Headed Spans and Asymmetric Non-Triggers in Vowel Harmony

Sören E. Tebay

Universität Leipzig

26.05.2022

29th Manchester Phonology Meeting

Main Claim

- Asymmetric Non-Triggers (ANTs) pose a problem for standard parallel Optimality Theory.
- This problem can be solved by assuming Headed Spans as representations.

Outline of this Talk

Asymmetric Non-Triggers

- In an asymmetric non-trigger (ANT) pattern, a certain vowel quality is only licit as the result of vowel harmony.
- The same vowel quality cannot occur as a trigger of vowel harmony or in isolation.
- Clements (1984, 1985) describes such an ANT pattern for Akan (Atlantic-Congo, Ghana).

Asymmetric Non-Triggers: Akan Data I

- In Akan vowel harmony, affix vowels assimilate in the feature [ATR] to a root.

(1) Akan regular harmony (Clements, 1985, 62,78)

a. e-bu-o
'nest'

b. ɛ-bʊ-ɔ
'stone'

c. o-be-tu-i
'he came and dug it'

d. ɔ-bɛ-tʊ-ɪ
'he came and threw it'

e. ɔ-kasa-ɪ
'he spoke'

Asymmetric Non-Triggers: Akan Data II

- [ə] can occur as the result of vowel harmony, but not as the trigger or in a root.

(2) Akan vowel inventory (triggers underlined) (Clements, 1985, 57)

		Front	Back
high	+ATR	i	u
	-ATR	ɪ	ʊ
mid	+ATR	e	o
	-ATR	ɛ	ɔ
low	+ATR		ə
	-ATR		a

Asymmetric Non-Triggers: Akan Data III

- [ə] can occur as the result of vowel harmony, (3-a).
- [ə] cannot occur as the trigger of vowel harmony, (3-b).
- [ə] cannot occur in isolation, (3-c).

(3) Distribution of [ə]

a. w-ə-di, *w-a-di
   'he has eaten'

b. *o-kəsə-i

c. kasa, **kəsə
   'to speak'

Asymmetric Non-Triggers: SPOT problem

- Clements (1984, 1985) identifies this as problem for a parallel constraint-based approach, similar to Optimality Theory.
- If a vowel harmony constraint is ranked above a constraint *ə, [ə] can occur both as the trigger and as an undergoer of vowel harmony.
- If the ranking is reversed, [ə] can never occur, even as the result of vowel harmony.

(4) Failure of simple SPOT analysis

I: /ɔ/-/kəsə/-/ɪ/	HARMONY(ATR)	*ə	IDENT(ATR)
a. ɔkəsəɪ	∗!		
☛b. ɔkəsəi		∗	∗
✌c. ɔkasaɪ	∗!		∗

Asymmetric Non-Triggers: Typology

- This pattern is not an isolated case.
- A close inspection of cases reported in Casali (2003); van der Hulst (2018); Rolle et al. (2020) and similar works, reveals 56 languages with an ANT pattern in vowel harmony.

(5) Crosslinguistic distribution of ANT types

ANTs	Harmonizing Feature	# of languages
e,o	[+ATR]	26
a̟	[+ATR]	10
ɪ,ʊ	[-ATR]	6
e,o,a̟	[+ATR]	5
ɪ̟,ʊ̟	[+raised]	3
Others		6
Total		56

ANTs in Assamese: Data I

- A further ANT pattern is reported and analyzed for Assamese (Indo-European, India) by Mahanta (2008).
- In Assamese dominant-recessive regressive [+ATR] harmony, non-low [-ATR] vowels assimilate to a following [+ATR] vowel in the feature [+ATR].

(6) Right-to-Left [+ATR] harmony in Assamese (Mahanta 2008, 7,91,94, Mahanta 2012, 1112)

a.	/gʊl/-/i/	→	[guli]	'to mix'
b.	/pʰur/-/ʊ/	→	[pʰurʊ]	'travel, roam (1.PRS)'
d.	/bʰut/-/ɛ/	→	[bʰutɛ]	'ghost (ERG)'
d.	/pʊr/-/ɛ/	→	[pʊrɛ]	'fall (3.PRS)'
e.	/kɔr/	→	[kɔr]	'do '

ANTs in Assamese: Data II

- [e] and [o] are ANTs.

