Asymmetries in Cross-Height Rounding Harmony

Caitlin Smith

University of Southern California
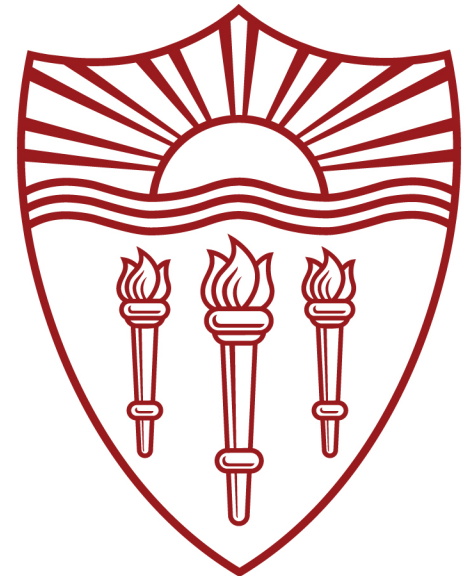
Restrictions on Rounding Harmony

- Rounding harmony: rounding spreads from trigger vowel to target vowel(s)

- Hong (1994), Kaun (1995, 2004): restrictions on rounding harmony based on
  - Trigger height (nonhigh preferred)
  - Target height (high preferred)
  - Matching height of trigger and target

Abridged Typology of Rounding Harmony

|	Turkish[1]	Yowlumne[2],*	Yakut[3]	Arapaho[4]
Within Height	o̱-o	o-o	o̱-o	o-o̱
	u̱-u	u-u	u̱-u	u-u
Cross Height	o̱-u	o-u	o̱-u	o̱-u
	u̱-o	u-o	u̱-o	u-o̱

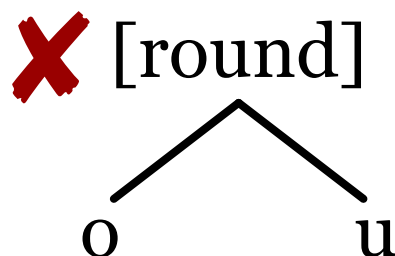[1] Clements & Sezer (1982)
[2] Kuroda (1967)
[3] Krueger (1962)
[4] Cowell & Moss (2008)

3

Gestural Uniformity
(Kaun 1995)

- Gestural Uniformity: autosegment should be uniformly executed throughout its span of association
- Feature [round] should be associated with vowels of uniform heights
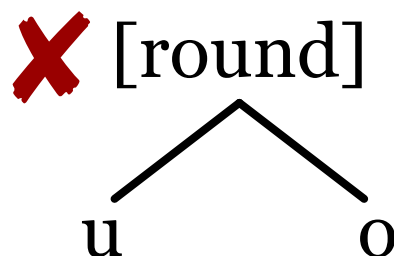
✗ [round]
o   u

✗ [round]
u   o

Cross-Height Harmony Asymmetry

- Asymmetry in cross-height harmony restriction:
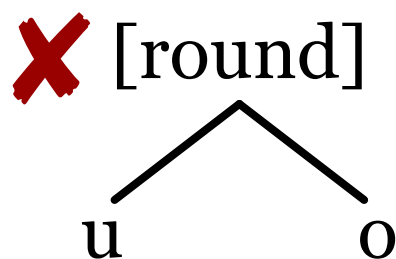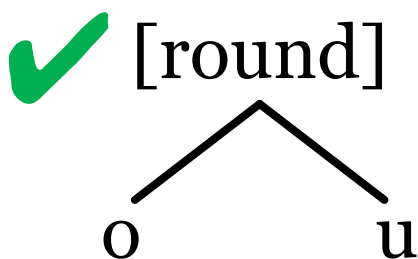
✔ [round]
   o   u

�’✘ [round]
   u   o

- Attributed to interaction of constraints against nonhigh round vowels and cross-height harmony (Kaun 1995, 2004; Walker 2017)

Proposals

- Constraint interaction analysis predicts cross-height harmony asymmetry in progressive (rightward) harmony only (e.g., Yakut)
- Asymmetry also holds in regressive (leftward) harmony (e.g., Arapaho)

Proposals:
1. Gestural Uniformity restriction on rounding harmony is split among two stringently defined constraints
2. More stringent constraint penalizes high-nonhigh vowel sequences only

6

Yakut

Yakut Rounding Harmony
(Turkic; Russia; Kaun 1995; Sasa 2001, 2009; Walker 2017)

- Vowel inventory:

	Front		Back	
	Unround	Round	Unround	Round
High	i iː	y yː	ɯ ɯː	u uː
Non-high	e eː	øː	a aː	o oː

- Full backness harmony
- Cross-height rounding harmony only if target is high

Yakut Rounding Harmony
(Turkic; Russia; Kaun 1995; Sasa 2001, 2009; Walker 2017)

High vowels undergo harmony triggered by high or nonhigh round vowels:

a. [o̱χ-u] 'arrow (acc.)'
b. [bø̱rø-ny] 'wolf (acc.)'
c. [mu̱rum-u] 'nose (acc.)'
d. [ty̱nnyk-y] 'window (acc.)'

c.f. [a̱ɣa-nɯ] 'father (acc.)'

