Modeling the gradient evolution and decay of harmony systems
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While some work has addressed the potential motivations and evolutionary trajectories of vowel harmony (Hyman 1976; Ohala 1994; Beddor & Yavuz 1995; Harrison et al. 2002; Przezdziecki 2005; Wayment 2009), very little has focused on the decomposition of vowel harmony (Binnick 1991; Nevins & Vaux 2004), leaving the nature of decaying systems largely unexplored. In this paper I propose that, as with the evolution of phonological harmony, the decomposition of harmony reveals a coarticulatory basis. Using the decay of labial harmony in Kazakh (Kaun 1995, 2004; McCollum 2015) as testing grounds, I present a novel framework through which to view categorical and gradient harmony in one unified model (Flemming 2001).

McCollum (2015) notes that rounding harmony in Kazakh applies categorically to second syllable vowels on three conditions: the target vowel is root-internal (1a), the target vowel is high (1b), and the trigger vowel is not [o] (1c).

(1) a. *qʊɬʊ̲n* 'colt' b. *kømʏ̲r* 'coal' c. *køsʏ̲k* 'desert carrot'
*qʊɬ-ə̲ (*qʊɬ-ʊ)* 'slave-POSS.3' *tøbe̲ (*tøbø)* 'hill' *qozə (*qozʊ)* 'lamb'

He suggests that the perceptual salience of the [o]-[ɑ] contrast relative to other [round] pairs distinguishes active, [ʏ, ø, ʊ], from inert, [o], triggers. However, he notes a variety of exceptions- suffixal rounding after a liquid (2a), rounding between two round vowels (2b), as well as rounding modulated by speech rate.

(2) a. *øl-ʏp ~ øl-ɪp* 'die-CVB' b. *qos-ʊ̲ɬ-u* 'add-PASS-GER'
*øs-ɪp (*øs-ʏp)* 'grow-CVB' *qos-ə̲ɬ-də (*qos-ʊɬ-də)* 'add-PASS-PST.3'

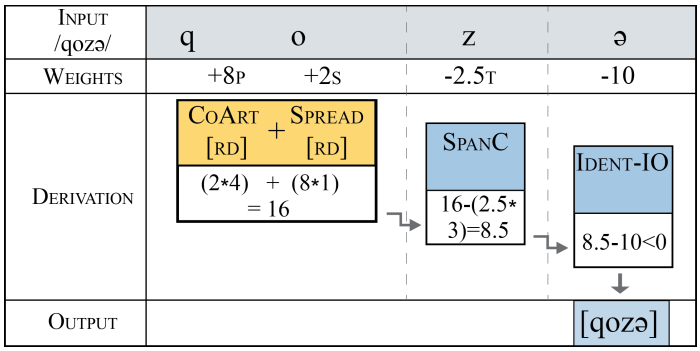
I directly encode these findings into a novel formalism that is able to capture both the categorical application of harmony and subphonemic teamwork (Lionnet 2014). Crucially, harmony is construed as a positive force that is depleted through its application. Phonological, morphological, and temporal forces may reduce the strength of harmony, in accordance with the empirical generalization made regarding some languages, that harmonic force diminishes throughout the domain of harmony (Mutaka 1995; Kirchner 1998; McPherson & Hayes 2014).

Both the drive for harmony and the cost of harmony are scalar, weighted variables. Triggers may differ according to strength, and constraints on harmony are not violable, but rather inexorable costs incurred by harmonic spreading.

Phonological harmony (SPREAD) is an augmentation of phonetic coarticulatory force (COARTICULATE), their combined strength equaling the assimilatory force of the trigger vowel. Diachronically, SPREAD develops from and devolves back to COARTICULATE. When the combined strength of these two forces does not equal the cost of a categorical shift in target vowel quality (IDENT-IO, e.g. /ə/ → [ʊ]) the effect of rounding is gradient, and by extension, perception and discrimination are variable and continuous (Fry et al. 1962).

Categorical vowel assimilation becomes generalized via ITERATE, a function that spreads assimilation to all potential targets within a domain. The evolution of harmony, then, requires the augmentation of phonetic coarticulation by phonological spreading (Przezdziecki 2005), which targets the most proximate vowel. These combined forces driving assimilation are then iterated throughout a particular domain. The generalization of this process via iteration typically obscures the underlying motivations for harmony (Barnes 2006), but when harmony decays that ITERATE function is lost, and the underlying cause(s) for harmony may resurface. In the Kazakh case, trigger strength asymmetries derived from perceptual weakness reemerge despite no evidence of their existence in older works (Menges 1947; Korn 1969).

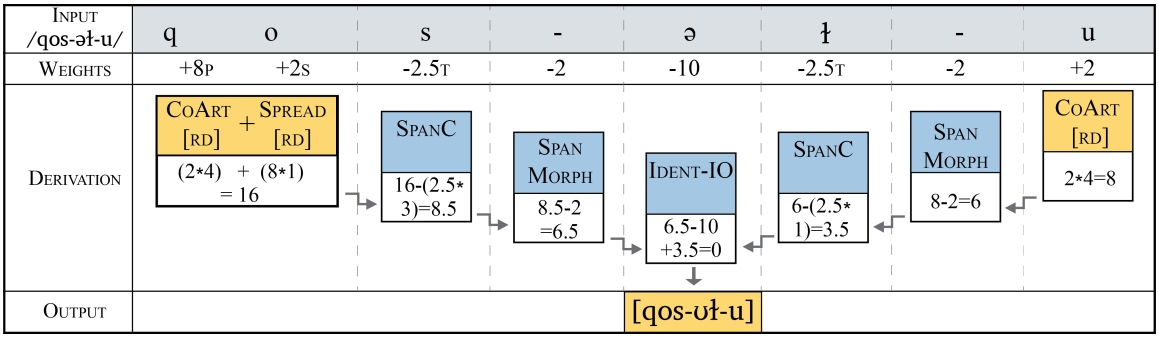
(3)



Thus, in [qozə], (3), the residual strength of harmony after spreading across the fricative is insufficient to trigger categorical rounding of [ə], but in [køsʏk] 'desert carrot', rounding obtains because [ø] is a better trigger than [o] (Kaun 1995).

However, when coupled with anticipatory rounding before GER /u/, [o] triggers rounding of the second syllable vowel in qos-ʊł-u 'add-PASS-GER', (4). The effect of the root vowel, [o], plus the coarticulatory pressure of [u], equals the cost of categorical vowel assimilation (IDENT-IO), modeling this instance of teamwork in assimilation.

(4)



This work analyzez a decaying harmony system, also addressing the interface of phonetics and phonology in understudied transitional harmony systems. This paper argues for a combination of phonetic and phonological forces in Kazakh labial harmony, and in transitional harmony systems generally, proposing that the evolution and decline of vowel harmony symmetrically may reflect a phonetic origin. The model developed herein offers a unified treatment of gradient and categorical harmony by the interworking of COARTICULATE, SPREAD, and ITERATE.

Selected References

McCollum, Adam G. 2015. On the Decay of Rounding Harmony in Kazakh: A Case of Contact-Induced Change? *CUNY Conference on Multilingual Phonology*. **Ohala, John J.** 1994. Towards a universal, phonetically-based, theory of vowel harmony. *Proceedings of the Third ICSLP*. **Przezdziecki, Marek** 2005. *Vowel harmony and coarticulation in three dialects of Yoruba: phonetics determining phonology*. Cornell dissertation.