Broad and fine acoustic categories in *bod*, *bond*, *bald*, and *bard*: A step toward acoustic phonology

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1. Introduction

- Modern phonology seeks articulatory description
  - Brought on by using segments, features or gestures
- Acoustics is more accessible, less invasive
- Acoustic descriptions of phonology should be considered complete

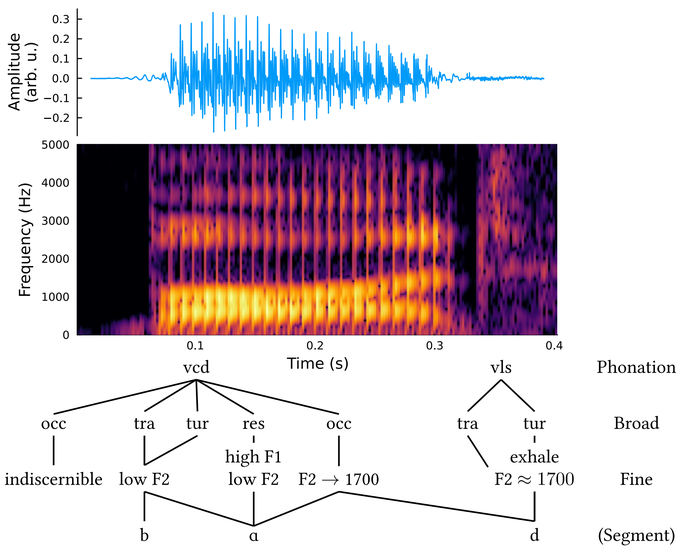

Figure 1. Representation for *bod*. Resonant section consists only of a vowel and has less overlap overall. Overlap still present in formant transitions.

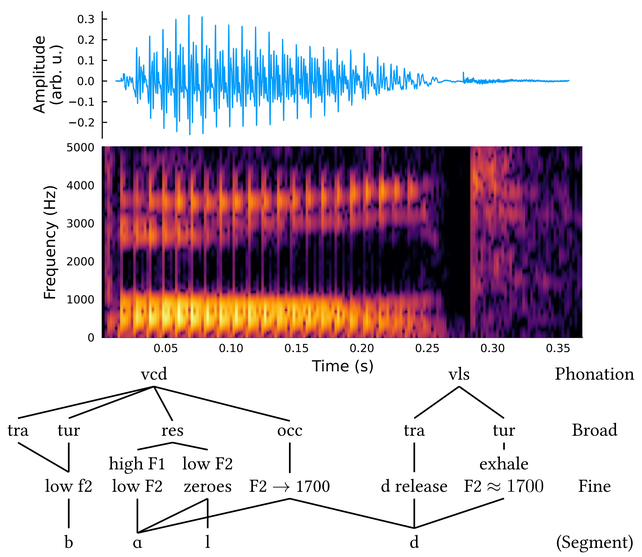

Figure 3. Representation for *bald*. Distinctive lowered F2 and zeroes co-occur with vowel production within resonant category.

2. Methods

- Analyzed recordings of *bod*, *bond*, *bald*, and *bard* from MALD young male speaker [4]
- Created representative graphs of acoustic features in productions (Figs. 1 - 4), inspired by gestural scores [1] and autosegmental trees [2]

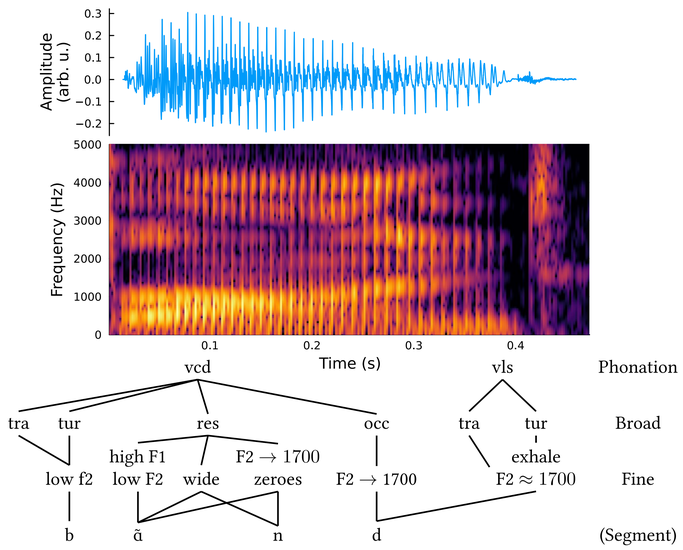

Figure 2. Representation for *bond*. Wide F1 bandwidth, zeroes, and nasal formants co-occur with vowel production.

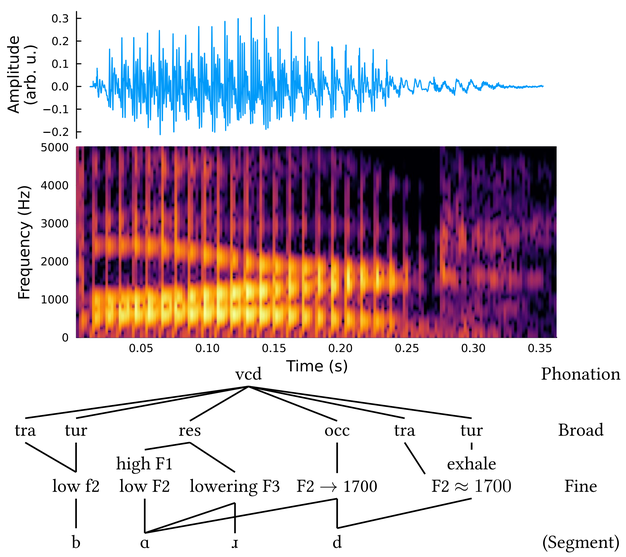

Figure 4. Representation for *bard*. Distinctive lowering of F3 for approximant co-occurs with vowel production, within the resonant category.

3. Representation format

- **Phonation**: voice quality (e.g., voicing)
- **Broad categories**: occludent, transient, turbulent, resonant
- **Fine categories**: specific acoustic events in signal
- Segment labels can be added for convenience
- Graph assumed to be specific to recording
- Assumes overlappable acoustic events as basic data type, not discretely segmentable units

4. Results

- In this quartet, form-based contrast extracted directly from acoustics
- Overlapping acoustic events can be represented in graphs
- Degree of overlap appear greater within broad categories than across them
- E.g., F3 lowering vs. formant transitions

5. Discussion & conclusion

- Abstract acoustic representations of speech seem possible, without reference to articulation
- Phonological phenomena like alternation need further explanation and theorization
- Graph structure shown here is impressionistic
- Larger-scale analyses need to be performed
- Isomorphy between acoustics and articulatory phonology should be explored [3]

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References:
[1] Browman, C. P., & Goldstein, L. (1992). Articulatory phonology: An overview. *Phonetica*, *49*(3–4), 155–180.
[2] Goldsmith, J. A. (1976). Autosegmental phonology [PhD dissertation]. Massachusetts Institute of Technology.
[3] Iskarous, K., & Pouplier, M. (2022). Advancements of phonetics in the 21st century: A critical appraisal of time and space in Articulatory Phonology. *Journal of Phonetics*, *95*, 101195.
[4] Tucker, B. V., Brenner, D., Danielson, D. K., Kelley, M. C., Nenadić, F., & Sims, M. (2019). The Massive Auditory Lexical Decision (MALD) database. *Behavior Research Methods*, *51*(3), 1187–1204.

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