Vowel Harmony in Qiang: An Optimality Theoretic Account

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0. Introduction

Qiang is a Tibeto-Burman language spoken by approximately 110,000 people in the mountainous region of northwest Sichuan, China. The data for this analysis comes from a descriptive grammar (LaPolla & Huang, 2003) and an article on the vowel system by (Evans & Huang, 2007) [1]. The Yadu dialect of Qiang has a complex system of vowel harmony in which vowels across morpheme boundaries agree in terms of the features: [low], [back], and [round]. This harmony does not apply to monomorphic lexical items. There is an opacity effect caused by a counterfeeding interaction between [back] and [round] harmony that will require a deviation from classic OT (Prince & Smolensky 1993-2004) and the use of LCC (Smolensky, 1997).

(1) *Vowel Inventory of Yadu*

	front	central	back
high	i, y		u
mid	ɛ	ə	ɔ
low	a		ɑ

(2) *Yadu vowel features adapted from Evans & Huang (2007)*

	i	y	ɛ	a	ə	u	ɔ	ɑ
Back	-	-	-	-	+	+	+	+
Low	-	-	-	+	-	-	-	+
ATR	+	+	-	-	+	+	-	-
Round	-	+	-	-	-	+	+	-

[1] This work on Yadu Vowel harmony is deeply indebted to the work done previously by Jonathan Evans, Huang Chenglong and Randy LaPolla in particular. None of this work would be possible without the research that these people have done on this dialect. All errors in this paper are my own.

1. Back Harmony

The first and most basic of these vowel harmony processes is the [back] harmony process. In (3) below we see examples how vowels can be either fronted or backed in order to agree with the specification for [back] of the root vowel. Note that the vowel in the root does not change in either instance.

(3) *Affix vowels fronted or backed to agree with the root vowel.*

a.	/ɦɑ-waʁ/	[ɦa.'waʁ]
	down-drive	'drive downward'
b.	/a-hɑ/	[ɑ.'hɑ]
	one-bunch	'a bunch'

To capture this process in OT a faithfulness constraint which militates against changing the features of any root vowel, will be used. This constraint will be called ROOT-FAITH (Golston, 1996). The constraint motivating the [back] harmony is an agreement constraint (Baković 2005), AGREE-[back], and the antagonistic faithfulness constraint is ID-[back]. The formal definitions of these constrains are as follows:

(4) ROOT-FAITH: Corresponding root vowels must be identical

AGREE-[back]: Vowels in adjacent syllables must agree with specification for [back]

ID-[back]: Vowels in the input must have the same specification for [back] as in the output.

Because both ROOT-FAITH and AGREE-[back] are never violated by an attested output candidate they will be placed at the top of the hierarchy. ID-[back] is dominated by both these constraints as evidenced by the fact that the winning candidate (a) in tableau (6) violates this constraint in order to satisfy AGREE-[back]. The ranking for these constrains are:

(5) ROOT-FAITH, AGREE-[back] » ID-[back]

(6)

Input: /ɦɑ-waʁ/	ROOT-FAITH	AGREE-[back]	ID-[back]
a. ☞ ɦa.'waʁ			*
b. ɦɑ.'waʁ		*!	
c. ɦɑ.'wɑʁ	*!		*

The tableau above demonstrates this ranking as it shows how the winning candidate satisfies the undominated constraints at the expense of violating the low ranked faithfulness constraint ID-[back].

2. Low Harmony

(7) *[low] agreement*

a. /ɦɑ-pʰu/ [ɦɔ.'pʰu]
down-flee 'flee downward'

b. /a-pɛ/ [ɛ.'pɛ]
one-bowl 'one bowl'

The [low] and [back] harmonies can interact so that a vowel such as /a/ can be backed and raised to [ɔ] in order to agree with the root vowels specifications for [low] and front. This is demonstrated below with the forms for 'push downward' and 'one liter'.

(8) *Interaction of [low] and [back] harmony*

a. /ɦɑ-ɕtɕi/ [ɦɛ.'ɕtɕi]
down-push 'push downward'

b. /a-pu/ [ɔ.'pu]
one-liter 'one liter'

(9) *Conditions for [low] and [back] harmony*

Both [back] and [low] harmony apply in such a way that they do not change the affix's specification for ATR[2].

[2] In Qiang the highest vowels are [+ATR], the lowest vowels are [-ATR], and [ATR] is distinctive for vowels that are neither low nor high.

The constraints that will be used for the [low] harmony are as follows:

(10) *Constraints*

ID-[ATR]: The value of [ATR] for an input segment must be identical in the output correspondent

AGREE-[low]: Vowels in adjacent syllables must agree in specification for [low]

ID-[low]: The value of [low] in an input segment must be identical in the output correspondent

ID-[ATR] is undominated and in the top tier. The fact that AGREE-[low] dominates ID-[low] can be seen from the raising from /ɑ/ to [ɔ] as shown in tableau (12) below. However tableau (13) shows that AGREE-[low] can be violated by a winning candidate. Thus the ranking of these constraints:

(11) *Ranking*

ID-[ATR] » AGREE-[low] » ID-[low]

(12)

Input: /ɦɑ-pʰu/	AGREE-[back]	ID-[ATR]	AGREE-[low]	ID-[back]	ID-[low]
a. ☞ ɦɔ.'pʰu					*
b. ɦɑ.'pʰu			*!		
c. ɦu.'pʰu		*!			*

(13)

Input: /tə-waʁ/	AGREE-[back]	ID-[ATR]	AGREE-[low]	ID-[back]	ID-[low]
a. ☞ ti.'waʁ			*	*	
b. ta.'waʁ		*!		*	*
c. tɛ.waʁ		*!	*	*	
d. tə.'waʁ	*!		*		

Having ID-[ATR] undominated prevents the 'one fell swoop' candidate (c) in tableau (12) and also accounts for the raising of schwa to [i] before /a/ in tableau (13), an otherwise perplexing phenomenon.

