Use It or Lose It Harmony in Komo

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1 Introduction

In Optimality Theory, a number of different repair strategies can be predicted through the interaction of basic markedness and faithfulness constraints. This property of OT allows for an elegant account of certain patterns, such as syllabification in Imdlawn Tashlhiyt Berber (Prince & Smolensky 1993) or the *NC̥ typology (Pater 1999). This same feature of OT, however, is also one of its most well-discussed weaknesses – the too-many-solutions problem (Steriade 2001). For example, Bakovic (2000) discusses the fact that the harmony-inducing constraint AGREE may be satisfied by either assimilation to the active feature value or by assimilation to the recessive feature value, which he labels "dominance reversal". More recent work on dominance reversal has often assumed that, in such cases, both feature values are active (Kutsch Lojenga 2008; Otero 2015; cf. Casali 2008 for discussion). In this paper we discuss a case of putative dominance reversal described in Otero (2015, 2018), which we analyze as a related, but distinct, repair strategy called "Use it or Lose it" (Mullin & Pater 2015). Mullin & Pater (2015) argue that Use it or Lose it harmony is a pathological prediction of AGREE for the same basic reason that "Sour Grapes" harmony (Wilson 2003, 2006; Heinz & Lai 2013) has been regarded as pathological – in both Use it or Lose it and Sour Grapes harmony patterns, the realization of some element, trigger or target, depends on non-local downstream information. In other words, both of these patterns are non-myopic (Wilson 2003, 2006). Wilson argues that unbounded spreading patterns are universally myopic, and as such, no theory should predict that the realization of some element in spreading – trigger or target – depends on downstream information.

However, recent research has shown that some patterns in natural languages are, in fact, non-myopic. For example, the surface [ATR] value for prefixal low vowels in Tutrugbu depends on both the [ATR] value of the root as well as the quality of the downstream word-initial prefix (McCollum & Essegbey 2018, 2020). Similarly, in Liko (de Wit 2015; McCollum et al. 2020) the surface quality of suffixal low vowels depends on the presence or absence of a [-ATR] blocking enclitic. Though not identical to Wilson's original conception of Sour Grapes, this class of patterns indicates that the predictions of AGREE are not as problematic as previously thought.

Use it or Lose it and Sour Grapes harmonies are fundamentally similar, differing only in the ranking of the constraint that privileges triggers, FAITH$_{\text{TRIGGER}}$, which is seen in (1-2). In a Sour Grapes pattern (1), FAITH$_{\text{TRIGGER}}$ is ranked highest, above a blocking and AGREE constraint. In Use it or Lose it (2), FAITH$_{\text{TRIGGER}}$ is ranked below AGREE and the Blocking constraint.

(1) FAITH$_{\text{TRIGGER R}}$ >> Blocking Constraint >> AGREE >> FAITH$_{\text{TARGET}}$

(2) Blocking Constraint >> AGREE >> FAITH$_{\text{TRIGGER}}$ >> FAITH$_{\text{TARGET}}$

These rankings are illustrated below through a toy ATR harmony pattern where regressive [+ATR] harmony is triggered by high vowels and blocked by low vowels. In (3-4) we consider the outcomes of Sour Grapes harmony. In (3), so long as no blocking low vowel is present, trigger /i/ spreads [+ATR] leftward throughout the word. However, in (4) the faithful candidate harmonically bounds the partial harmony candidate.

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In Use it or Lose it harmony, we see the same iterative assimilation of preceding mid vowels in (5) since no blocker is present. In (6) with the blocking low vowel, the trigger is effaced, losing its underlying [+ATR] value to satisfy AGREE. To sum up the difference between these two patterns, in Use it or Lose it harmony, blocking vowels induce trigger effacement to satisfy AGREE while in Sour Grapes harmony this repair is blocked by a highly-ranked faithfulness constraint, resulting in a faithful input-output mapping when blockers are present.

