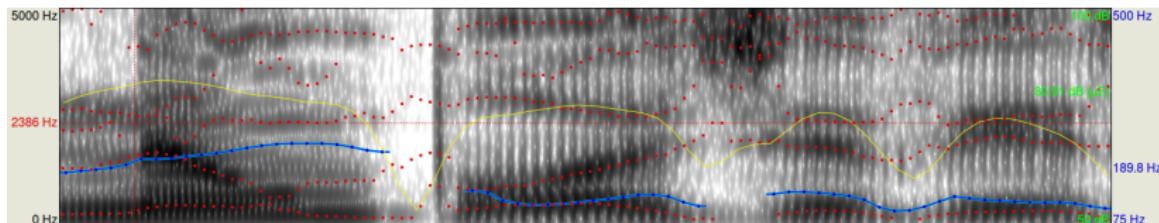
The Spectrum



From the spectrum we can see:

1. Pitch/F0
2. Formants
3. Burst
4. Closure

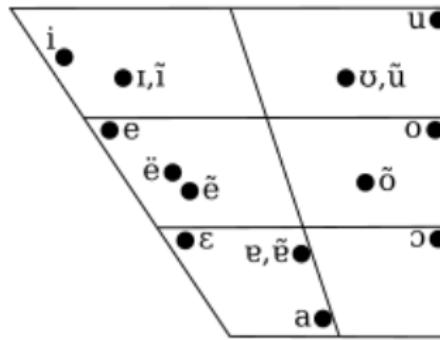
Pitch, Intensity and Formant Contours



Some notes:

1. Pitch is marked only for "voiced sections"
2. The standard range is from 75 to 500 hertz (Depending on the voice you may want to change this)
3. Intensity (energy) is the power carried by sound waves per unit area relative auditory threshold for a 1000-Hz sine wave.
4. The first four formants are marked (first 2 are used to get the oral position of a vowel)

Brazilian Portuguese Vowels



These are the vowels found in Brazilian Portuguese according to (Barbosa & Albano, 2004)

Real examples from tokens

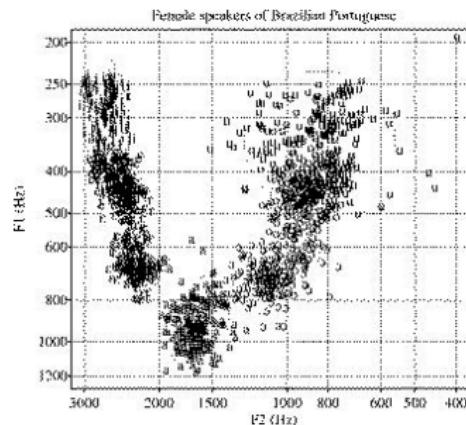


Figure: (Escudero et al., 2009)

It is important to note that values differ from speaker to speaker

Examples from a single speaker

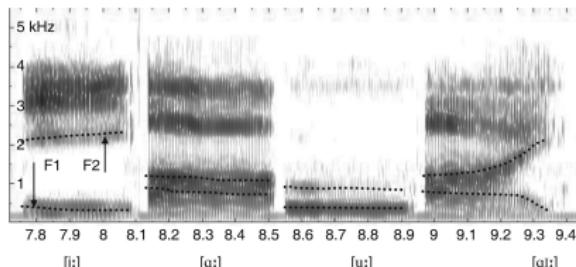
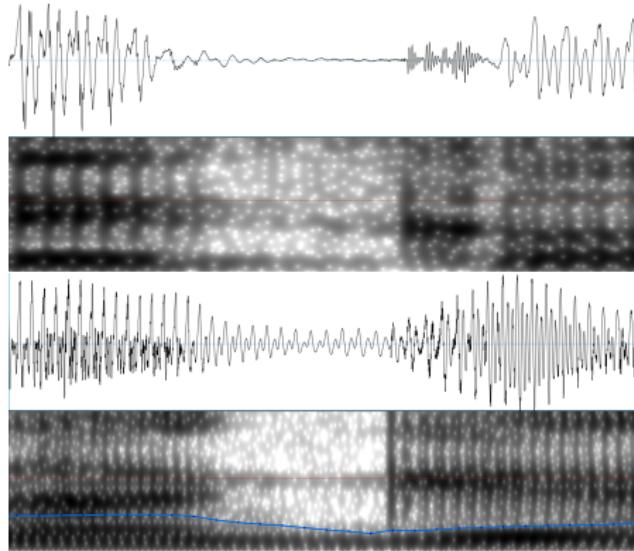


