Basics: Praat

Praat is a computer program for doing acoustic phonetics.

> Open Praat
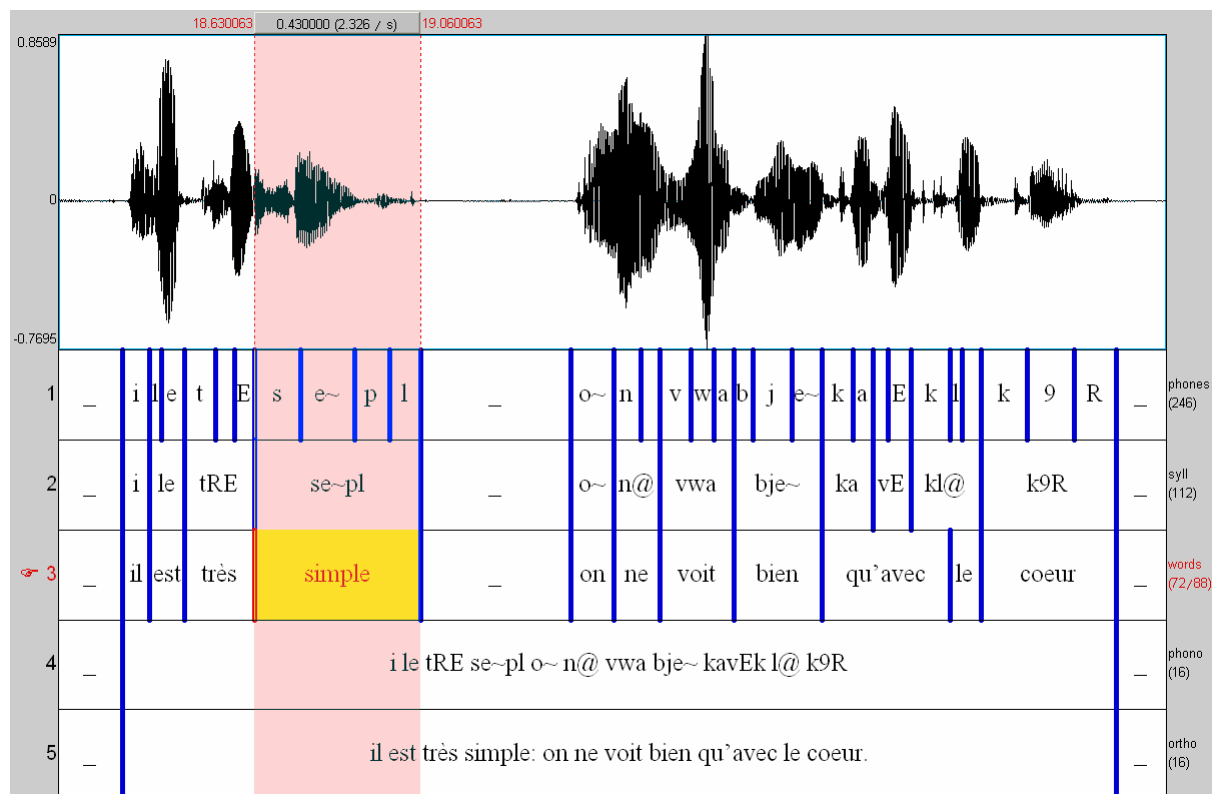

Opening a sound file

Two sound files from the IViE corpus are located here: https://goo.gl/2mfZLS.
Download them to the L: drive.

> *Open*
> *Read from file…*
> Find and select the files and click "Open"

Files will appear in the 'Objects' list of the main Praat window.

Creating a TextGrid to label data

http://latlcui.unige.ch/phonetique/easyalign.php

TextGrids enable you to label your speech data so you can mark sounds, words and anything else – in the image above the user has provided various levels of transcription from phonemes (not using IPA) to orthographic sentences. The purpose of labelling is [1] to help you navigate your data [2] to enable quick analysis of specific parts of your data. You may find that you only have use for labelling

phonemes, and likely only specific sounds: in my own research, I just labelled tokens of /s/.

Each row of the TextGrid is called a 'tier', so you might have a tier for phonemes, a tier for syllables and so on.

