UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
Department of Electrical and Computer Engineering,
Department of Speech and Hearing Sciences, and
Department of Linguistics

ECE 598 The Speech Chain

Laboratory Exercises 4

Fall 2006

Labs for the week of: Monday, October 9, 2006
Write-up due in lab during the week of: Monday, October 16, 2006

Problem 4.1

This week, you'll be using the VTM-10 mechanical vocal tract model. There is only one, so you will have to work together in one large lab group, together with all members of your lab section.

(a) The large glass blocks depict vocal tract shapes associated with the five Japanese vowels, /a,i,u,e,o/, as measured using MRI. Couple the electronic larynx to each of these five blocks. Listen to the result. Record the result in Praat, and measure the first two formant frequencies (F_1 and F_2) of each vowel.

(b) Construct a two-tube approximation of the vowel /a/, by stacking an appropriate number of fixed-area plates. Measure the cross-sectional area and length of each of the two tubes. In your lab report, calculate the expected formant frequencies (F_1 and F_2; keep in mind that the speed of sound at room temperature is slower than the speed of sound at body temperature, i.e., $c \approx 340$m/s). Couple your structure to the electronic larynx, and record the actual formant frequencies in Praat.

(c) If you have time: repeat part (b) with an /i/-like configuration.