Figure: (Howard & Heselwood, 2012)

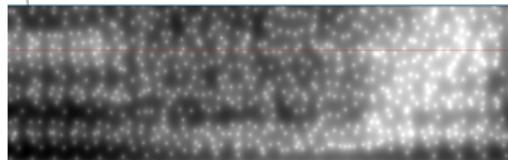
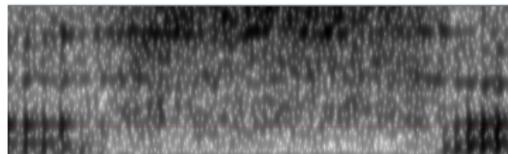
But... for a single speaker these values will be relative!

Stops - In articulation, stops consist of:



- i) if preceded by a vowel, a closing phase exists;
- ii) an interval of complete closure;
- iii) an audible burst, as the closure is opened;
- iv) possibly an interval of aspiration;
- v) an interval of transitions from the stop into the following vowel or approximant

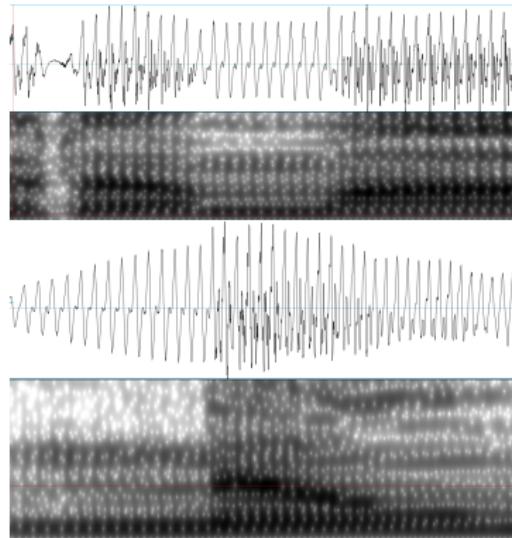
Fricatives - Main features:



i) friction noise
-aperiodic spread of sound over part of spectrum

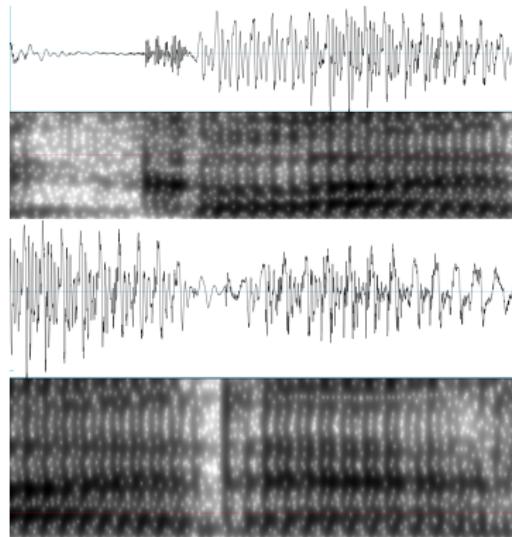
ii) areas of 'anti-resonance'
-where there is no energy.

Nasals



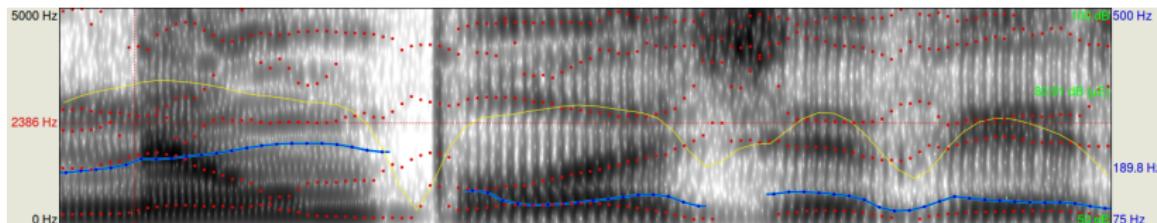
- i) Nearly always voiced
- ii) Show a sudden change in formant structure from/to adjacent vowel.
- iii) antiformants help disambiguate nasals.