Yakut Rounding Harmony
(Turkic; Russia; Kaun 1995; Sasa 2001, 2009; Walker 2017)

Nonhigh vowels undergo harmony triggered by nonhigh round vowels:

a.   [o̲ɣo-lor] 'child (pl.)'
b.   [bo̲rø-lør] 'wolf (pl.)'

c.f. [a̲ɣa-lar] 'father (pl.)'

Yakut Rounding Harmony
(Turkic; Russia; Kaun 1995; Sasa 2001, 2009; Walker 2017)

- Nonhigh vowels block rounding harmony triggered by high round vowels:

  a. [ku̲s-tar] 'duck (pl.)'
  b. [ty̲nnyk-ler] 'window (pl.)'

- Blocking occurs even when original trigger (initial syllable vowel) is nonhigh:

  c. [to̲buk-ka] 'knee (dat.)'
  d. [ø̲rys-ter] 'river (pl.)

Yakut Rounding Harmony
(Turkic; Russia; Kaun 1995; Sasa 2001, 2009; Walker 2017)

Within Height

o-o

u-u

Cross Height

o-u

u-o

- Rounding harmony creates:
  - Within-height sequences [o-o] and [u-u]
  - Cross-height sequence [o-u]

- Rounding harmony avoids cross-height sequence [u-o]

Constraints for Yakut Rounding Harmony

Within Height	o-o
	u-u
Cross Height	o-u
	u-o

- *RoLo: *[+round, -high]

- Uniform(round)

- Ident(round)-IO

- Spread(round): For each feature [round] in a word, assign a violation for every vowel that is not associated to that [round].

Harmonic Grammar
(Legendre et al. 1990; Smolensky & Legendre 2006)

- Constraints are weighted rather than strictly ranked

- Cumulative constraint interaction ('gang effect'): violation of two lower weighted constraints outweighs violation of single higher weighted constraint

- Yakut: interaction between constraints *RoLo and Uniform(round)

Constraint Ranking for Yakut Rounding Harmony

	SPREAD(rd) w=6	UNIFORM(rd) w=4	*RoLo w=4	IDENT(rd) w=1	$\mathcal{H}$
Input: /o-a/ a. [o-a]	-1		-1		-10
☞ b. [o-o]			-2	-1	-9
Input: /o-ɯ/ c. [o-ɯ]	-1		-1		-10
☞ d. [o-u]		-1	-1	-1	-9
Input: /u-a/ ☞ e. [u-a]	-1				-6
f. [u-o]		-1	-1	-1	-9
Input: /u-ɯ/ g. [u-ɯ]	-1				-6
☞ h. [u-u]				-1	-1

Arapaho

Cross-Height Harmony in Arapaho
(Algonquian; USA; Cowell & Moss 2008)

- Vowel inventory:

	Front/ Unround	Back/ Round
High	i iː	u uː
Non-high	e eː	o oː

- Two vowel harmony processes (progressive and regressive) affecting backness and rounding

Vowel Harmony in Arapaho
(Cowell & Moss 2008)

Progressive harmony: /i/→[u] after trigger /o/

a. [hoːw-u̱-seː] 'to walk downward'

c.f. [tʃeb-i̱-seː] 'to walk (along)'

b. [nonoːhow-u̱n] 'you see me'

c.f. [beniːn-i̱n] 'you are giving it to me'

c. [bixoːx-u̱] 'love me!'

c.f. [tʃih-biin-i̱] 'give it to me!'

Vowel Harmony in Arapaho
(Cowell & Moss 2008)

Regressive harmony: /e/→[o] before trigger /o/

a. [bo̞ːʔ-oːwu] 'the water flows red'

b. [ho̞ːk-ouni-ʔ] 'it is dammed up']

c. [be̞ːʔ-eː] 'it is red'

d. [he̞tʃ-etiː] 'close your mouth!'

