

In this lab, you will be conducting detailed phonetic analysis of the vowels in the language you are studying for your final project. You can use your previously recorded material from Labs #1 and #4, re-record the Lab #1 and #4 material if your previous recordings were unsatisfactory, and/or record new material for the purposes of this lab. Whatever material you use for your analysis should be burned to CD and submitted along with your write-up.

Be sure to take measurements from as many different similarly structured words as possible (at least five), rather than just one measurement from a single word. As always, give all units, and report the mean and standard error for every set of measured data.

For each vowel in your language, determine its **first four vowel formants** using Praat to measure the formant values over a portion of the vowel that is about 0.1 sec long or longer, is fully voiced, and is centered at the middle of the vowel. If you need to remind yourself how to measure formants in Praat, re-read Lab #2. Fill out a table like the following for every vowel:

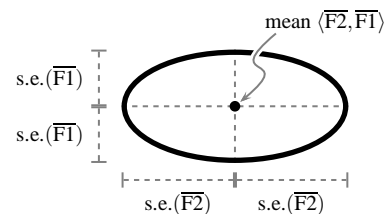
	F1	F2	F3	F4
#1				
#2				
#3				
#4				
#5				
mean				
s.e.				

If Praat gives you obviously unusual measurements for a particular vowel (i.e., formants significantly different from those on the “Tube Models for Vowels” handout, $F1 > 1500$ Hz, F2 higher for a back vowel than a corresponding front vowel, F3 or F4 significantly outside the range 2000–4000 Hz, etc.), try using spectral slices instead.

To do this, get the spectral slice for the selected region as in Lab #4. Then use LPC smoothing on the spectral slice to generate an LPC-smoothed slice, asking Praat to find 20 peaks. The smoothed slice should give you clear peaks at reasonable values for F1, F2, F3, and F4. If not, try fine-tuning the setting for LPC smoothing to produce more or fewer peaks, until you get reasonable results. Ignore the apparent peak at 0 Hz; this is just the mathematical distortion inherent to the LPC calculation.

If you collect any formant values with LPC smoothing, be sure to describe what you did carefully and thoroughly.

Using the means of your measurements for F1 and F2, plot all of the vowel phonemes on the $F2 \times F1$ graph paper provided on the course website (or a reasonable approximation). Around each plotted vowel, draw an ellipse using the standard errors of your measurements of F1 and F2 as the radii of the ellipse, as in the diagram to the right. Don't worry about drawing an ellipse if your standard error is so small that your ellipse would be indistinguishable from a dot.



Draw a vowel quadrangle around your plotted vowels so that (i) the lowest and highest recorded F1 measurements serve as the flat boundaries for vowel height, (ii) the lowest recorded F2 measurement serves as the flat boundary for vowel backness, and (iii) a diagonal line from high front to low front finishes off the quadrangle, keeping all ellipses inside the quadrangle.

Finally, discuss anything you found interesting (or troubling!) about the data you collected and the overall vowel system of your language.