

## High Vowel Triggers and Morphological Variation in Mayak<sup>1</sup>

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### 1. The Proposal

- (1) It is possible to make sense of the intricacies of vowel harmony systems: triggers, targets, dominance and directionality by adopting a Headed Feature Domains approach to harmony which applies a representation similar to that of autosegmental phonology, but applies the interaction of grounded OT constraints.
- (2) Specifically, I will focus on the intricacies of the dominant recessive vowel harmony system of Mayak (a Southern Nilotic language), showing that we can make sense of complicated data by deriving local conjunctions of simple, familiar constraints, if we incorporate feature domains as domains of conjunction (in addition to segments) (Smolensky 1997, 2005).

#### 1.1. Headed-Feature Domains (Smolensky 2005): The Basics

Headed-feature domains is a way of looking at feature representations in a way that captures the strength of autosegmental theory, applied to the OT framework.

As a theory of vowel harmony, Headed-feature domains is a combination of the features of Optimal Domains Theory (Cole & Kisseberth 1994a, Cole & Kisseberth 1994b) and AGREE constraints (Bakovic 2000).

- (3) A note on SpanTheory (McCarthy 2004):  
Span Theory is a theory of autosegmental spreading very similar to Headed Feature Domains, with some subtle differences. I will not get into the similarities/differences in this talk.
- (4) All features represented in feature domains
  - (a) [be:kum]<sub>[+ATR]</sub>
- (5) All domains are headed (heads are marked with °)
  - (a) [be:ku°m]<sub>[+ATR]</sub>
  - (b) [be:°kum]<sub>[+ATR]</sub>
  - (c) \* [be:kum]<sub>[+ATR]</sub> (headless domains prohibited by GEN)

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- (d) \* [be:°ku°m]<sub>[+ATR]</sub> (multiply-headed domains prohibited by GEN)
- (e) \* [be:°k][u°m]<sub>[+ATR]</sub> (adjacent domains of the same feature value prohibited by GEN)
- (6) Heads are marked \*HD
  - (a) Each lexical item should have at least one violation of \*HD
  - (b) [be:°kum]<sub>[+ATR]</sub> (One violation of \*HD[ATR])
- (7) -The more heads in a lexical item, the more violations of \*HD.
  - (a) [bɛ:°]<sub>[\_ATR]</sub> [ku°m]<sub>[+ATR]</sub> (2 violations of \*HD[ATR])
  - (b) Harmony a result of high-ranked \*HD
- (8) Local conjunction of \*HD with traditional OT constraints derive complex restrictions.
  - The domain of the conjunction spans either
    - o the headed-segment
    - o the full feature domain
  - No new constraints are postulated

## 2. The Data

Mayak is a Western Nilotic language spoken in Northern Burun which displays dominant-recessive [ATR] ([+ATR] is dominant)

### (9) Vowel Inventory (Mayak)

|      | [+ATR] |   | [_ATR] |   |
|------|--------|---|--------|---|
| High | i      | u | ɪ      | ʊ |
| Mid  | e      | o | ɛ      | ɔ |
| Low  | ʌ      |   | a      |   |

Despite its symmetric inventory, vowels are asymmetric for participating in harmony, depending on height.

[+ATR] mid vowels [e] and [o] are licensed only by vowel harmony (10) (Note: vowel harmony targets are in **bold**)

### (10) Mayak Mid Vowels (Andersen 1999)

- (a) [lɛp] (\*[lep]) 'tongue'
- (b) [pɔk] (\*[pok]) 'mouth'
- (c) [be:kum] 'monkey'
- (d) [okur] 'chickens'
- (e) /lɛp/ [lew-u] 'open- Past'
- (f) /wɔŋ/ [wɔŋ-u] 'eye -PI'

Harmony in Mayak is also subject to directionality effects; mid vowels are targets only in regressive assimilation

(11) Right-Left Directionality for Mid-Vowel Targets

- (a) \*Left-Right  
[ʔib-ɛr] \*[ʔib-er] ‘shoot, 3S’
- (b) ✓ Right-Left  
[lep] [lep-ir] ‘open’

High vowels assimilate in both directions:

(12) Bi-Directionality for High-Vowel Targets

- (a) Harmony Spreads Right to Left  
/ʔit-u/ [ʔiṭ-u] ‘shape with an axe’
- (b) Harmony Spreads Left to Right  
/ʔuŋ-i/ [ʔuŋ-i] ‘knee 1S possessed’

In general, low vowels are neutral to harmony: [a] is not a target in either direction; [ʌ] is not a trigger in either direction.