Liquids



- i) Liquids are normally voiced - clear formant structure, but less energy than vowels.
- ii) Laterals have antiformants, though usually less strong than in nasals.
- iii) In laterals in general e.g., /l/, transitions are very sudden; in Rhotics /r/, less so.
- iv) Trills are characterized acoustically by a pattern of pulses of closures and openings

Helpful commands for pitch, intensity and formant analysis



Shift-Ctrl-H: move to max pitch

Ctrl-0: move to nearest 0 crossing

Ctrl-.: move end to nearest 0 crossing

Ctrl-F5: Get min pitch

F1: Get 1st formant

F3: Get 3rd formant

F6: Get cursor

F8: Get intensity

Shift-F8: Get max intensity

Shift-Ctrl-L: move to min pitch

Ctrl-,: move start to nearest 0 crossing

F5: Get pitch

Shift-F5: Get max pitch

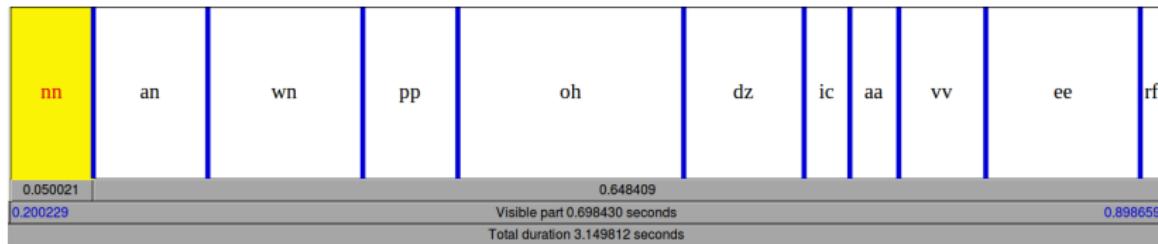
F2: Get 2nd formant

F4: Get 4th formant

F7: Get spectral power @ cursor cross

Ctrl-F8: Get min intensity

TextGrid



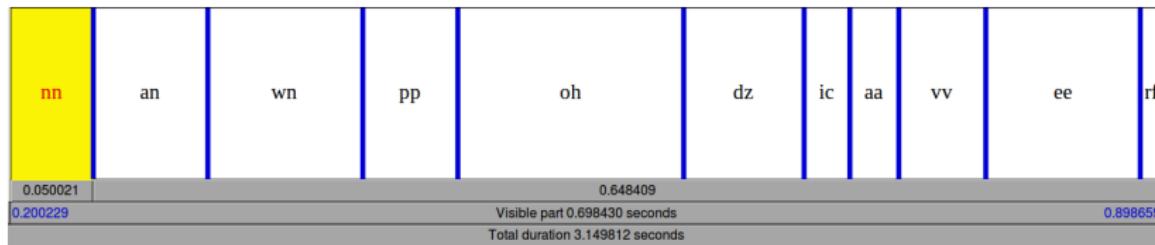
The TextGrid is simply a structure for saving boundaries and their labels

- One can insert or remove boundaries and edit the text within them.
- One can create up to three TextGrids, often for annotation on different levels.