(3) Sour Grapes: No Blocker

/ɛ...ɛ...i/	FAITH[+ATR]	*ə	AGREE	FAITH[-ATR]	
☛ (a) e...e...i				**	*Full harmony*
(b) ɛ...ɛ...i			[ɛ...i]!		*Faithful cand.*
(c) ɛ...ɛ...ɪ	*!				*Trigger effaced*
(d) ɛ...e...i			[ɛ..e]!	*	*Partial harmony*

(4) Sour Grapes: Blocker present

/a...ɛ...i/	FAITH[+ATR]	*ə	AGREE	FAITH[-ATR]	
(a) ə...e...i		*!			*Full harmony*
☛ (b) a...ɛ...i			[ɛ...i]		*Faithful cand.*
(c) a...ɛ...ɪ	*!				*Trigger effaced*
(d) a...e...i			[a...e]	*!	*Partial harmony*

(5) Use it or Lose it: No Blocker

/ɛ...ɛ...i/	*ə	AGREE	FAITH[+ATR]	FAITH[-ATR]	
☛ (a) e...e...i				**	*Full harmony*
(b) ɛ...ɛ...i		[ɛ...i]!			*Faithful cand.*
(c) ɛ...ɛ...ɪ			*!		*Trigger effaced*
(d) ɛ...e...i		[ɛ...e]!		*	*Partial harmony*

(6) Use it or Lose it: Blocker present

/a...ɛ...i/	*ə	AGREE	FAITH[+ATR]	FAITH[-ATR]	
(a) ə...e...i	*!			**	*Full harmony*
(b) a...ɛ...i		[ɛ...i]!			*Faithful cand.*
☛ (c) a...ɛ...ɪ			*		*Trigger effaced*
(d) a...e...i		[a...e]!	*		*Partial harmony*

Although the existence of Sour Grapes-like patterns has already been discovered in natural languages (McCollum et al. 2020), Use it or Lose it patterns have not been described in previous literature. This paper argues that the best analysis of Komo ATR harmony derives progressive [-ATR] spreading from trigger effacement. As such, we contend that all semblances of [-ATR] harmony in Komo are emergent manifestations of the multiple ways an AGREE constraint may be satisfied.

The paper is organized as follows. In Section 2, we present the Komo language and its harmony system, before presenting our analysis of Komo in Section 3. In Section 3 we also demonstrate why trigger effacement is superior to an analysis predicated on both [+ATR] and [-ATR] spreading. We conclude the paper in Section 4.

2 Komo vowel harmony

Komo (Nilo-Saharan; Otero 2015, 2018; Olejarczuk *et al.* 2019) possesses 7 contrastive vowels /i ɪ u ʊ ɛ ɔ a/ and three non-contrastive vowels [e o ə]. The language exhibits leftward ATR harmony, which is triggered by high vowels only and targets non-high vowels only. Harmony is evident in alternations across morpheme boundaries (7a-d) and as a co-occurrence restriction within roots (7e,f). Furthermore, [+ATR] spreading is strictly leftward, and never rightward (7g, h).

(7)

	UR	SR	Gloss		UR	SR	Gloss
a.	/ham-a/	[hama]	yawn-1S	e.	/bɛzi/	[bezi]	be thin
b.	/ham-uk/	[həmuk]	yawn-PFV	f.	/gɔdum/	[godum]	sow
c.	/kɛʃ-i/	[keʃi]	thresh-2S	g.	/kɔg-i-r-ɛ/	[kogirɛ]	fear-ITV-3S-2S
d.	/dɔt'-uk/	[dot'uk]	squat-PFV	h.	/zɛbɛ-i/	[zɛbei]	enjoy-2S

When a [+HI, + ATR] vowel is preceded by a [+HI, - ATR] vowel, [+ATR] does not spread. In this context, the trigger loses its [+ATR] feature value, surfacing as [-ATR] (8). Observe in (8d) that only the final [+ATR] vowel is effaced; preceding [+ATR] vowels are unaffected. In other words, only preceding [+HI, -ATR] vowels induce trigger effacement.