> *Annotate*
> *To TextGrid*
> Enter a label for each tier using no spaces; separate tiers using spaces
> Don't use point tiers if you just want to mark periods of speech as in the image above; point tiers are for marking singular points. If you *do* want to use point tiers, enter the names of the appropriate tiers in the second field ("Which of these are point tiers?").

This will create a new object in the list with the prefix "TextGrid", followed by the name of the sound file to which it corresponds.

View and edit sound with TextGrid

> Select both objects from the list using *cmd* (OS X) or *CTRL* (Windows).
> *View & Edit*

We'll get onto how to label speech using the TextGrid after a quick run through the basics of setting up and navigating the window that has just opened.

Show formants, pitch and intensity

Praat can provide a few rough indicators of formants, pitch and intensity on the spectrogram.

Formants:
> *Formant*
> *Show formants*

Pitch:
> *Pitch*
> *Show pitch*

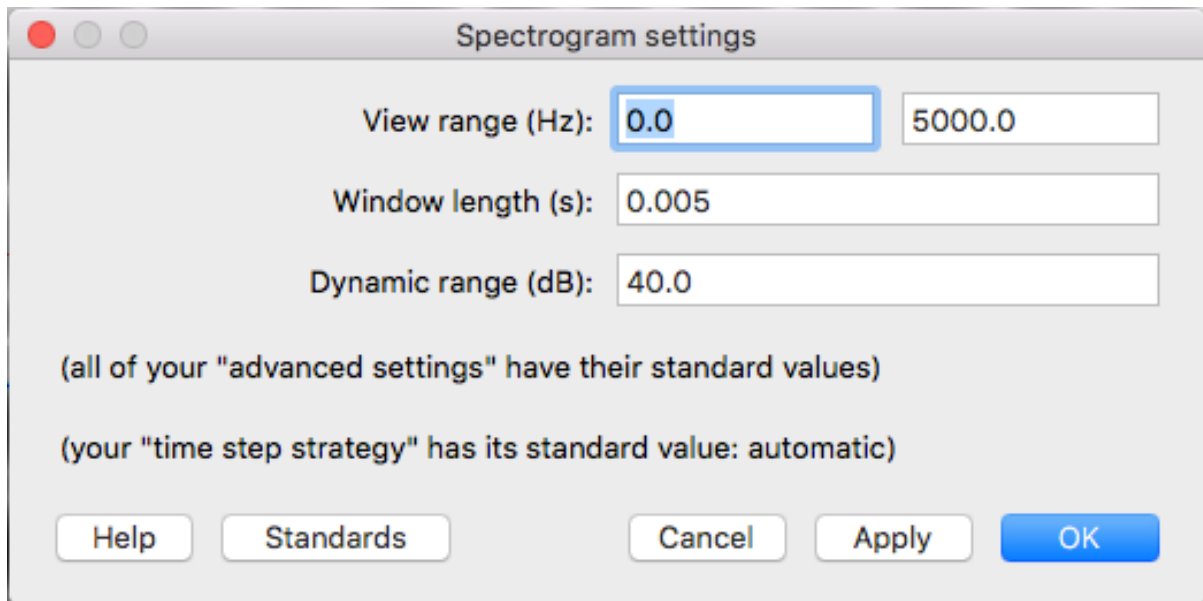Intensity:
> *Intensity*
> *Show intensity*

Spectrogram settings

> *Spectrum*
> *Spectrogram settings…*

> Enter the settings as below. These are a good standard, but you might want to tweak them for specific purposes.

```
●  ○  ○                    Spectrogram settings

        View range (Hz):   [0.0        ]   [5000.0      ]

      Window length (s):   [0.005                       ]

      Dynamic range (dB):  [40.0                        ]

   (all of your "advanced settings" have their standard values)

   (your "time step strategy" has its standard value: automatic)

   [ Help ]   [ Standards ]        [ Cancel ]  [ Apply ]  [ OK ]
```

Navigating sound files

> Use the tab key or click on any of the three bottom darker-shaded rows to play the file or specific parts of it
> Click and drag to select periods of the sound, which you can then play in isolation using the appropriate section of the first of the bottom rows. Use *shift* and click to extend the current selection.
> Use the buttons at the bottom left to zoom in and out:
• "all" shows the entire sound file
• "in" zooms in
• "out" zooms out
• "sel" zooms to the selected period of the sound (assuming you have selected a period of the sound!)
• "bak" returns to the previous view setting (but it only remembers the very last setting)