(13) [a] does not assimilate

- (a) No Left-to-Right Assimilation  
/kuɖ-ak/ [kuɖ-ak] ‘nest-Plural’
- (b) No Right-to-Left Assimilation  
/ʔam-u/ [ʔam-u] ‘eat- PST’

(14) [ʌ] does not spread harmony

- (a) No Left-To-Right Spreading  
/ʔʌm-ir/ [ʔʌm-ir] ‘he is eating’
- (b) No Right-to-Left Spreading  
/dɪ:m-b-ʌr/ [dɪ:m-b-ʌr] ‘spear- 3SG’

**2.2. The proposal (Repeated):**

It is possible to account for all of the above data using headed-feature domains (Smolensky 2005). Headed feature domains penalize disharmony, but can account for both directionality and trigger/target effects through head-alignment and restrictions on feature domain heads. The interaction of these constraints produces the data seen in Mayak.

I will also provide a brief account of variation/exceptions in the harmony system.

### 3. Headed Feature Domains: Subtleties/Accounting for Mayak Data

- (15) The data to account for:
- (a) [+ATR] mid vowels found only in harmony-induced conditions
  - (b) Mid vowels are leftward targets only
  - (c) High vowels are bidirectional triggers and targets
  - (d) Low vowels do not participate in harmony

#### 3.1. Accounting for Mid/Low [+ATR] Vowels: Restricting Heads

- (16) Restricting Harmony Targets: Conjoin \*HD with Markedness  
Local conjunction of \*HD and markedness restricts whether a vowel can be a harmony trigger or a harmony target only.

In the case of [e] and [o], which are licensed only by harmony, we can constrain heads of [+ATR] domains to non-mid vowels, using the constraint:

- (17) \*HD[ATR] &<sub>SEG</sub> \*[+ATR, \_HIGH] (domain = segment): Non-high [+ATR] vowels must not head feature domains.

- (18) Hypothetical input with underlying /e/

| /lep/                               | ID[HIGH] | *HD[ATR] &<br>*[+ATR,<br>_HIGH] | *HD[ATR] | ID[ATR] |
|-------------------------------------|----------|---------------------------------|----------|---------|
| a. [le <sup>o</sup> p]              |          | *!                              | *        |         |
| b. $\leftarrow$ [le <sup>o</sup> p] |          |                                 | *        | *       |
| c. [li <sup>o</sup> p]              | *!       |                                 | *        |         |

- (19) Left-ward assimilation of [+ATR] to /ε/

| /be:k-um/ ‘monkey’                        | ID<br>[HIGH] | *HD[ATR] &<br>*[+ATR, _HIGH] | *HD[ATR] | ID[ATR] |
|---|--------------|------------------------------|----------|---------|
| a. [bε: <sup>o</sup> k][u <sup>o</sup> m] |              |                              | **!      |         |
| b. $\leftarrow$ [be:ku <sup>o</sup> m]    |              |                              | *        | *       |

The distribution of LOW vowels will be discussed in Section 3.

- (20) Constraints on triggers formed by conjoining \*HD and faithfulness constraints.

The dominant-recessive nature of harmony can be captured by constraining [\_ATR] domains to contain *only* underlyingly [\_ATR] vowels

- (21) \*HD[\_ATR] &<sub>FEAT. DOM.</sub> ID[ATR] (domain = feature domain): All vowels in [\_ATR] feature domains must be underlyingly [\_ATR]

Together, \*HD[ATR] & <sub>SEG</sub> \* [+ATR, \_HIGH] and \*HD[\_ATR] & <sub>FEAT. DOM</sub> ID[ATR] constrain mid vowels from occurring only as harmony targets.

(22) Left-ward assimilation of [+ATR] to /ε/

| /be:k-um/<br>'monkey'      | ID<br>[HIGH] | *HD[ATR]<br>& * [+ATR,<br>_HIGH] | *HD[_ATR]<br>& <sub>FEAT. DOM.</sub><br>ID[ATR] | *HD[ATR] | ID[ATR] |
|----------------------------|--------------|----------------------------------|---|----------|---------|
| a. [be:°k][u°m]            |              |                                  |   | **!      |         |
| b. $\rightarrow$ [be:ku°m] |              |                                  |   | *        | *       |
| c. [beku°m]                |              |                                  | *!  | *        | *       |
| d. [be°kum]                |              |                                  | *!  | *        | *       |

### 3.2. Directionality

(23) Directionality effects are handled through alignment of feature heads

The directionality effect for mid vowels shows that heads must be aligned to the right edge of the feature domain.

