

Similarity and contrast in consonant harmony: Evidence from Dardic

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1 Introduction

- This paper is concerned with consonant harmony, which can be defined as follows:
 - (1) Consonant harmony (Rose, 2011, p. 1811)
Assimilation for an articulatory or acoustic property between two or more non-adjacent consonants, where intervening segments are not noticeably affected by the assimilating property.
- Assimilation is understood to include both alternations and assimilatory co-occurrence restrictions; i.e., static morpheme structure constraints in which the consonants within some domain (typically a lexical root/stem) must agree for some feature(s).
- Cross-linguistic surveys have observed that consonant harmony systems are constrained by similarity; i.e., interacting consonants are those that are *highly similar to one another* (Rose & Walker, 2004; Hansson, 2010).
- Some note that consonant harmony is also constrained by phonological contrast:
 - “In general, the set of consonants that interact in any given consonant harmony system typically consists of those that are contrastively specified for the feature in question; segments that are redundantly [+F] (or redundantly [-F]) are completely inert and transparent to the harmony.” (Hansson, 2010, p. 328)
- However, the relation between similarity and contrast remains controversial:
 - “it is not always the case that contrast is involved in determining participation in LDCA [Long-Distance Consonant Agreement]” (Rose & Walker, 2004, p. 517)
- Recently, Mackenzie (2005; 2009) has argued that similarity can be determined by contrastive feature specifications, assuming an appropriate model of contrast.
- Mackenzie argues that similarity effects in consonant harmony systems can be reduced to one of the following:

- (2) Interacting (“similar”) segments in consonant harmony systems (Mackenzie, 2009)
- a. the natural class of segments contrastively specified for the harmonic feature;
 - b. segments that differ only in a single marked and contrastive feature specification.

- This paper examines evidence from retroflex consonant harmony in a Dardic language, Indus Kohistani, where similarity effects cannot be reduced to either (2)(a) or (2)(b).
- The paper argues that Mackenzie’s contrast-based approach can be maintained and extended to the Dardic languages, but only if we refine (2)(b) in ways to be discussed.

2 MacKenzie (2005; 2009): Contrast and similarity in consonant harmony

- Mackenzie adopts the “contrastive hierarchy” model of contrast (Dresher, 2003; 2009).
- Contrast is determined by a hierarchic ordering of features in which features higher in the hierarchy have scope over features lower in the hierarchy.
- Feature-hierarchies are language-specific. Two languages with identical or near-identical inventories might have different contrastive feature specifications, and hence, different phonological patterns, including different similarity effects.

2.1 Similarity as a natural class

- Nilotic languages, Anywa and Dholuo, both have dental vs. alveolar contrast in stops; both have alveolar /n/ but lack phonemic dental */ɲ/.

(3) Anywa and Dholuo (Nilotic): oral and nasal stop inventories

	Anywa	Dholuo	
Alveolar:	t d n	t d ⁿ d n	
Dental:	ṭ ḍ	ṭ ḍ ⁿ ḍ	

- Both have dental consonant harmony between stops, but Anywa nasals participate in harmony while Dholuo nasals do not.

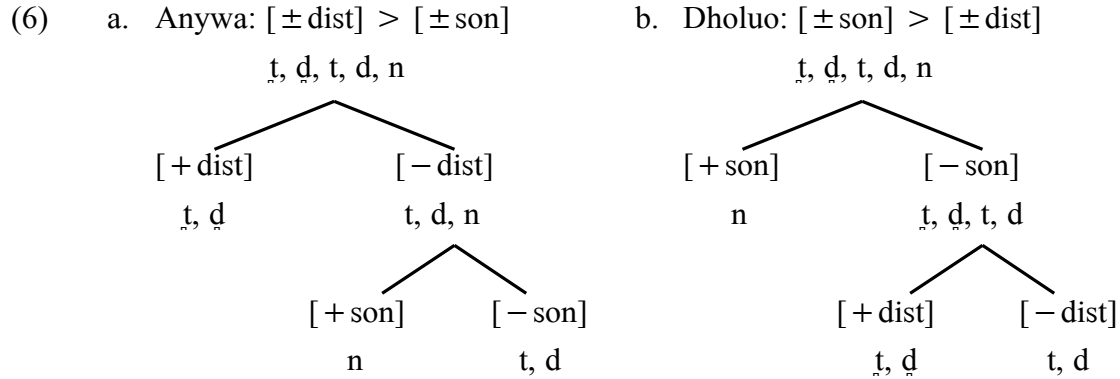
(4) Dental consonant harmony in Anywa: nasals participate