Vowel Harmony in Arapaho
(Cowell & Moss 2008)

Within Height
$\underline{o}$-o

u-u

Cross Height
$\underline{o}$-u

u-$\underline{o}$

- Progressive harmony creates cross-height sequence [o-u]

- Regressive harmony:
  - Creates within-height sequence [o-o]
  - Avoids cross-height sequence [u-o]

- In avoided sequence [u-o], [u] would be derived, not [o]

Vowel Harmony in Arapaho
(Cowell & Moss 2008)

UNIFORM(round) and *ROLO will not rule out /i-o/ → [u-o]:

	SPREAD(rd/bk) w=6	UNIFORM(rd) w=4	*ROLO w=4	IDENT(rd/bk) w=1	$\mathcal{H}$
Input: /e-o/ a. [e-o]	-1		-1		-10
☞ b. [o-o]			-2	-1	-9
Input: /i-o/ ☹ c. [i-o]	-1		-1		-10
☞ d. [u-o]		-1	-1	-1	-9
Input: /o-i/ e. [o-i]	-1		-1		-10
☞ f. [o-u]		-1	-1	-1	-9

Split Gestural Uniformity
(Sasa 2001, 2009)

- Sasa's two Gestural Uniformity constraints:
  - *H-L(round) penalizes [round]-linked [u-o] sequences
  - *L-H(round) penalizes [round]-linked [o-u] sequences

- Constraint *L-H[round] makes undesirable typological predictions, including reversal of cross-height rounding harmony asymmetry (Walker 2017)

Issues with Simple Split Gestural Uniformity

Reversal of cross-height rounding harmony asymmetry:

	*L-H(rd) w=5	SPREAD(rd) w=3	*H-L(rd) w=1	IDENT(rd) w=1	$\mathcal{H}$
Input: /o-a/　　a.　[o-a]		-1			-3
☞ b.　[o-o]				-1	-1
Input: /o-ɯ/　☞ c.　[o-ɯ]		-1			-3
d.　[o-u]	-1			-1	-6
Input: /u-a/　　e.　[u-a]		-1			-3
☞ f.　[u-o]			-1	-1	-2
Input: /u-ɯ/　　g.　[u-ɯ]		-1			-3
☞ h.　[u-u]				-1	-1

Solution: Stringent Gestural Uniformity

Proposal: two Gestural Uniformity constraints in stringent relation (de Lacy 2002)

- *H-L(round) penalizes [round]-linked [u-o]
- UNIFORM(round) penalizes [round]-linked [u-o] and [o-u]

*[round]
u   o

*[round]
V   V
| |
[αhigh]   [βhigh]
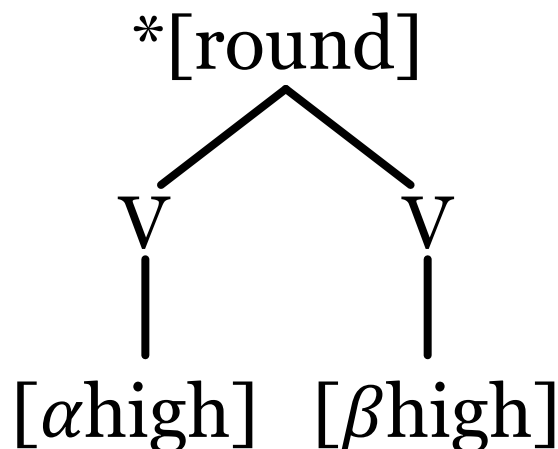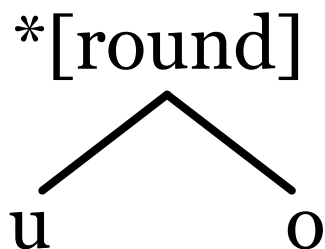
Stringent Gestural Uniformity in Arapaho

Under stringent constraints, [u-o] sequences incur additional penalty and do not surface:

	Spread (rd/bk) w=5	*H-L(rd) w=4	Uniform(rd) w=1	*RoLo w=1	Ident (rd/bk) w=1	$\mathcal{H}$
Input: /e-o/ a. [e-o]	-1			-1		-6
☞ b. [o-o]				-2	-1	-3
Input: /i-o/ ☞ c. [i-o]	-1			-1		-6
d. [u-o]		-1	-1	-1	-1	-7
Input: /o-i/ e. [o-i]	-1			-1		-6
☞ f. [o-u]			-1	-1	-1	-3

Conclusion

Conclusion

- Cross-height rounding asymmetry accounted for by splitting Gestural Uniformity among two stringently defined constraints

- Generates asymmetry for both progressive harmony (e.g., Yakut) and regressive harmony (e.g., Arapaho)

- Avoids pathological predictions of splitting among two mirror-image constraints

Future Work

- Identify additional regressive cross-height rounding harmony systems

- What is the phonetic grounding of the cross-height rounding harmony asymmetry?

- How does the cross-height asymmetry relate to the typology of diphthongs?