CMPU4018: Lab 4

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Instructions

The aim of this lab is explore phonemes and formant frequencies using python:

Before you begin, take out a pen and paper. Put a title of Lab 3 on it and the date. Answer the questions below and make any notes or questions or comments or thoughts on your page.

- Plotting a spectrum for a vowel
- Finding the peak frequencies indicating the formants
- Plotting F1 and F2 frequencies for a range of vowels and comparing them

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Exercises

Download the lab3.zip from webcourses and unzip it into a folder. Open the project in spyder. There are a number of wav files in the sub-directory vowelphonemes. The files for the lab are vowelspectrums.py and vowelf1f2scatter.py. Youll need to run vowelformants.py before you can run vowelf1f2scatter.py. When you run vowelformants.py, you should generate a number of png figures in the plots subdirectory.

1. ((8 points) Contrast the sound and the spectrum plots for had and hid. Hid is shown in Figure 1(a) but youll have to run vowelformants.py to generate a plot for had.

(a) The two words had and hid are made up of consonants with a vowel in the middle. They are sometimes called CVC words and the vowel phoneme is the nucleus. Why do you think they all begin and end with /h/ and /d/?

(b) What F1 and F2 frequencies are computed for had?

(c) What F1 and F2 frequencies are computed for hid?

(d) From visually inspecting the plots, do they look like they have been correctly computed?

(e) How do they compare to the formant frequencies shown in the plot in Figure 1(b)? (i.e. are they in the same regions?)

(f) Explain in general terms what the PeakUtils library is used for in the code?

(g) What are the parameters thresh and `min_dist` used for?

(h) What is the value of `min_dist` for the wav samples tested?

2. (4 points) Contrast the F1 and F2 plot shown in figure 2 with the plot generated by running vowelf1f2scatter.py.

(a) How do the rest of the samples compare to the formant frequencies shown in the plot in Figure 1(b)? (HINT: There is a paper in the resources folder on webcourses that Figure (b) is reproduced from. See Figure 3 in that paper)

(b) 2. Why do you think the x-axis plots the difference between F1 and F2 rather than just plotting F2?

(c) Try recording you own versions of some or all of the sounds and add them to the plot

(d) If you have time, try recording whispered or shouted versions of the sounds and compare these

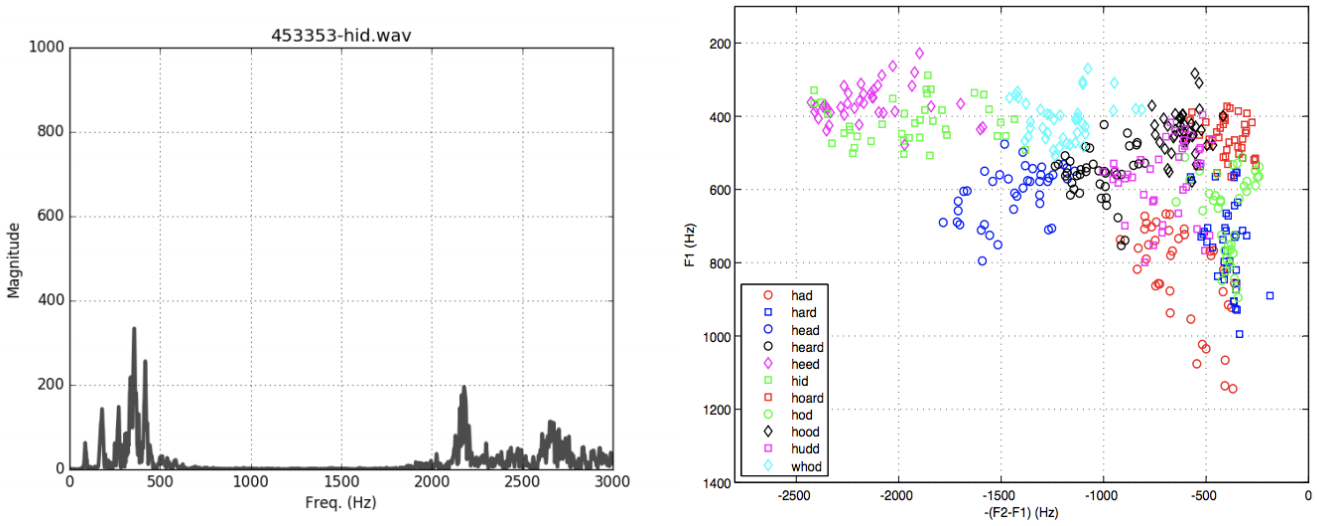

Figure 1: (a) Spectrum for the word hid; (b) plot of the first and second formant frequencies for various vowels. Source: Sharifzadeh et al., 2010