Problem Set 5

Problem 1

On the server terminal there are waveforms of a sentence spoken by four speakers --- two female, two male. The sentence is: The box would contain just a few cookies.

You are asked to select two of these utterances (one female, one male), and to make several measurements on these sentences.

a) What are the two shortest vowels in the sentences and what are the two longest vowels? Tabulate these eight durations (4 vowels, 2 sentences).

b) There are four versions of the consonant /k/ in each sentence. Using a 6.4-millisecond window, display the spectrum just at the time of the release of each of these consonants. The window should be centered just at the release. For each /k/, tabulate the frequency of the major peak, representing the front-cavity resonance for the consonant. Note that these frequencies are different for the different /k/’s and the different speakers. Discuss reasons for these differences in terms of vocal-tract size and tongue-body position.

c) The sentence contains two versions of /s/, one of /z/, and one of /f/. Display the spectrum of each of these fricatives in turn. Use a 6.4-millisecond window, and calculate an average spectrum over a time interval of 40-80 ms, depending on the duration of fricative. There should be no preemphasis (d=o).

In the case of /s/’s and /z/’, make the following measurements:

(i) frequency and amplitude (in dB) of the peak at high frequencies (above 3500 Hz).
(ii) maximum amplitude (in dB) in the range of the second and third formants (usually 1300 to 3000 Hz).
(iii) Calculate difference between (i) and (ii). Discuss your answer. See discussion in text, pp. 398-403.

Do the same measurements for /f/. In this case, there is probably no peak at high frequencies, so just take the maximum amplitude in the frequency range 3500-6000 Hz, corresponding to (i) above for /s/. Discuss the difference in spectrum shape for /f/ and /s/. 