

Hoole, Seminar Akustik Übung Formantmessung

Examining formants with Praat

Log on to your Linux account, open a terminal window, and enter the following commands:

```
mkdir voweltransitions
cd voweltransitions
cp ~matlab/akustikfort/voweltransitions/*.txt .
cp ~matlab/akustikfort/voweltransitions/*.wav .
praat
```

(Alternatively, you can use the matlab account, using akustikfort/voweltransitions as the working directory)

Load a wav file into the edit window.

You will find files for several different speakers, mostly consisting of a transition from schwa to one of the point vowels (e.g. phil_schwa_a.wav). Alternatively, record a new sound yourself.

Make sure the sonagram display is set as follows:

```
Spectrum > spectrogram settings > view range 0 .. 5000,
Dynamic range 50, window length 0.005
```

Basic formant setting:

```
Formant > Formant settings > maximum formant 5000, window
length 0.1
```

(the window length is longer than the standard setting of 0.025, but this gives smoother data for the fairly slow vowel transitions that we will be looking at).

In the formant drop-down menu make sure that Show formants is ticked.

Formants are shown as red dots overlaid on the spectrogram (to keep the display as simple as possible turn off any additional displays that are overlaid on the sonagram.

Check in these drop-down menus if necessary: Pitch, Intensity, Pulses)

Keep these settings for all speakers

Overall aim

For as many speakers as possible draw a vowel chart (plot of F1 vs. F2) with the formant values for /a, i, u, y/ and at least one schwa.

For each vowel that is analyzed you first need to place the cursor at a stable position in the vowel.

Then use the following Praat script to get a print out in Praat's info window of the values of F1 and F2 as well as the bandwidths of F1 and F2: printformantbandwidth.txt

(Frequency and bandwidth of F3 will also be shown)

In the **edit window (not the Praat object window)** choose

```
File > Open editor script > printformantbandwidth.txt
```

Then run the script by choosing (in the script window)

```
Run > Run
```

Before running the script enter the label of the vowel you are analyzing in the fourth line of the script, and the name or initials of the speaker in the third line.

The fifth line of the script ('n_formants =') is used to set the number of formants that Praat looks for in the range up to 5kHz

(It corresponds to using Praat's dropdown menu Formant > Formant settings > number of formants)

The results shown in Praat's info window should look like this

```
Speaker: em. Vowel: i. n_form.: 4. F1-3: 388 2796 3728 BW1-3: 131 385 293
```

For each speaker and each vowel transition experiment with the setting 'number of formants'. The schwa part of each utterance should give a rough idea of the appropriate number of formants in the frequency range up to 5kHz.

But the initial setting may not allow the formants to be followed smoothly into the vowels /i, u, a, y/ where often two formants are close together.

In other words, you need to check that the calculated formants (shown with red dots) match up well with the formants that can be observed in the sonagram display.

Experiment with at most +/- 2 around the initial choice for number of formants.

Do not enter the formant values into the vowel chart until you have decided on the best setting to use.

Be prepared to check the **bandwidth** of formants.

Unfortunately, Praat does not show the bandwidth of the formants overlaid on the sonagram display.

When the setting for 'number of formants' is too high you may see 'extra' formants in the display between what are obviously the true formants. Check whether these 'extra' formants have unusually high bandwidths.

When the setting is too low only one formant may be found (as indicated by the red dots) in a region where the sonagram suggests that two should be present. Here, too, the bandwidth value may be unusually high.

Always be careful to check by eye with the cursor that the values reported in the info window are plausible.

For example:

If there is an 'extra' formant between F1 and F2 then the value reported for F2 will be rubbish (and the value reported for F3 may correspond to the actual F2 value).

If no formant is found at all in the region where F1 is expected ('number of formants' set too low) then the value reported for F1 may actually correspond to F2.

In short:

Try and get a feeling for what typical bandwidth values are.

Try and get a feeling for how the display looks if the setting for number of formants is either too small or too big.

When you have finished analyzing one utterance remove the sound from Praat's object list, and close the script window, without storing any changes you have made to the script (unfortunately, it is necessary to re-open the script each time a new sound is opened in an edit window).

Note: specify the number as a multiple of 0.5 (i.e. 4.5, 5, 5.5 are all possible values)
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In addition to plotting the results in the formant chart, paste the results of the analyses that you think are correct from Praat's info window into any text editor and save them as a text file named something like 'phil_analysen.txt'.

(If you are not familiar with a text editor for Linux you can chose File > New editor script in Praat's edit window and you use this text window to collect your results.)

For reference, here is the praat script:

```
=====
#set speaker, vowel and n_formants for each analysis
#make sure cursor is at an appropriate position before running the script
speaker$="ph"
vowel$="i"
n_formants=4
#####

Formant settings... 5000 'n_formants' 0.1 30 1

b1 = Get first bandwidth
b2 = Get second bandwidth
b3 = Get third bandwidth

f1 = Get first formant
f2 = Get second formant
f3 = Get third formant
f1=round(f1)
f2=round(f2)
f3=round(f3)
b1=round(b1)
b2=round(b2)
b3=round(b3)

mysettings$="Speaker: 'speaker$'. Vowel: 'vowel$'. n_form.: 'n_formants'.
F1-3: "

printline 'mysettings$' 'f1''tab$''f2''tab$''f3' BW1-3:
'b1''tab$''b2''tab$''b3'
```

=====

(Final note: In Praat an equivalent way of adjusting the formant calculation is to adjust 'maximum formant' rather than 'number of formants'. For example, one could leave 'number of formants' set at 5 for all speakers and reduce the value of 'maximum formant' for a speaker with a long vocal tract.)

Speaker:

