Dutch past tense allomorphy

- 2 allomorphs for past tense weak verbs: -de/da/-te/ta/
- Choice between allomorphs determined by fortis/lenis specification of stem-final consonant of the verb
- Final devicing obscures fortis/lenis contrast in many contexts
  - Example: 'kunnen' - kun / kunne vs. 'slaan' - slaan / slaanne
- Speakers sometimes suffix the ‘wrong’ allomorph:
  - Incongruous voicing

Incongruous voicing

- Speakers sometimes suffix the ‘wrong’ allomorph:
  - kraak, kraakte ~ kramen, klamen

These deviations from the rule are correlated with token frequency and type similarity

- More mismatches with infrequent verbs
- More mismatches with verbs that have a large number of lexical neighbours with the opposite fortis/lenis specification

- Potential problem with E&B studies: spelling-based tasks

- Influence of spelling unclear
- Dutch spelling partially encodes fortis/lenis contrast
  - /k/ kraak, kraakte ~ /g/ klamen, klamen

- How do speakers produce these forms?

- This study: audio-based task only

Method

- B speakers of Standard Dutch
- Female, 18-26 years old, from western/central NL
- 2nd year students of English at Utrecht University

- Stimuli: 3 x 36 verbs in frame sentence, read by male speaker
  - Hym damit helemaal niet ‘He doesn’t dance at all’

- Task: repeat frame sentence, change verb to past tense

- -de:
  - Eleven, Blaffen, Bienen, Bieten, Beien, Beien, Beien, Beien, Beien, Beien, Beien, Beien, Beien
  - Kraak, Kraak, Kraak, Kraak, Kraak, Kraak, Kraak, Kraak, Kraak, Kraak, Kraak, Kraak

- -te:
  - Blaffen, Blaffen, Blaffen, Blaffen, Blaffen, Blaffen, Blaffen, Blaffen, Blaffen, Blaffen, Blaffen, Blaffen

Analysis

- Acoustic measurements of:
  - duration of vocal fold vibration during frication and closure
  - fricative duration
  - stop closure duration
  - burst duration
  - mean intensity of the burst
  - f1 and f2, at 10 ms after the burst

- Fricative duration (ms)

- Modelling fricative duration

  LDA-based classification

  - Term Level β SE t p
  - Prescriptive target -de 0.00 0.01 2.36 0.01
  - Analogy index -de 0.03 0.01 2.36 0.01
  - Fricative duration -de 0.02 0.01 2.36 0.01
  - Closure duration -de 0.01 0.01 2.36 0.01
  - Burst duration -de 0.03 0.01 2.36 0.01
  - Burst intensity -de 0.03 0.01 2.36 0.01
  - f1 -de 0.03 0.01 2.36 0.01
  - f2 -de 0.03 0.01 2.36 0.01

  Perception-based classification

  - Term Level β SE t p
  - Prescriptive target -de 0.03 0.01 2.36 0.01
  - Analogy index -de 0.03 0.01 2.36 0.01
  - Fricative duration -de 0.03 0.01 2.36 0.01
  - Closure duration -de 0.03 0.01 2.36 0.01
  - Burst duration -de 0.03 0.01 2.36 0.01
  - Burst intensity -de 0.03 0.01 2.36 0.01
  - f1 -de 0.03 0.01 2.36 0.01
  - f2 -de 0.03 0.01 2.36 0.01

- Modelling the likelihood of a mismatch between the prescriptive target and the classification results

  LDA-based classification

  - Term Level β SE t p
  - Prescriptive target -te 0.00 0.01 2.36 0.01
  - Analogy index -te 0.00 0.01 2.36 0.01
  - Fricative duration -te 0.02 0.01 2.36 0.01
  - Closure duration -te 0.01 0.01 2.36 0.01
  - Burst duration -te 0.02 0.01 2.36 0.01
  - Burst intensity -te 0.02 0.01 2.36 0.01
  - f1 -te 0.02 0.01 2.36 0.01
  - f2 -te 0.02 0.01 2.36 0.01

  Perception-based classification

  - Term Level β SE t p
  - Prescriptive target -te 0.00 0.01 2.36 0.01
  - Analogy index -te 0.00 0.01 2.36 0.01
  - Fricative duration -te 0.00 0.01 2.36 0.01
  - Closure duration -te 0.00 0.01 2.36 0.01
  - Burst duration -te 0.00 0.01 2.36 0.01
  - Burst intensity -te 0.00 0.01 2.36 0.01
  - f1 -te 0.00 0.01 2.36 0.01
  - f2 -te 0.00 0.01 2.36 0.01

Summary

- Effect of target: -de voicing more likely than -te devoicing
- Effect of neighbourhood density: probability of a -de classification increases with the number of -de verbs in the neighbourhood
- Effect of token frequency (acc. to the perceptual classification only): incongruous voicing more likely in less frequent verbs
- Effect on fricative duration: incongruous voicing in verbs involves more phonetic similarity between -te and -de words wrt. fricative duration

Main findings

- Selection of allomorph influenced by more than underlying fortis/lenis specification
- Similarity-based analogy (neighbourhood density)
- When conflicting: higher chance of mismatch
- Mismatch: phonetic blending

Implications

- Mismatchive and phonetic blending: suggest interactive model of speech production
- Fully discrete feed-forward models cannot accommodate these results
- Spreading activation models, or cascading: competing representations
- Partial activation of multiple representations (lexical or phonological) (Goldrick & Blumstein, 2006)
- Exemplar models (Pierrhumbert, 2001): storage includes phonetic detail
- Choice of non-central exemplar