(7) Assamese vowel inventory (Mahanta, 2008, 58) (triggers underlined)

		Front	Back
high	+ATR	i̲	u̲
	-ATR		↑ ʊ
mid	+ATR	e	o
	-ATR	↑ ɛ	↑ ɔ
low			ɑ

ANTs in Assamese: Data III

- [e o] can occur as the result of vowel harmony, (8-a).
- [e o] cannot occur as the trigger in affixes (8-b,c) or in isolated roots (8-d).

(8) Right-to-Left [+ATR] harmony in Assamese
(Mahanta 2008, 7,91,94, Mahanta 2012, 1112)

a.	/pɛt/-/u/	→	[petu]	'pot bellied'
b.	/kɔr/-*/o/	→	*[koro]	
c.	/pʊr/-*/e/	→	*[pure]	
d.	*/kor/	→	*[kor]	

ANTs in Assamese: SPOT problem

- This is again a problem for standard parallel OT.
- ANTs cannot be banned in general.
- They can also not be allowed in all vowel harmony contexts.

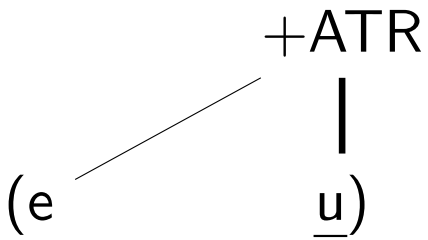
(9) Failure of simple SPOT analysis

I: /kɔr/-/o/	HARMONY(ATR)	*e,o	IDENT(ATR)
a. kɔro	*!		
☛b. koro		*	*
✌c. kɔrɔ	*!		*

Headed Spans Analysis: Background I

- Headed Spans Theory was originally proposed to solve the Sour Grapes problem in Optimality Theory (McCarthy, 2004).
- All segments connected to one and the same feature form a span.
- This span has to include exactly one head.

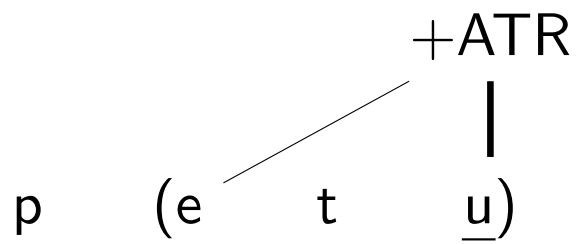
(10) Headed Spans

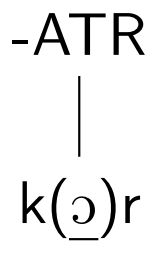


Headed Spans Analysis: Background II

- In vowel harmony, the head of an output span is the trigger, (11-a).
- In simple spans, the only segment is automatically the head, (11-b).
- I notate the head with a thick association line an underlined segment.

(11) Simple and complex headed spans

a.


b.


Headed Spans Analysis: Constraints on Heads I

- Headed Spans Theory allows for constraints on the feature specification of heads of certain feature spans.
- Banning [e o] from the head position of a [+ATR] span allows for [e o] acting as non-triggers.

(12) *SpanHead(e,o)(+ATR) (=*SH(eo))
Count one violation for every [+ATR] span that is headed by a [-high,-low] vowel.

Headed Spans Analysis: Constraints on Heads II

(13) [+ATR] mid vowels as non-triggers because of head markedness

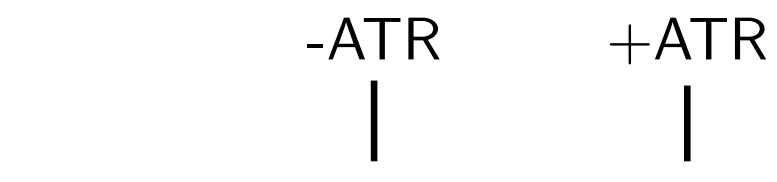
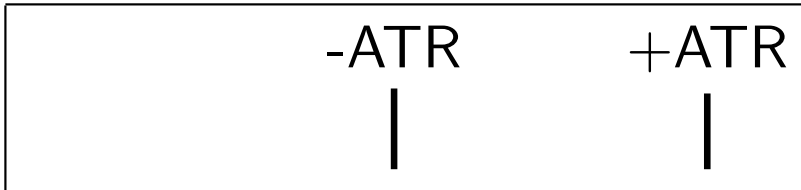
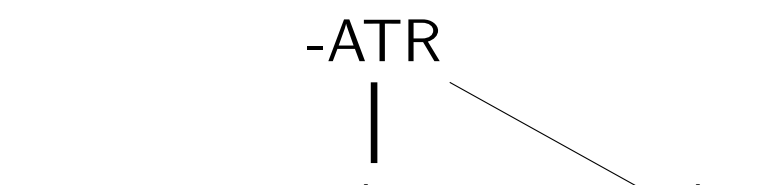
		*SH(eo)	Harmony	Faith
I:	p (-ATR: (ʊ̲)) r (+ATR: (e̲))			
a.	p (-ATR: (ʊ̲)) r (+ATR: (e̲))	*!	*	
☞b.	p (ʊ r -ATR: ɛ̲)		*	**
c.	p (u r +ATR: e̲)	*!		*