(8)

	UR	SR	Gloss		UR	SR	Gloss
a.	/ʃɪt-i/	[ʃɪtɪ]	whistle-2S	e.	/mʊt-ir/	[mʊtɪr]	dig-3S
b.	/dɪl-uk/	[dɪlʊk]	stamp-PFV	f.	/kiʃ-ʊ-i/	[kiʃʊɪ]	harvest-VENT-2S

Finally, trigger effacement only affects sequences of high vowels; when a non-high vowel intervenes between two high vowels, the [+HI, +ATR] vowel retains its [+ATR] value and spreads it to the preceding non-high vowel. The [+HI, -ATR] vowel surfaces faithfully.

(9)

/t'ɪt'a-i/ [t'ɪt'əi] thin-2

To summarize, Komo has seven phonemic vowels, with only high vowels having an underlying ATR contrast. There is a process of ATR harmony where a [+ATR] vowel will cause a preceding non high vowel to surface as [+ATR] but leaves high [-ATR] vowels unaffected. When high vowels /i u/ are directly preceded by their [-ATR] counterpart, they will lose their ATR value and surface as [ɪ ʊ] respectively. In the next section, we will see that this behavior in the high vowels resolves violations on the harmony-driving markedness constraint.

3 Analysis

In this section, we present our analysis of Komo harmony as Use it or Lose it, before comparing an alternative analysis which assumes progressive [-A**TR**] harmony rather than trigger effacement.

3.1 *Trigger Effacement* We have claimed that in Komo only the feature [+ATR] is active, and the apparent spread of [-ATR] in the high vowels is a result of Use It or Lose It. To further that explicit reference to [-ATR] is unnecessary, we employ privative [ATR] in our analysis. If reference to [-ATR] is extraneous, then a fortiori [-ATR] must not be in any sense active in the language.

We induce regressive ATR harmony through a high-ranked sequential markedness constraint *VC$_0$[HI, ATR], defined in (10), which outranks MAX-LINK[ATR] and DEP-LINK[ATR].

(10) *VC$_0$[HI, ATR]: Assign a violation for every vowel which does not share the same [ATR] feature as a following [HI, ATR] vowel.

The full harmony candidate in (11) is preferred over the faithful candidate due to*VC$_0$[HI, ATR] >> DEP-LINK[ATR]. The full harmony candidate is preferred over the trigger effacement candidate due to *VC$_0$[HI, ATR] >> MAX-LINK[ATR]. Throughout ATR harmony spans are indicated with parentheses.

(11) Regressive harmony

/ham-(u)k/	*VC$_0$[HI, ATR]	MAX-LINK[ATR]	DEP-LINK[ATR]	
☛ (a) h(əmu)k			*	*Full harmony*
(b) ham(u)k	[a...u]!			*Faithful cand.*
(c) hamʊk		*!		*Trigger effaced*

The apparent non-iterativity in (12) is derivable directly from the markedness constraint that motivates harmony. Since the constraint refers specifically to [HI, ATR] vowels, derived mid ATR vowels are exempt from the spreading imperative.

(12) Emergent non-iterative harmony

/zɛbɛ-(i)	*VC$_0$[HI, ATR]	MAX-LINK[ATR]	DEP-LINK[ATR]	
(a) z(ebei)			**!	*Full harmony*
(b) zɛbɛ(i)	[ɛ...i]!			*Faithful cand.*
(c) zɛbɛɪ		*!		*Trigger effaced*
☛ (d) zɛb(ei)			*	*Partial harmony*

To account for the non-participation of /ɪ ʊ/ we introduce the constraint DEP-LINK[ATR]/[HI], defined in (13), which must crucially outrank the harmony driving constraint *VC$_0$[HI, ATR].

(13) DEP-LINK[ATR]/[HI]: if a vowel is [HI] in the input, assign a violation if it is associated with [ATR] in the output, but not in the input.

This ranking predicts that [ATR] spreading cannot occur onto high non-ATR vowels, leaving trigger effacement as the optimal way to repair potential violations to the harmony-driving constraint in (14). Due to space constraints, we abbreviate constraint names in the tableaux below.