Labelling data

> Select the start of the period by clicking on the point in the spectrogram
> Click the circle at the top of the vertical bar that appears in the labelling tier (directly below the spectrogram)
> Repeat for the end of the period
> Click in between the two points in the labelling tier
> Type the label

Below is an example from these data of the word "difference" with phonemes labelled. Note the uncertainty about one of the phonemes – uncertainty in transcription is an issue that you will encounter!
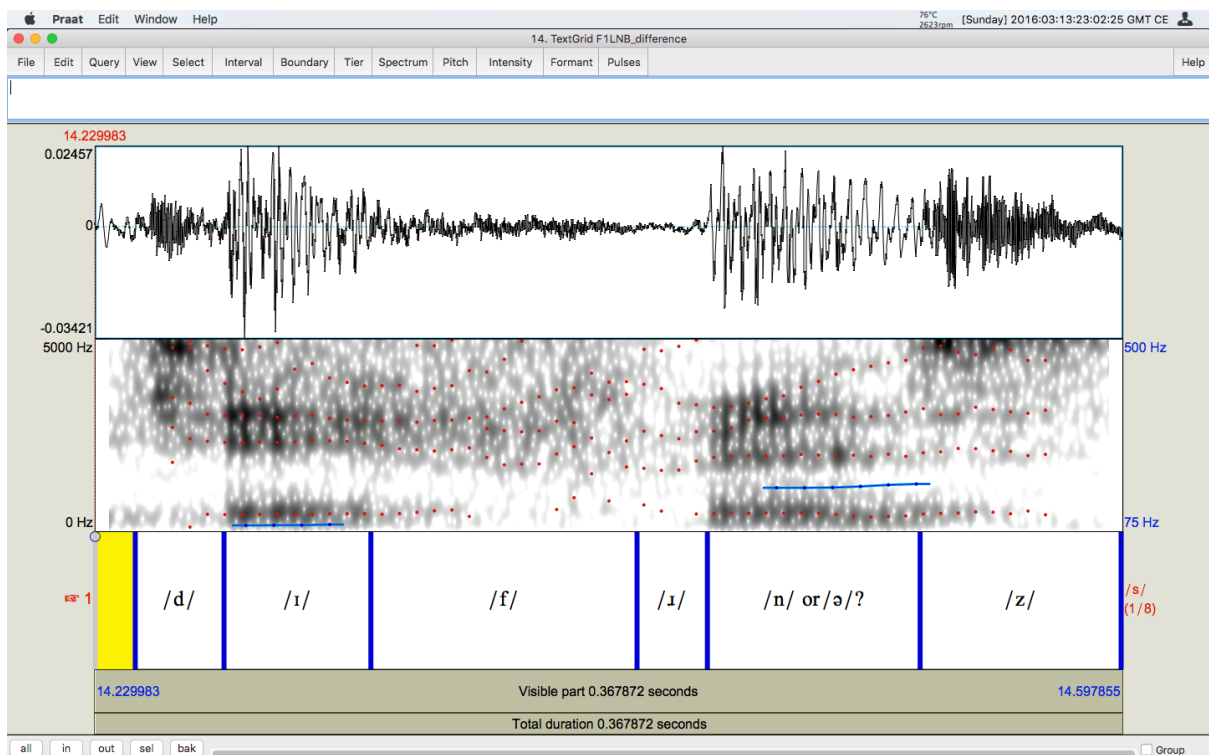
"difference" (/dɪfɹnz/ or /dɪfɹəz/) in Praat with waveform, spectrogram and label tier

> activity one <

1. Create a new TextGrid with two tiers, "phoneme" and "speaker", for one of the two sound files and open both.

2. On the bottom tier, label the first turn of each speaker ("speaker one" and "speaker two").

3. On the top tier, try transcribing the phonemes [IPA keyboard] of these turns.

Measuring fundamental frequency

There are three (possibly more) methods for measuring fundamental frequency (F0) in Praat.

The first is to count the number of periods/cycles in X amount of time and multiply it to equate to one second. So, if you take 0.1 seconds of speech, count the number of striations (vertical bars) on the spectrogram or the number of periods/cycles on the waveform (if periodicity is present) and multiply it by 10 in order to get the equivalent number for one second.