Headed Spans Analysis: Constraints on Heads III

- The same constraint still allows [e o] as undergoers of vowel harmony.
- In such a context, [e o] occur as non-heads.
- The constraint *SH(eo) is not violated.

Headed Spans Analysis: Constraints on Heads IV

(14) Derived [+ATR] mid vowels in Assamese as non-heads

		*SH(eo)	HARMONY	FAITH
I:				
a.			*!	
☞b.				*
c.			*!	**

Headed Spans Analysis: Constraints on Heads V

- In an isolated root, a single vowel is necessarily the head of a [+ATR] span.
- Therefore, *SH(eo) also bans [e o] from this position.

Headed Spans Analysis: Constraints on Heads VI

(15) No [+ATR] mid vowels in isolated roots due to head markedness

	+ATR | k(o̲)r	*SH(eo)	HARMONY	FAITH
I:				
a.	+ATR | k(o̲)r	*!		*
☞b.	-ATR | k(ɔ̲)r			*

Headed Spans Analysis: Summary

- In sum, Headed Spans Theory allows for an asymmetric representation of vowel harmony as feature spans.
- A constraint on span heads allows banning ANTs from triggering vowel harmony.

Alternative Approaches

- Previous approaches on ANTs were either based on a serial architecture of grammar (Clements, 1984, 1985; Trommer, 2011) or complex faithfulness constraints (Mahanta, 2008, 2012).
- I provide a conceptual argument that neither approach can uphold Richness of the Base (Prince & Smolensky, 1993) and Output-Drivenness (Tesar, 2013).

(16) Richness of the Base
There are no language-specific constraint on the input.

(17) Output Drivenness (Tesar, 2013, 13)
A phonological map is output-driven if, for any mapping from an input to an output, any other input that has greater similarity to the output also maps to the same output.

Alternative Approaches: Serial Accounts

- Serial approaches have been based on explicit constraint on underlying representations (Clements 1984, 1985 for Akan) or a root stratum/pre-optimization (Trommer 2011 for Päri).
- The basic logic always bans ANTs from the input of phonology proper and later on derives ANTs by the application of vowel harmony.
- This means that ANTs are excluded on a language-specific basis before any other phonological or morphological operation takes place.
- Therefore, serial approaches cannot uphold Richness of the Base.

Alternative Approaches: Complex Faithfulness

- Mahanta (2008, 2012) suggests an account for Assamese based on a complex faithfulness constraint $\textsc{Ident}(\text{ATR})_{+\text{high}}$, which protects the ATR value of high vowels.
- Triggers are thus especially protected, but non-triggers can be neutralized to [-ATR] mid vowels unless they need to fulfill vowel harmony requirements.
- Such complex faithfulness constraints predict non-output-driven patterns, which might pose problems for learnability (Tesar, 2013).

Discussion

- Asymmetric Non-Triggers seem to be mostly be restricted to the following vowels [ɐ̟ e o ɪ ʊ].

(18) Crosslinguistic distribution of ANT types

ANTs	Harmonizing Feature	# of languages
e,o	[+ATR]	26
ɐ̟	[+ATR]	10
ɪ,ʊ	[-ATR]	6
e,o,ɐ̟	[+ATR]	5
ɪ̟,ʊ̟	[+raised]	3
Others		6
Total		56

- These vowels have been independently argued to be articulatory marked (Archangeli & Pulleyblank, 1994).
- Constraints on span heads might be interpreted as markedness constraints relativized to head positions.

Conclusion

- Asymmetric Non-Triggers pose a challenge to standard parallel OT.
- Headed Spans Theory provides a solution to this problem.
- Alternative approaches cannot uphold Richness of the Base or Output-Drivenness.

References I

Archangeli, Diana & Douglas Pulleyblank. 1994. *Grounded phonology*. Cambridge, MA: MIT Press.

Casali, Roderic F. 2003. ATR value asymmetries and underlying vowel inventory structure in Niger-Congo and Nilo-Saharan. *Linguistic Typology* 7(3). 307–382.