For example: Word, Gloss, Phoneme

Textgrid

TextGrid Boundaries



Return: Add boundary on tier

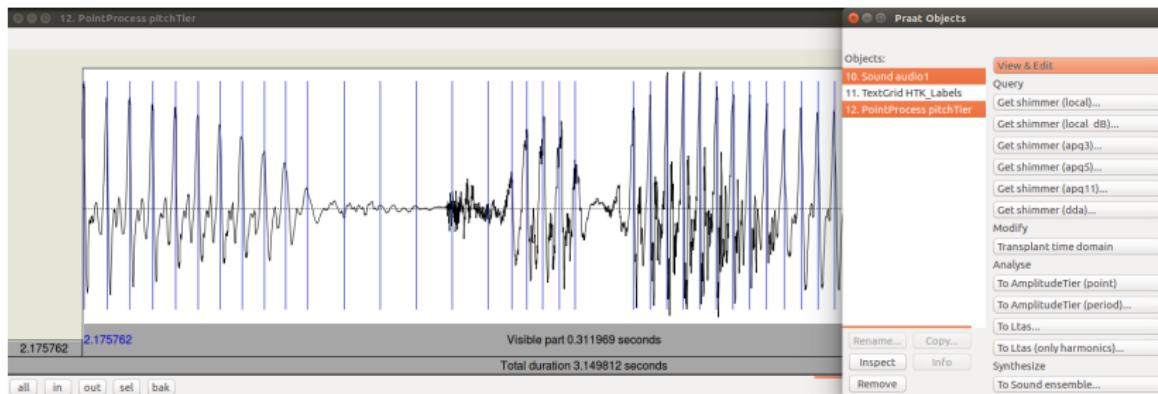
Alt-Backspace: Remove boundary on tier

Click-and-drag will move a boundary

Clicking inside a box will allow for editing labels

Other editing windows and useful information

Manipulation



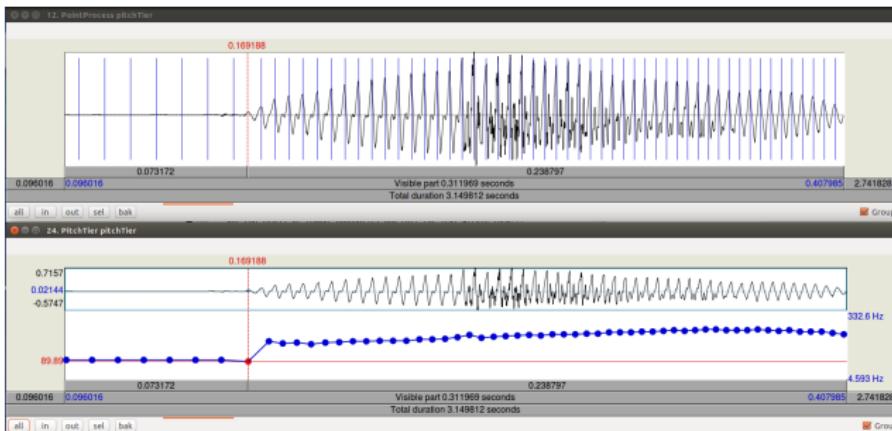
The manipulation window can be accessed by one of the following two combinations:

1. Sound + Point Process (Pulses)
2. Sound + Pitch* Tier (Contours)

*Other contours can be plotted in the same way

Other editing windows and useful information

Helpful Manipulation Keys



Ctrl-P: Add pulse at cursor

Alt-Ctrl-P: Remove selected pulses

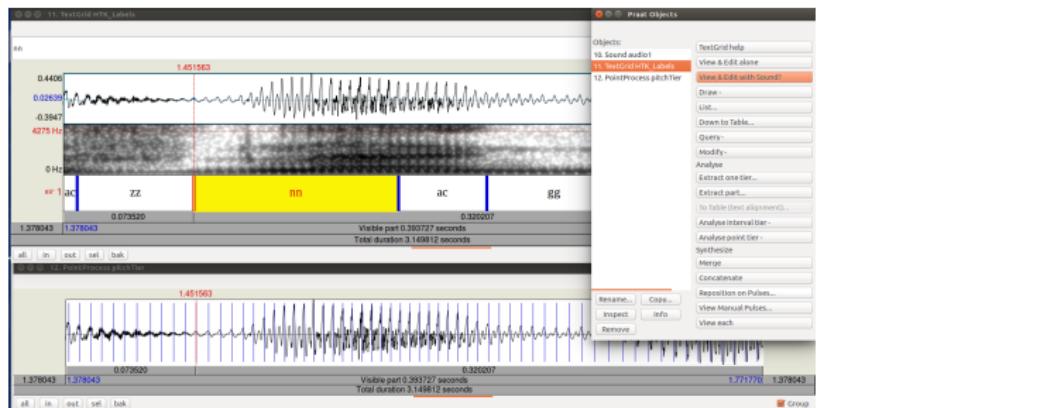
Ctrl-T: Add pitch point at cursor

Alt-Ctrl-T: Remove selected pitch points

Clicking and dragging will also move pitch points

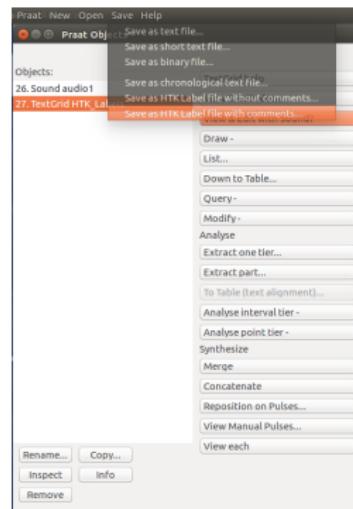
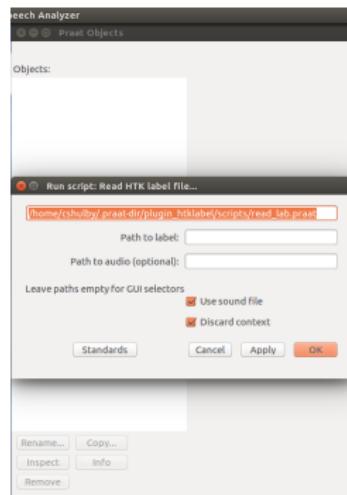
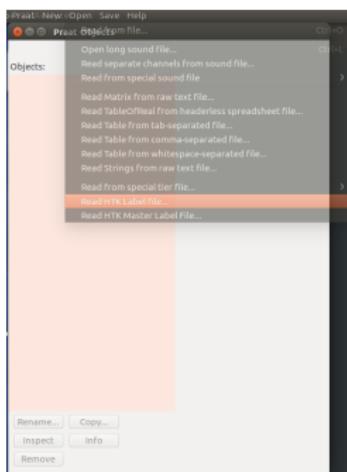
Description