ṭùḍ	‘ropes’	tūud	‘pus’	
ṇùḍò	‘to lick’	núudó	‘to press something down’	*n...ḍ
òḍóòṇ	‘mud’	dīn	‘to thrash something’	*ḍ...n

(5) Dental consonant harmony in Dholuo: nasals do not participate

ṭeḍo	‘to forge’	tedo	‘to cook’
ḍoḍo	‘to suckle’	diedo	‘to balance’
ṭuno	‘breast’	dino	‘deaf, to be stopped up’
ṭuon	‘brave man’	ṭin	‘small’

- Rose & Walker see this as counter-evidence to the claim that contrast determines participation in consonant harmony (2004, p. 517).
- Mackenzie attributes this distinction to different contrastive hierarchies.



- In (6)(a), $[\pm \text{dist}]$ has scope over $[\pm \text{son}]$. Thus, alveolar /n/ is contrastively specified as $[-\text{dist}, +\text{son}]$ even though it has no $[\text{+dist}]$ counterpart.
- In (6)(b), $[\pm \text{son}]$ has scope over $[\pm \text{dist}]$. Thus, alveolar /n/ is contrastively specified as $[\text{+son}]$ but not for any value of $[\pm \text{dist}]$.
- In each case the class of segments participating in consonant harmony can be defined as the natural class of segments contrastively specified for the harmonic feature $[\pm \text{dist}]$.

2.2 Similarity as minimal contrast

- Some cases of consonant harmony require reference to a notion of similarity that is distinct from the notion of natural classes.
- In these cases, Mackenzie argues that harmony holds between those segments that differ only (“minimally”) in a single marked and contrastive feature specification.

(7) Hausa obstruent phonemes

(f, fʰ)	t	tʃ	k	kʷ	kʲ	
b	d	ɗ	g	gʷ	gʲ	
ɓ	ɗ	(ɗʰ)	kʰ	kʷʰ	kʲʰ	ʔ
f, fʰ	s	ʃ				h
	z					
	sʰ					

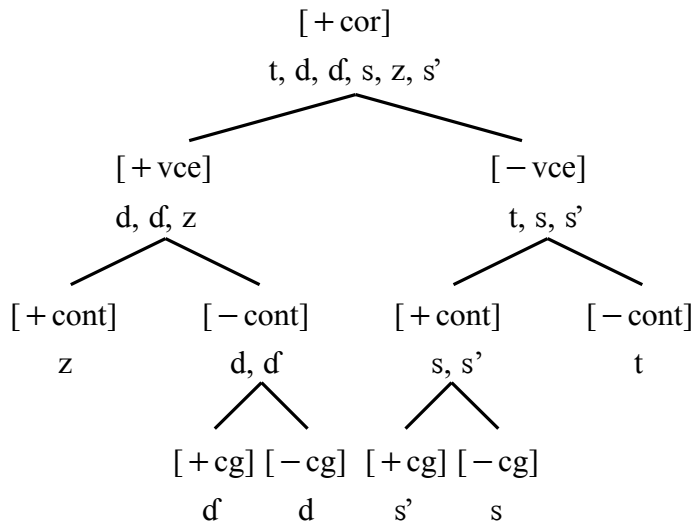
- Hausa: laryngeal contrasts for voice and [constricted glottis] (implosive or ejective)
- Laryngeal co-occurrence restrictions in Hausa:
 - Dissimilation for [constricted glottis] in heterorganic pairs
 - Assimilation/harmony for [constricted glottis] in homorganic pairs

(8) Hausa: homorganic consonants agree for laryngeal features

- a. ɓaɓɛ ‘quarrel’ *ɓ...ɓ, *ɓ...ɓ
- b. s’as’a ‘rust’ *s’...s, *s...s’
- c. k’uk’uta ‘try hard’ *k’...k, *k...k’

- Similarity effect: laryngeal harmony is dependent on agreement for place and voicing.
- The output of harmony is identity.