Clements, George. 1984. Vowel harmony in Akan: A consideration of Stewart's word structure conditions. *Studies in African Linguistics* 15(3). 321–338.

Clements, George. 1985. Akan vowel harmony: a nonlinear analysis. In Didier L. Goyvaerts (ed.), *African linguistics: Essays in memory of M.W.K. Semikenke*, 55–98. Amsterdam: John Benjamins.

van der Hulst, Harry. 2018. *Asymmetries in vowel harmony: A representational account*. Oxford: Oxford University Press.

References II

Kaplan, Aaron. 2011. Harmonic improvement without candidate chains in Chamorro. *Linguistic Inquiry* 42(4). 631–650.

Kavitskaya, Darya & Peter Staroverov. 2010. When an interaction is both opaque and transparent: the paradox of fed counterfeeding. *Phonology* 27(2). 255–288.

Mahanta, Shakuntala. 2008. *Directionality and locality in vowel harmony: With special reference to vowel harmony in Assamese*. Utrecht: Utrecht Institute of Linguistics dissertation.

Mahanta, Shakuntala. 2012. Locality in exceptions and derived environments in vowel harmony. *Natural Language & Linguistic Theory* 30(4). 1109–1146.

McCarthy, John J. 2002. Comparative markedness (long version). *Linguistics Department Faculty Publication Series* 30.

McCarthy, John J. 2004. Headed spans and autosegmental spreading. *Linguistics Department Faculty Publication Series* 42.

References III

Prince, Alan & Paul Smolensky. 1993. Optimality Theory: Constraint interaction in generative grammar. Available online at `http://roa.rutgers.edu/files/537-0802/537-0802-PRINCE-0-0.PDF`.

Rolle, Nicholas, Florian Lionnet & Matthew Faytak. 2020. Areal patterns in the vowel systems of the Macro-Sudan Belt. *Linguistic Typology* 24(1). 113–179.

Tesar, Bruce. 2013. *Output-driven phonology: Theory and learning*. Cambridge: Cambridge University Press.

Trommer, Jochen. 2011. Phonological aspects of Western Nilotic mutation morphology. Habilitation.

Walker, Rachel. 2005. Weak triggers in vowel harmony. *Natural Language & Linguistic Theory* 23(4). 917–989.

Vowel Harmony Constraints

- The constraint responsible for vowel harmony restrictions is not crucial for the argument.
- For a SPOT-Analysis, splitting the vowel harmony constraint into constraints for harmony, directionality, and dominance does not allow for exclusion of ANTs from being triggers.
- For the sake of concreteness, the following constraints are assumed in the headed spans analysis.

(19) Further constraints on Assamese vowel harmony

a. *AdjacentSpans(ATR)
Count one violation for each pair of adjacent [±ATR] spans.

b. SpanHead-Right(+ATR)
Count one violation for an every [+ATR] span that is not headed by its final segment.

c. FaithfulnessHeadSpan(+ATR)
Count one violation for a segment that is the head of a [+ATR]-Span in the input but not in the output.

LICENSE-based approaches

- Mahanta (2012) hints at a LICENSE-based account (Walker, 2005; Kaplan, 2011) of some vowel harmony facts in Assamese.
- A local licensing approach cannot be empirically adequate here, since forms such as (20), require non-local licensing.
- If the licensing constraint is based on association to feature spans, it becomes very similar to a headed spans approach.

(20) /kɛtɛr/-/ijɑ/ → [keterija] 'peevish'

Stem-Level Neutralization

- A different approach would neutralize [e o] with [ɛ ɔ] at the stem level.
- Vowel harmony would then apply at the word level.
- Assamese, however, also possesses a set of prefixes which do not undergo all processes related to vowel harmony.
- In prefixes, the same restrictions on [e o] hold.
- This means that some vowel harmony related processes have to apply to a domain smaller than the word, i.e. at the stem level.

Opaqueness and Derived-Environment Effects

- ANTs instantiate an opaque pattern of (fed) counterfeeding in a serial framework (cf. Kavitskaya & Staroverov, 2010).
- Vowel harmony would feed the ban on [e o] if the order of processes where reversed.
- ANTs are not a case of derived environment effects/grandfather effects (DEE) because no process or constraint can be said to apply only in derived environments.
- Instead, certain segments are only allowed if derived, which cannot be analyzed with standard OT devices for DEE like comparative markedness (McCarthy, 2002).