The Winnipeg Vowels Project and method

This presentation draws from a subset of data gathered as part of the Winnipeg Vowels Project, currently under way at the University of Manitoba. The goal of the project is to study vowel production and variation in Winnipeg and South. The project is designed to establish ‘normative’ frequencies for the forms of the vowels to serve as a standard of comparison with other dialects, languages, or varieties.

The present subset of speakers is 15 monolingual English speakers (5 men and 5 women), 18-25 years of age, all natives of Winnipeg, and children of monolingual, anglophone natives of Manitoba. Possible ethnic-social variation within the heterogeneous Winnipeg community will be left for future research. These non-speakers represent a typical subset of the general population.

These speakers were digitally recorded in a laboratory setting, using methods based on recommendations from Diapause at 1994. “An interaction of vowel formant and voice characteristics: AMI 1994 (1995). Each read a script containing target words of /aʊ, i/ and /ʌ/ shapes. The vowels were used, some substitutions to the target shape were necessary. Each target word appeared five times in the randomly ordered script.

Digital audio recordings were made at 16 kHz (16-bit) on professional quality equipment. Digital audio recordings were made at 44.1 kHz (16-bit) on professional quality equipment. Once transferred to the computer, the files were downsampled to 16 kHz. All analyses were done using Kay Semi-Automatic Analysis System (SAS) and third order narrowband spectra (SAS) digitized, and F1 and F2 files were taken at the timepoint under consideration. Analyses parameters were adjusted to produce the best results for each speaker. The resulting formant measurements were adjusted to the coarse auto-normalization procedure (see below), and the results plotted in the diagrams seen here.

The above don’t generally describe the behaviour of the monophthongs; this process is distinct from the shortening/lengthening of the vowels. These views show the dynamic information for the monophthongs. Similar key as for the diphthongs above. Solid arrows represent the path of the vowel in the longer (left) context, dotted arrows represent the shorter (right) context.

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### Coarse auto-normalization and these vowel diagrams

For each speaker, a regression (formant numbers x frequency) is calculated from all available plain-vowel formants and timepoints. The slope-intercept formula is taken to represent that speaker’s neutral resonance curve. These should approximate F1 = 3000(f) + 5,000 Hz for men and F1 = 3000(f) + 5,000 Hz for women. All measurements are converted to an auditory scale (Bark), and the formant frequency is expressed as an auditory distance (ΔBark) from the speaker’s vowel resonance. Since the procedure allows each speaker’s data to normalize for itself, I call this coarse auto-normalization.

Coarse auto-normalization is suitable for relatively balanced datasets such as are gathered experimentally, and does not rely on the accuracy or precision of any one formant measurement of any particular vowel target. In this poster, the coarse auto-normalized results for F1 and F2 are used as coordinates in plotting the vowel diagrams. The result resembles the placement of vowels in traditional vowel diagrams with height and backness/rounding dimensions.

● Partially complete merger of low-back vowels /aʊ/ and /ʌ/
● Advancement of /u/ and /aʊ/ relative to /ə/
● Some retraction of /u/ and re-adjustment of front vowels
● Few non-trivial gender differences
● Women’s vowels distributed more distantly in the space (i.e. are more peripheral)
● In particular, women seem to use more of the height dimension than men

### Contact information:

Rob Hagiwara
Linguistics Department, University of Manitoba, Winnipeg, MB, CANADA. R3T 5V1
rhagiwa@cc.umanitoba.ca
www.umanitoba.ca/linguistics/rhagiwa/

ASA 149, Vancouver BC