So far the all of the constraints can be ranked accordingly:

(14) *Interim constraint hierarchy*

ROOT-FAITH, AGREE-[back], ID-[ATR] » AGREE-[low] » ID-[back], ID-[low]

3. Round Harmony

The rounding harmony in Yadu Qiang is the most interesting of the harmony processes as it involves a derived environment blocking effect. The basic rounding process is shown in the data set below:

(15) *Vowels across syllable boundaries agree in terms of [round]*

a. /ʁwɑk^{h}u-pə/ [ʁwɑ.k^{h}u.pu]
sarcasm-do 'to be sarcastic'

b. /tə-p^{h}u/ [tu.'p^{h}u]
up-flee 'flee upward'

Above it is shown that schwa becomes the [u] as a result of rounding harmony. This data set also illustrates that the harmony occurring is bidirectional and applies to both prefixes and suffixes alike. The constraints used for describing round harmony are as follow:

(16) *Constraints for rounding*

AGREE-[round]: Vowels across syllable boundaries must agree with regards to [round]

ID-[round]: The value of [round] for an input segment must be identical to the output correspondent

The ranking of these two constraints is straightforward; the markedness constraint must dominate the antagonistic faithfulness constraint in order for the process to apply. This is shown in tableau (18)

(17) *Ranking*

AGREE-[round] » ID-[round]

(18)

Input: /tə-pʰu/	AGREE-[round]	ID-[round]
a. ☞ tu.'pʰu		*
b. tə.'pʰu	*!	

With these constraints we would expect that the high front rounded vowel /y/ would also trigger vowel harmony but instead there is an underapplication of this harmony when schwa precedes /y/.

(19) *Underapplication of [round] harmony*

a. /ɕtɕə-tɕy/ [ɕtɕi.'tɕy]
seven-sentences 'seven sentences'

The established ranking hierarchy so far cannot account for this phenomenon as shown below:

(20) *Ranking paradox of this counterfeeding interaction*

Input: /tə-phu/	AGREE-[back]	ID-[ATR]	AGREE-[low]	AGREE-[round]	ID-[back]	ID-[low]	ID-[round]
a. ☞ tu.'phu							*
b. tə.'phu				*!			
c. tɔ.'phu		*!					*

Input: /ɕtɕə.tɕy/	AGREE-[back]	ID-[ATR]	AGREE-[low]	AGREE-[round]	ID-[back]	ID-[low]	ID-[round]
a. ☞ ɕtɕy.'tɕy					*		*
b. ☹ ɕtɕi.'tɕy				*!	*		
c. ɕtɕə.'tɕy	*!			*			

Tableaux (20) and (21) show this ranking paradox. In order of the first input to produce the correct output, agree round must be ranked over id round. This same ranking however selects the incorrect candidate as the winning candidate in for tableau (21). The attested candidate (b) is opaque because it contains an unrounded vowel where a rounded vowel is expected. The transparent candidate (a) wins out over the opaque candidate (b) because (a) does not violate Agree-[round].

This is a counterfeeding interaction because in a rule ordering framework, we would say that backing counter-feeds rounding because it creates an environment in which rounding could apply but it does so too late because rounding has already applied vacuously. Classic OT cannot account for this interaction as demonstrated by the ranking paradox above, however local constraint conjunction provides a straightforward solution to this problem. The LCC that will be used is a conjunction of ID-[back] and ID-[round] with the domain for the constraint being the segment.

(21) *Using Local Constraint Conjunction to solve this problem*

ID-[[back] & [round]]S: One violation is assigned for a candidate that violates both ID-[back] and ID-[round]. The domain for this constraint is the segment.

(22)

Input: /ɕtɕə.tɕy/	ID-[[back] & [round]]S	AGREE-[round]	ID-[back]	ID-[round]
a.☞ ɕtɕi.'tɕy		*	*	
b. ɕtɕy.'tɕy	*!		*	*

The tableau above shows that installing the LCC at the top of the hierarchy eliminates the transparent candidate (b) and allows the attested opaque candidate (a) to win. Note that the LCC and AGREE-[round] are not on the same tier because the LCC is never violated by a winning candidate whereas AGREE-[round] can be violated as in candidate (a) of tableau (13). Lastly, the final ranking of all of the constraints used is given below:

(23) *Final ranking*

AGREE-[back], ID-[ATR], ID [back & round]S
» AGREE-[low], AGREE-[round]
» ID-[back], ID-[low], ID-[round]

4. Further Directions:

Given that /i/→[y]/__y is unattested, it is possible that the fact that /y/ does not cause rounding is not a derived environment blocking effect but instead a grandfather effect militating against new [y] vowels regardless of ID-[back]. If this were true then the best way to capture that generalization would be to use comparative markedness. However, because there are no examples of an affix with an underlying /i/ adjacent to a root with the vowel /y/, this prediction would be making an empirical claim that at this point cannot be justified.

5. Summary:

In conclusion, vowel in Qiang roots are faithful and do not change their segmental features from the input to output. All affix vowels agree with roots in terms of [back]. Throughout the harmony processes, the specification for [ATR] is always preserved in the affix. Affix vowels agree with roots with regards to the feature [low] as allowed by ID-[ATR]. Also, Affix vowels agree with roots in terms of [round]. The counterfeeding interaction of fronting and rounding cannot be accounted for using classic OT, however using a locally conjoined constraint can solve this ranking paradox. One of the advantages to this OT analysis is that it is able to allow for the bi-directionality of these processes without needing to specify the harmony as being regressive or progressive, as would be required using a derivational theoretic framework.

6. References:

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