(14) Use It or Lose It

/jɪl-(i)r/	DEP-LINK[HI]	*VC$_0$[HI, ATR]	MAX-LINK	DEP-LINK	
(a) j(ilir)	*!			*	*Full harmony*
(b) jɪl(i)r		[ɪ...i]!			*Faithful cand.*
☛ (c) jɪlɪr			*		*Trigger effaced*

Additionally, the directionality of *VC$_0$[HI, ATR] specifies that only vowels preceding a high ATR vowel will incur violations on this constraint. Thus a sequence like [i...ʊ] will not violate the harmony-driving constraint. Repairing this structure to either [i...u] (15a) or [ɪ...ʊ] (15d) will incur gratuitous violations of DEP-LINK[ATR] and MAX-LINK[ATR] respectively.

(15)

/k(i)ʃʊ-(i)/	DEP-LINK[HI]	*VC$_0$[HI,ATR]	MAX-LINK	DEP-LINK	
(a) k(iʃui)	*!			*	*Full harmony*
(b) k(i)ʃʊ-(i)		[ʊ...i]!			*Faithful cand.*
☛ (c) k(i)ʃʊɪ			*		*Trigger effaced*
(d) kɪʃʊɪ			**!		*Bidirectionally triggers effaced*

The iterative nature of trigger effacement in (16) is accounted for under the present constraint ranking; no amendments are necessary to capture this fact from Komo. Since effacement of one trigger in these instances creates another potential violation of the harmony-driver, iterative trigger effacement falls out nicely without further elaboration of CON.

(16)

/ʃɪt-(uk-u)n/	DEP-LINK[HI]	*VC$_0$[HI, ATR]	MAX-LINK	DEP-LINK	
a. ʃ(itukun)	*!			*	*Full harmony*
b. ʃɪt(ukun)		[ɪ...u]!			*Faithful cand.*
☛ c. ʃɪtʊkʊn			**		*Trigger effaced*
d. ʃɪtʊk(u)n		[ʊ...u]!	*		*Partial. Trigger effaced*

Finally, in a situation where a non-high vowel intervenes between two high vowels, partial leftward ATR harmony (17d) is preferred over trigger effacement due to MAX-LINK[ATR] >> DEP-LINK[ATR]. Assimilation of a non-high vowel to [ATR] satisfies the harmony-driver while avoiding any violations of MAX-LINK[ATR].

(17)

/t'ɪt'a-(i)/	DEP-LINK[HI]	*VC$_0$[HI, ATR]	MAX-LINK	DEP-LINK	
a. t'(it'əi)	*!			**	*Full harmony*
b. t'ɪt'a(i)		[a...i]!			*Faithful cand.*
c. t'ɪt'aɪ			*!		*Trigger effaced*
☛ d. t'ɪt'(əi)				*	*Partial Harmony*

In summary, we have laid out an analysis of Komo built entirely on the activity of [ATR] without any crucial reference to [-ATR] as a potential feature value. The choice of privative feature values throughout was largely rhetorical, to demonstrate that the Komo pattern is derivable without referencing active [-ATR]. ATR harmony in Komo is non-myopic under our analysis because the realization of potential [HI, ATR] triggers depends on the presence or absence of a blocking vowel further leftward in the word. In this regard, the Komo pattern is unique from other non-myopic harmonies discovered to-date, which all exhibit target-related lookahead. In Komo, the surface quality of targets is not at issue, rather, the surface quality of triggers crucially depends on downstream information. In Section 3.2 below we lay out an alternative analysis where [-ATR] is participatory as a progressive, parasitic form of harmony spreading only between sequences of high vowels.

3.2 *Alternative Analysis* In this section, we will consider an analysis where both features are active in Komo and can act as triggers for harmony. We adopt Jurgec's (2011) metrical theory of feature spreading, which relies on directional alignment constraints as well as constraints regulating which elements may head a metrical domain (see also De Lacy 2006). Jurgec (2011) argues that spreading is binary, and that the grammar only generates binary domains for evaluation. These binary domains may overlap (Hyde 2002), and we will indicate [+ATR] domains with (overlapping) parentheses, and [-ATR] domains with (overlapping) square brackets. In addition to two very general alignment constraints, ALIGN-L[+ATR] and ALIGN-R[-ATR], and the battery of faithfulness constraints already introduced, we employ the following constraint on metrical heads (18).

