

Applying likelihood ratio calculations to multi-dimensional chain shifts

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This paper presents a novel method to assess distances between vowel distributions under a chain shift-in-progress scenario. Although traditionally restricted to the field of forensic science/linguistics (Rose 2004, Aitken 1982), it will be argued that likelihood ratios (LR) are well-suited to cope with interrelations between disparate acoustic dimensions such as formant frequency and vowel duration. These have been argued to show interdependencies in push-chain scenarios such as the short front vowel shift in New Zealand English, where vowel distributions that overlap in formant frequency space remain distinct over the course of the shift due to radically different durational values of the vowels involved (Langstrof 2009, cf. Labov and Baranowski 2004 for a similar scenario under experimental conditions).

However, no attempt at incorporating the magnitude of these dimensions into a unified distance measure has so far been formulated, presumably due to the radically different physical dimensions involved in combination with different properties regarding distributional/delimiting conditions on formant frequency and vowel duration, respectively.

In addition to applying LR modelling to the New Zealand English data showing that such an approach does indeed capture the intuition that the two vowel distributions were kept distinct in intermediate stages of New Zealand English, it will also be argued that likelihood ratios provide a straightforward method to investigate distances in complex vowel systems in general. As a consequence, concepts such as 'symmetry' in the acoustic vowel space can be taken a fresh look at without any artificial restrictions to basic 2-dimensional systems.

References

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