Incomplete Neutralization
Via Paradigm Uniformity and Weighted Constraints

Aaron Braver (Texas Tech University) & Shigeto Kawahara (Keio University)

Basehood

We assume that bases may be selected on the basis of (a) frequency (Steriade 2013; cf. Albright 2002), (b) morphology (Benua 1997), or (c) canonical realization (Steriade 1997:55, Kawahara 2002).

- We adopt Recursive Evaluation of bases (Benua 1997): at speech time, the speaker first determines the base UR as above, then applies the language's canonical phonology and phonetics to that form. The candidate is then evaluated with respect to this freshly-minted base.
- This view neatly accounts for PU effects in nonce words: the speaker need only apply canonical phonology and phonetics to the nonce base; no word-specific frequency information is needed since type frequency is computed over entire inflectional paradigms. The alternative view, in which the phonetic detail of bases is pre-generated, is problematic since nonce words (by virtue of never having been heard by the speaker) are not associated with phonetic details.
- Morpheme-internal IN: a word like English *ladder* serves as its own base after canonical phonology and phonetics have applied. This does, though, crucially assume that flapping is not part of the *canon.* (On faithfulness to "canonical" or "phonetically natural" forms see Steriade 1997:55 and Kawahara 2002.)

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Introduction

- Incomplete neutralization (IN):
  Two underlyingly distinct segments become *nearly* identical on the surface ([9],[14]).
- Challenge for classical architectures (e.g., [3],[7]):
  IN creates sub-phonemic distinctions, which require reference to UR contrasts unavailable to phonetics.
- We combine two independently motivated mechanisms—paradigm uniformity ([2],[17]) and weighted phonetic constraints ([8],[13],[21])—to account for IN patterns.

Two Generalizations

Directionality: IN's subphonemic distinctions trend in the direction of the full contrast.
E.g., in IN of German final devoicing, the vowel in /ʁad/ 'wheel' is longer than in /ʁat/ 'advice'. This is the same direction (but smaller magnitude) as in non-neutralizing contexts cross-linguistically ([6]).

Magnitude continuum: The magnitude of surface distinctions in IN varies across languages and situations:

- Am.E. flapping: ~5–10 ms. ([4],[10])
- German final devoicing: ~10–15 ms. ([9],[14])

Weighted Phonetic Constraints

We use a phonetic grammar whose constraints refer to phonetic details ([8]) to formalize the tradeoff between neutralization and identity to a base.

IN of Japanese Vowel Length

Japanese monomoraic nouns lengthen to meet a bimoraicity requirement ([11],[15]), but these lengthened nouns are shorter than underlyingly long nouns ([5]).

Schematic example (values rounded):

	Example	Mean Dur.
(a) Unlengthened (short)	[ki mo] nakushita yo	50 ms.
(b) Lengthened (/short/)	[ki Ø] nakushita yo	125 ms.
(c) Long (/long/)	[kii Ø] nakushita yo	150 ms.

The Model: Targets & Constraints

Dur(base)
Actual base duration (here, unlengthened as in (a))

TargetDur(μ) and *TargetDur(μμ)*
Canonical vowel duration targets

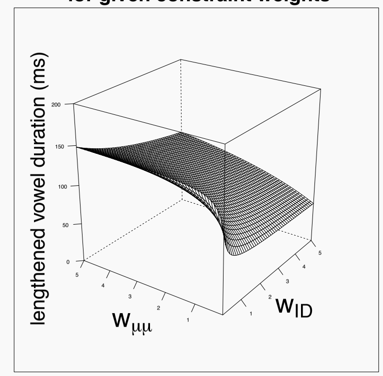
DUR(μμ) cost: $w_{\mu\mu}(TargetDur(\mu\mu) - Dur(Cand))^2$
Bimoraic vowels approximate target duration

OO-ID-DUR(μμ) cost: $w_{ID}(Dur(Cand) - Dur(Base))^2$
Candidate durations approximate base duration

Lengthened Vowel Duration	Cost of OO-ID-Dur(μμ)	Cost of Dur(μμ)	Total Cost
(a) 100	$1(100-50)^2 = 2{,}500$	$3(150-100)^2 = 7{,}500$	10,000
(b) 125	$1(125-50)^2 = 5{,}625$	$3(150-125)^2 = 1{,}875$	7500
(c) 150	$1(150-50)^2 = 10{,}000$	$3(150-150)^2 = 0$	10,000

Discussion

Predicted duration of lengthened vowels for given constraint weights



Conclusions: Two individually motivated mechanisms account for both Directionality and the Magnitude Continuum. Lengthened vowels cannot become longer than underlyingly long vowels since no weightings prefer this situation (see figure above). With appropriate weightings, the model can account for a wide range of durations.

Remaining issues: We assume bases may be selected on the basis of (a) frequency, (b) morphology, or (c) canonical realization.

In monomorphemic, morpheme-internal IN (e.g. English *ladder* vs. *latter*) a word serves as its own base after the application of canonical phonetic and phonological processes (see [12] and [16] on faithfulness to canonical/natural forms). A research question: what counts as canonical phonetics and phonology?

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