(18) *HEAD[±ATR, -HI]: assign a violation to every [-HI] vowel that is head of a [±ATR] domain.

If *Head is highly ranked, then the emergent non-iterativity of leftward [+ATR] is accounted for, as seen in (19). Essentially, leftward spreading is licit so long as it does not result in a [-HI] head of a [+ATR] domain.

(19)

/z[ɛbɛ]-(i)/	*HD [±ATR, - HI]	ALIGN-L [+ATR]	MAX [+ATR]	ALIGN-R [-ATR]	DEP [+ATR]	
(a) [zɛ[bɛ]ɪ]	*!*		*			*Trigger effaced*
(b) (zeb(e)i)	*!				**	*Full harmony*
(c) zɛbɛ(i)		**!		*		*Faithful cand.*
☛ (d) zɛ(bei)		*		**	*	*Partial Harmony*

The tableau below (20) demonstrates that leftward spreading is also curtailed by the same faithfulness constraint discussed in our analysis, DEP-LINK[+ATR]/[HI], though we need to explicitly reference [+ATR] and [+HI] rather than [ATR] and [HI] here since this alternative analysis assumes equipollent features. Observe that trigger effacement in (20) is not derived from the ranking of ALIGN-R[-ATR]. In other words, it is not the active propagation of [-ATR] leftward motivated by this alignment constraint that results in the mapping from input /i/ to [ɪ]. Rather, the loss of [+ATR] on this potential trigger falls out from the ranking of DEP-LINK[+ATR]/[+HI], ALIGN-L[+ATR] >> MAX[+ATR].

(20)

/jɪl-(i)r/	DEP-LINK [+ATR]/[+HI]	ALIGN-L [+ATR]	MAX [+ATR]	ALIGN-R [-ATR]	DEP [+ATR]	
(a) (jilir)	*!				*	*Full harmony*
(b) j[ɪ]l(i)r		*!		*		*Faithful cand.*
☛ (c) [jɪlɪr]			*			*Trigger effaced*

Again, (21) illustrates that the apparent rightward spreading of [-ATR] in the alternative never depends on the ranking of ALIGN-R[-ATR]. There is no markedness constraint motivating rightward spreading here. Instead, the mapping from /u/ to [ʊ] for both non-initial vowels in (21) is a byproduct of the interaction of DEP-LINK[+ATR]/[+ HI] and ALIGN-L[+ATR].

(21)

/ʃ[ɪ]t-(uk-u)n/	DEP-LINK [+ATR]/[+HI]	ALIGN-L [+ATR]	MAX [+ATR]	ALIGN-R [-ATR]	DEP [+ATR]	
(a) (ʃitukun)	*!				*	*Full harmony*
(b) ʃ[ɪ]t(ukun)		*!		**		*Faithful cand.*
(c) [ʃɪtʊ]kun		*!*	*	*		*1 Trigger effaced*
☛ (d) [ʃɪt[ʊ]kʊn]			**			*Triggers effaced*

Finally, partial spreading of [+ATR] in the presence of a [+HI, -ATR] vowel in (22) supports the conclusion that all rightward spreading is emergent. Leftward [+ATR] spreading and trigger effacement are both ways to satisfy the markedness constraint ALIGN-L[+ATR]. Alignment constraints may be satisfied by active spreading, but also by feature dislocation (McCarthy 2002; Sasa 2009), or as seen here, by trigger effacement.

(22)

/t'[ɪt'a]-(i)/	*HD [±ATR, -HI]	ALIGN-L [+ATR]	MAX [+ATR]	ALIGN-R [-ATR]	DEP [+ATR]	
(a) [t'ɪt'[a]ɪ]	*!		*			*Trigger effaced*
(b) (t'it'(ə)i)	*!				**	*Full harmony*
(c) [t'ɪt'a](i)		**!		*		*Faithful cand.*
☛ (d) [t'ɪ](t'əi)		*		**	*	*Partial Harmony*