(9) Hausa: [± cor] > [± vce] > [± cont] > [± c.g.]



(10) Marked contrastive specifications for Hausa coronals

t	d	d'	s	s'
[+cor]	[+cor]	[+cor]	[+cor]	[+cor]
	[+vce]	[+vce]	[+cont]	[+cont]
		[+cg]		[+cg]

- Interacting segments are those that differ minimally in the harmonic feature; i.e., they differ only in a single marked and contrastive feature (/d/ vs. /d'/; /s/ vs. /s'/)
- Prediction: similarity-sensitive harmony should always result in total identity. If interacting segments differ only in the harmonic feature, then agreement for that feature will result in total identity. Cf. similar claims in Gallagher & Coon (2009).

3 Evidence from Dardic: Indus Kohistani

- The Dardic languages are a sub-group of Indo-Aryan languages in northern Pakistan.
- Some of them exhibit root-internal retroflex consonant harmony; e.g., Kalasha (Arsenault & Kochetov, 2008; 2009); Indus Kohistani (Arsenault, 2009).
- These languages provide unambiguous evidence of similarity effects without identity.

- Indus Kohistani obstruents:
 - Retroflexion: contrastive in plosives and sibilants (affricates and fricatives)
 - Laryngeal: contrast for voice and aspiration/breathy voice ([spread glottis]).

(11) Indus Kohistani coronal obstruent phonemes

t, t ^h	ʈ, ʈ ^h	
d, d ^h	ɖ, ɖ ^h	
ts, ts ^h	tʂ, tʂ ^h	tʃ, tʃ ^h
s	ʂ	ʃ
z, z ^h	ʐ, ʐ ^h	ʒ, ʒ ^h

- Retroflex consonant harmony is dependent on agreement for manner: harmony holds between 2 plosives or 2 sibilants, but not between plosives and sibilants.

(12) Indus Kohistani: Retroflex consonant harmony between plosives

a. to:tá:	‘butterfly’	d ^h ʌtr̩:	‘burnt food’
tʌt ^h	‘hot; heat’	tùnd	‘a kind of basket’
t ^h atʌr	‘smallpox’	dùnd	‘a flock, herd’
dít ^{hi}	‘given’	d ^h ʌndà ^h	‘dealings, business’
b. tʌtú:	‘a small horse’	ɖ ^h à:ɖ	‘a woodpecker’
t̂à:t ^h	‘a small rug’	tʌndáã	‘to beat’
t ^h atʌr	‘shallow’	ɖá:nd	‘a stick’
ɖí:t ^{hi}	‘span of hand’	ɖ ^h ã:nd	‘a pond’
c. *t...t, *t...d, *t...d, *d...t, *d...d, *d...d, etc.	(no retroflexes with non-retroflexes)		

(13) Indus Kohistani: Retroflex consonant harmony between sibilants (affricate and fricative)

a. tsít ^{hi}	‘nipple, breast’	tsàs	‘a pinch’
tsãz	‘soft’	sʌzú:	‘sister’s son’
z ^h ã:z	‘a branch of a holm oak’	z ^h ʌnzé:r	‘a kind of bird’
b. tʃi:tʃʌk ^h	‘smallpox’	tʃã:tʃú:	‘a dwarf’
tʃʌf̩t̩i:	‘absorption’	ʃã:tʃ	‘a kind of mungo’
tʃ ^h ʌʒ̩ ⁱ	‘a winnowing tray’	ʃiʃáã	‘to dry (up)’
ʃò:ʃa:	‘decoration’	ʃʌmʃʌtá:	‘a turtle’
c. tʂ̩tʂ ^h	‘grey, spotted’	tʂ ^h iʃáã	‘to learn’
tʂo:ʂáã	‘to wring out’	tʂ ^h ʌnzò:	‘a curry comb’
zà:tʂ	‘a grape’	zʌmʃú:	‘a son-in-law’
ʂ̩ʂ	‘a head’	ʂù:ʂ	‘decent, fine, proper’