htklabel description



A plugin for Praat to read information from a HTK/HTS label files and convert them back.

htklabel Usage: Read .lab



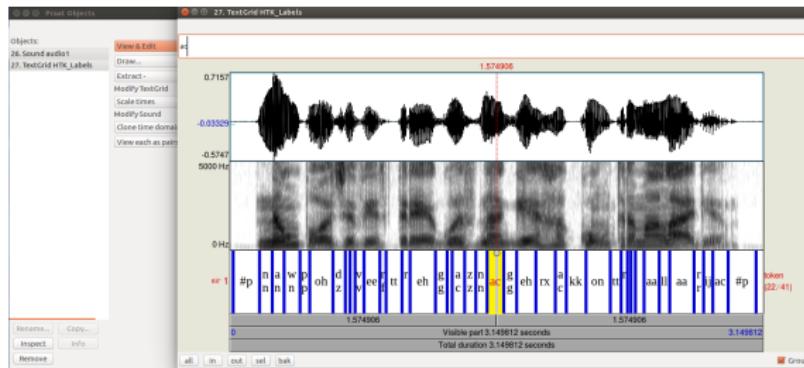
Open .lab: Open -> Read HTK Label file...

Read .lab: Include Paths to .lab and audio files (or leave blank)

Save .lab: Save -> Save as HTK Label file with comments...

Usage

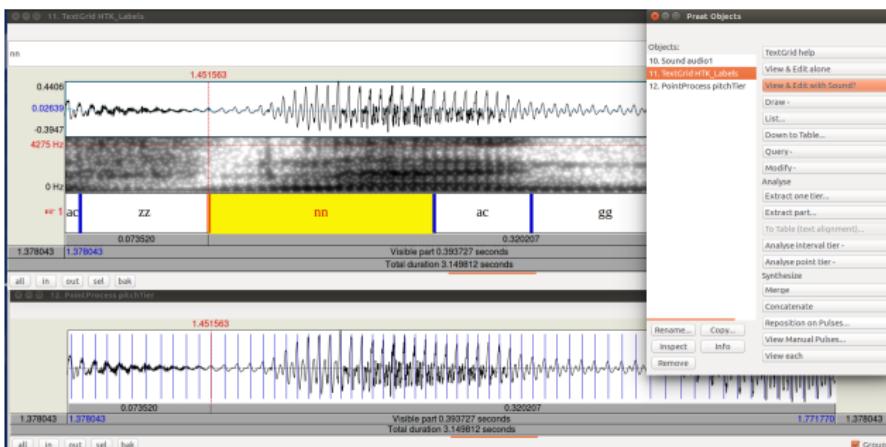
One more look at the View and Edit Window...



- Select TextGrid and Audio together + View & Edit
- To zoom or select:
 - 1.) Use the Gui buttons and Scroll bar;
 - 2.) Use the Menu buttons;
 - 3.) Use keyboard shortcuts (Recommended)



Manual Pitch Marks



The following two features are available for Manual Pitch Marks:

1. Reposition on Pulses... (Moves boundaries to nearest pitch)
2. View Manual Pulses... (Opens manipulation window - pitch marks displayed as pulses)

The End

Thank You For Your Attention

References

- Barbosa, P. A., & Albano, E. C. (2004). Brazilian portuguese. *Journal of the International Phonetic Association*, 34(02), 227–232.
- Escudero, P., Boersma, P., Rauber, A. S., & Bion, R. A. (2009). A cross-dialect acoustic description of vowels: Brazilian and european portuguese. *The Journal of the Acoustical Society of America*, 126(3), 1379–1393.
- Howard, S., & Heselwood, B. (2012). The contribution of phonetics to the study of vowel development and disorders.
- Wood, S. (2014, Mar). *Understanding waveforms*. Retrieved from <https://swphonetics.com/praat/tutorials/understanding-waveforms/>