To summarize, in this alternative analysis of Komo harmony, we assumed that there were two harmony processes: a regressive, local pattern where [+ATR] spread from a high vowel onto a preceding non-high vowel, and a progressive spread of [-ATR] spreading from a high vowel and only affecting high vowels. Significantly, the constraint motivating rightward spread of [-ATR] is not active in the analysis, and loss of input [+ATR] values for high vowels emerges from the interaction of other higher ranked constraints. Even an equipollent analysis couched in OT treats [-ATR] spreading as a byproduct of leftward [+ATR] spreading modeled via featural alignment. Thus, our claim is not that no other set of constraints can generate the pattern, but rather that a variety of constraints can, and they induce a pattern that crucially does not rely on the activity of [-ATR]. To restate our claim, leftward [+ATR] spreading and rightward [-ATR] spreading are not distinct, but allo-harmonies of a single underlying harmonic imperative.

3.3 *Discussion* When comparing our proposed analysis with the alignment-based alternative there is one key issue. The alignment-based analysis suggests that both feature values are active, though there is no independent evidence supporting the activity of [-ATR] in Komo. Further, despite this commitment, an alternative like the one sketched above using featural alignment actually induces apparent [-ATR] harmony from the interaction of decidedly different constraints. In addition to these language-internal pieces of evidence, Casali (2003, 2008) argues that [+ATR] is typically dominant in languages with contrastive ATR for the high vowels, as in Komo. Thus, from a typological point of view we expect [+ATR] activity – and not [-ATR] activity – based on the inventory structure of Komo.

Additionally, in some cases where clear [-ATR] activity is attested, e.g., Turkana (Dimmendaal 1983; Bakovic 2000), the alternations themselves support the existence of both [+ATR] and [-ATR] activity. For instance, in Turkana, stem-outward [+ATR] spreading maps underlyingly /a/ to his harmonic counterpart, |o|. This derived mid vowel is then subject to [-ATR] spreading from dominant [-ATR] prefixes, which output [ɔ]. As noted in Dimmendaal (1983) and Bakovic (2000), the only plausible pathway for deriving output [ɔ] from input /a/ is via both [+ATR] and [-ATR] harmony. No comparable interactions are found in Komo. In other languages where [-ATR] dominance is observed, it introduces new mappings into the phonology. If both [+ATR] and [-ATR] are active in Komo, then the complementarity between the two harmonies is conspicuous. The only triggers for [-ATR] harmony, /ɪ ʊ/, are the only blockers for ATR harmony, and the only targets for [-ATR] harmony /i u/ are the only triggers for ATR harmony. This complementarity in and of itself, ignoring evidence from typology and the internal structure of alternations, suggests that what Otero (2015, 2018) treats as two harmony patterns are allo-harmonies, two superficial patterns that emerge from a single harmonic imperative.

4 Conclusion

Although Wilson (2003) argues that unbounded harmony is universally myopic, more recent work has shown the existence of various non-myopic patterns. Previously attested cases of non-myopic spreading require lookahead to correctly output potential targets of harmony. In Komo, though, we see that lookahead is necessary to correctly output the triggers of harmony, /i u/. When preceded by a potential blocker, even when that blocker is separated by another syllable containing a high vowel, these vowels are output as [ɪ ʊ]. When preceded by a non-high vowel or by a word boundary, though, these triggering [+ATR] features are preserved. Use It or Lose It is another type of non-myopic pattern thought to be pathological. However, the Komo language showed that such patterns are attested in natural languages.

Wilson's argument for phonological patterns to be strictly myopic is sensible, as myopic things are computationally simpler and more efficient than non-myopic processes. Nonetheless, the pattern in Komo supports the oft-vilified non-myopic predictions of AGREE. And while past work has inferred Use It or Lose It in vowel harmony (Stanton (2020)'s work on Gurindji nasal cluster dissimilation), the Komo data is clearer, and its pattern is the first obvious case of Use It or Lose It harmony.

To conclude, this paper argues that the best analysis of Komo relies on the activity of [+ATR] as opposed to any analysis requiring the spread of both [+ATR] and [-ATR]. Both regressive [+ATR] spreading and [+ATR] trigger effacement are repairs to a single marked structure in the language, *VC$_0$[HI, ATR]. Given this finding, perhaps other cases of "dominance reversal," as in Kinande, are derivable as Use It or Lose It harmony.

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