Nomograms for unrounded vowels

A ***nomogram*** is a graphic that allows for (approximate) visual determination of the value of a mathematical function.

The nomograms on this handout are from Johnson (2012), *Acoustic and Auditory Phonetics*, sec 6.1.

I. Formant frequencies for a vowel with the 'tube structure' of [ɑ]

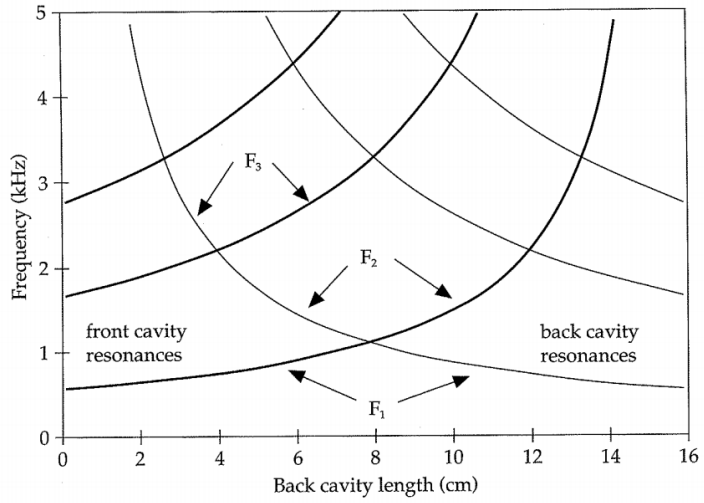

Figure 6.2 Natural resonant frequencies of the back tube (light lines) and front tube (heavy lines) in the tube model shown in figure 6.1 for different lengths of the back cavity. Overall vocal tract length is 16 cm, so the front cavity length is 16 cm minus the back cavity length.

This nomogram models vowels with the following properties:

- Two tubes
- Back-cavity tube is narrow and open/closed
- Front-cavity tube is wide and open/closed
- Total length of vocal tract: 16cm

II. Formant frequencies for a vowel with the 'tube structure' of [i]

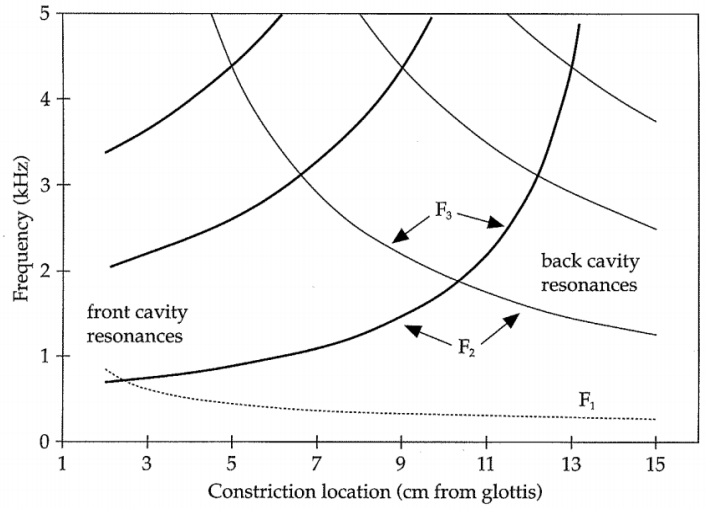

Figure 6.4 Resonant frequencies of the back tube (light lines), front tube (heavy lines) and Helmholtz resonance (dashed line) in the tube model illustrated in figure 6.3. Frequencies are plotted as a function of different back tube lengths (l_b), with the length of the constriction fixed at 2 cm and the total length of the model fixed at 16 cm.

This nomogram models vowels with the following properties:

- Two tubes with constriction between them
- Back-cavity tube is wide and closed/closed
- Front cavity tube is wide and open/closed
- Constriction is 2cm long and acts as Helmholtz resonator
- Total length of vocal tract: 16cm