The other two methods involve Praat doing more of the work for you.

Spectral slice method:
> Select a period of speech
> *Spectrum*
> *View spectral slice*
> Click the at the top of the first peak (zoom in for accuracy). The number at the top is F0.

Get pitch method:
> Select a period of speech
> *Pitch*
> *Get pitch*

> activity two <

1. Click on the first speaker's first turn, as labelled in activity one.

2. Measure their fundamental frequency.

3. Repeat for the second speaker.

Measuring vowel formant frequencies

Again, there are a few ways of getting the formant frequencies of vowels.

The first is just clicking in the middle of each formant and there *should* (I say should as there isn't as I write this!) be a reading on the left.

The second again involves Praat doing more of the work for you (not you need to be showing formants in order for this to work – see above for details):
> *Formant*
> *Formant listing* (or for individual formants, *Get first formant* and so on)

Note that Praat is a computer program and doesn't have the corresponding subjective judgment to always get it right. If you look at the spectrogram, occasionally the red dots will not be properly aligned with the formants. The formant listings are based on these, so in such cases Praat will give you inaccurate information. It's always best to check that the listings look sensible!

> activity three <

1. Download this Excel file: https://goo.gl/96BVbY

2. Measure and record the formant frequencies for both speakers' first ten vowels.

Record your own speech

You can also record speech directly in Praat from the main window.

> *New*
> *Record mono Sound…*
> *Record* to start the recording
> *Stop* to stop the recording
> *Save to list* to add the new sound file to your objects list

Note unless you export the sound, it will be lost when you quit. To export:
> Select the sound in the objects list
> *Save*
> *Save as WAV file…*
> Choose a name and location
> *Save*

> activity four <

1. Record yourself saying "Acoustic phonetics is better than syntax"

2. In the same Excel file as in activity three, measure and record the formant frequencies of your first ten vowels. How do you compare with the other two speakers?

Exporting waveforms and spectrograms

You may want to take a copy of the waveform or spectrogram for use elsewhere. One way is just to take a screenshot, which is perfectly fine. A slightly tidier (but somewhat fiddly) way is to use Praat's picture window. There are two options for waveform and one for spectrogram. There is no neat way to export both together without introducing image (vector) editing software.

Waveforms (option one):
> Select the period of the waveform you want to export
> *File*
> *Draw selected sound…*
> *OK*

Waveforms (option two)
> Zoom in so that only the period of the waveform you want to export is visible
> *File*
> *Draw visible sound…*
> *OK*

Spectrogram:
> Zoom in so that only the period of the spectrogram you want to export is visible
> *Spectrum*
> *Paint visible spectrum…*
> *OK*

To export the images from the picture window, you can create a PDF or just copy the image to the clipboard.

PDF:
> *File*
> *Save as PDF file…*
> Choose a name and location
> *Save*

Copy:
> *Edit*
> *Copy to clipboard*

That's all the basics covered!

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Bonus (not 'the basics'): digital manipulation/synthesised speech

Praat can also be used to manipulate sound files. One use is to cut and splice periods of sound or individual phonemes. This could be used for a perception test:
- two speakers produce "bath", one Northern English (A) and one Southern English (B);
- take and concatenate the "b" from speaker A, the "a" from speaker B and the "th" from speaker A, for example;
- compare perceptions (region, friendliness, education level, age, sexual orientation etc.) based on the following combinations using a Likert or semantic differential scale:

"bath" token	"b" and "th" speaker	"a" speaker
1	Northern	Northern
2	Northern	Southern
3	Southern	Northern
4	Southern	Southern

You could do similar with glottal stops in "kettle", and many, many other sounds!

This has two steps in Praat. First, extract each phoneme or string of phonemes from your base sound files:
> Select the period of speech you want to extract
> *File*
> *Extract selected sound (preserve times)*

The extracted sound will now appear in the objects list of the main window.

When you have all your base sounds, you can then connect different sounds up (concatenate them):
> Select the sounds you want to concatenate
> *Combine –*
> *Concatenate*

The new sound file will appear in the objects window. Note that the order of the sounds in the new file is according to the order in the objects list. In order to manipulate the order, you would need to export the sound files (see the "Record your own speech" section for details) and then import them in your preferred order.