- d. *ts...tʃ, *tʃ...ts, *tʃ...tʃ, *tʃ...tʃ, *ts...ʃ, *ʃ...ts, *tʃ...ʃ, *ʃ...tʃ, *s...ʃ, *ʃ...ʃ, *ʃ...ʃ, etc.
(no retroflexes with non-retroflexes)

(14) Indus Kohistani: No retroflex consonant harmony between plosives and sibilants

a.	tsaʃáĩ	‘to lick’	tʃè:ts ^h	‘a flint’
	siʃi:	‘a whistle’	t ^h osà:	‘a fist, punch’
	taʃ ^h áĩ	‘to carve’	tʃ ^h atáĩ	‘to plaster’
	dù:ʃ	‘a sin’	sá:ŋǽ	‘a bull’
b.	tʃʌtú:	‘a grater for spices’	tʃi:ŋǽ	‘a crack, fissure’
	ʃòt ^h	‘a bump, swelling’	ʃʌŋǽ	‘barren, castrated’

- Laryngeal features play no role in harmony. Agreement for laryngeal features is neither a pre-condition for harmony nor a necessary output of harmony.
 - Rarely more than one aspirate in a word/root. Possible case of dissimilation.
 - Voicing agreement is not necessary. E.g., /dʃi:t^{hi}/ ‘span of hand’; /tʃaŋǽĩ/ ‘to beat’; /zà:tʃ/ ‘a grape’; etc.
 - Manner agreement between fricatives and affricates is not necessary: /tʃo:ʃáĩ/ ‘to wring out’; /zʌmtʃú:/ ‘a son-in-law’; etc.
- The class of interacting segments cannot be reduced to either (2)(a) or (2)(b).
 - Natural class? Not all segments that are contrastively specified for retroflexion interact with each other (i.e., sibilant and non-sibilant obstruents);
 - Minimal contrast? Interacting segments do not differ only in the single marked and contrastive feature of retroflexion (i.e., they differ in laryngeal features, etc).

4 Minimal contrast re-defined

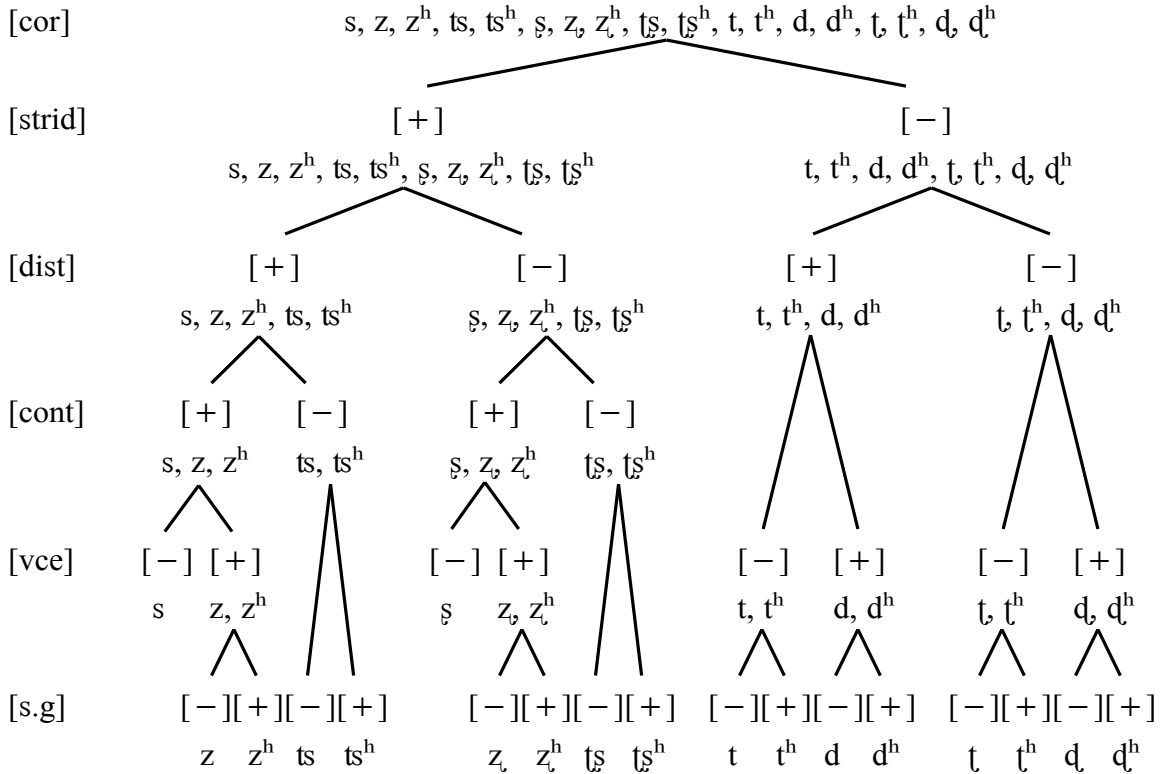
- Mackenzie’s contrast-based approach to similarity effects might be maintained and extended to Dardic if we refine the notion of minimal contrast in (2)(b) as follows:

(15) Similarity effects as minimal contrast: redefined

Interacting segments are those that agree with respect to all features that have scope over the harmonic feature, but (potentially) disagree with respect to: (i) the harmonic feature itself; and (ii) any features over which the harmonic feature has scope.

- Ignoring palatals (for simplicity), the contrastive hierarchy for Kohistani might be:

(16) Indus Kohistani: [cor], [±strid] > [±dist] > [±cont], [±vce], [±s.g.]



- If [±strid] has scope over [±dist], then harmony for [-dist] (apicality/retroflexion) will apply only between pairs that agree for [±strid].
- If [±dist] has scope over [±cont] and all laryngeal features, including [±vce] and [±s.g.], then harmony for [-dist] will not entail agreement for these other features.
- Palatals could be distinguished by [±ant], which would be below [±dist] because interacting segments need not agree for [±ant] (i.e., dentals and palatals assimilate to retroflexes). [±ant] would be above [±cont] because dental and palatal sibilants also appear to exhibit palatal agreement without agreement for laryngeal features.

5 Discussion

- Cross-linguistically minor place harmony is often sensitive to manner (esp. sibilant vs. non-sibilant); but laryngeal features rarely if ever play any role.
 - “laryngeal specifications do not usually impact coronal or dorsal agreement” (Rose & Walker, 2004, p. 485)
- Laryngeal harmony is often dependent on agreement for place and manner; the output is often identity (Gallagher & Coon, 2009; Mackenzie, 2009).

- It is generally assumed that the contrastive hierarchy is subject to cross-linguistic variation, but some have suggested that there may be a universal or near-universal order in which features are accessed (Clements, 2001).
- In most implementations of the contrastive hierarchy, major class, major manner and major place features tend to be high, while minor place features tend to be intermediate, and laryngeal features tend to be low (often last).
- If this reflects a universal trend (perhaps influenced by perceptual salience??), then the proposed revision to contrast-based similarity predicts the following generalizations:
 - Coronal harmonies should be sensitive to major place/manner distinctions, but not to laryngeal distinctions (i.e., they should not result in total identity);
 - Laryngeal harmony should be sensitive to major place/manner and minor place, and should often result in total identity.

6 Summary & conclusion

- Mackenzie (2009) argues that similarity effects in consonant harmony systems can be reduced to one of the following:
 - (17) Interacting (“similar”) segments in consonant harmony systems (Mackenzie, 2009)
 - a. the natural class of segments contrastively specified for the harmonic feature;
 - b. segments that differ only in a single marked and contrastive feature specification.
- Indus Kohistani and other Dardic languages exhibit retroflex consonant harmony in which the class of interacting segments cannot be reduced to either (17)(a) or (17)(b).
 - Natural class: Not all segments that are contrastively specified for retroflexion interact with each other (i.e., sibilant and non-sibilant obstruents);
 - Minimal contrast: Interacting segments do not differ only in the single marked and contrastive feature of retroflexion (i.e., they differ in laryngeal features).
- Mackenzie’s contrast-based approach to similarity effects might be maintained and extended to Dardic if we refine the notion of minimal contrast so that it is sensitive to the relative scope of features in the contrastive hierarchy:
 - Interacting segments are those that are contrastively specified for the harmonic feature *and* agree for all features that have scope over the harmonic feature, but not necessarily for those that fall within the scope of the harmonic feature.
- It remains to be seen whether this account can be extended to other cases of consonant harmony.

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