(24) ALIGN HD RIGHT: The head of a feature domain must be at the right edge.

\*HD[ATR] & \* [+ATR, \_HIGH] create conflict with ALIGN-HD-RIGHT whereby disharmony will be chosen over incorrect alignment or a mid-vowel heading a [+ATR] domain.

(25) Mid vowels targets only right to left

| /ʔib-εr/<br>'shoot- 3S'      | *HD[ATR]<br>& * [+ATR,<br>_HIGH] | *HD[_ATR]<br>& ID[ATR] | ALIGN<br>HD[ATR]<br>RIGHT | *HD[ATR] | ID[ATR] |
|------------------------------|----------------------------------|------------------------|---------------------------|----------|---------|
| a. [ʔibe°r]                  |                                  | *!                     |                           | *        | *       |
| b. $\rightarrow$ [ʔi°b][ε°r] |                                  |                        |                           | **       |         |
| c. [ʔibe°r]                  | *!                               |                        |                           | *        | *       |
| d. [ʔi°ber]                  |                                  |                        | *!                        | *        | *       |

This conflict does not affect high vowels, as the conflicting constraint \*HD[ATR] & \* [+ATR, \_HIGH] can never apply to high vowels, thus predicting bi-directionality for high vowels.

(26) High vowels bi-directionally triggers and targets

| /ʔidi/<br>'ear- 1S' | *HD[ATR]<br>& * [+ATR,<br>_HIGH] | *HD[_ATR]<br>& ID[ATR] | ALIGN<br>HD[ATR]<br>RIGHT | *HD[ATR] | ID[ATR] |
|---------------------|----------------------------------|------------------------|---------------------------|----------|---------|
| a. [ʔi°][di°]       |                                  |                        |                           | **       |         |
| b. [ʔidr°]          |                                  | *!                     |                           | *        | *       |
| c. [ʔi°di]          |                                  | *!                     | *                         | *        | *       |
| d. ↗ [ʔidi°]        |                                  |                        |                           | *        | *       |
| e. [ʔi°di]          |                                  |                        | *!                        | *        | *       |

**3.3. Low-Vowels As Non-Triggers**

Low vowels are not involved as triggers or targets of harmony. This is accounted for by treating low vowels as especially marked, such that they cannot participate in harmony.

This is achieved by taking the conjunction:

\*HD[ATR] & <sub>FEAT. DOM</sub> ID[ATR] and conjoining it with \*[LOW]

This has the effect of treating low vowels as neutral: they neither spread nor assimilate to the harmonic feature.

This conjunction has the effect of allowing [+ATR] low vowels to occur in all environments.

(27) [+ATR] low vowels occur independent of harmony

| /pΛ:m/<br>'mountain' | ID<br>[HIGH] | (*HD<br>[ATR] &<br>ID[ATR])<br>&<br>*[LOW] | *HD[ATR]<br>& * [+ATR,<br>_HIGH] | *HD[ATR] | ID[ATR] |
|----------------------|--------------|--|----------------------------------|----------|---------|
| a. [pa:°m]           |              | *!   |                                  | *        | *       |
| b. ↗ [pΛ:°m]         |              |  | *                                | *        |         |
| c. [pi:°m]           | *!           |  |                                  | *        |         |

It also has the effect of making low vowels non-participating.

(28) Low-vowels do not trigger harmony, [Λ] in stem

| /dΛ:m-b-ɪr/                 | (*HD<br>[ATR] &<br>ID[ATR])<br>&<br>*[Low] | *HD[ATR]<br>&<br>*[+ATR,<br>_HIGH] | *HD<br>[_ATR]<br>&<br>ID[ATR] | ALIGN<br>HD[ATR]<br>RIGHT | *HD<br>[ATR] | ID<br>[ATR] |
|-----------------------------|--|------------------------------------|-------------------------------|---------------------------|--------------|-------------|
| a. [dΛ:°mbɪr]               | *!   | *                                  |                               | *                         | *            | *           |
| b. $\text{↗}$ [dΛ:°m][bɪ°r] |  | *                                  |                               |                           | **           |             |
| c. [dΛ:mbɪ°r]               | *!   |                                    |                               |                           | *            | *           |
| d. [da:mbɪr°]               | *!   |                                    | *                             |                           | *            | *           |

(29) Low-vowels do not trigger harmony, [Λ] in suffix

| /dɪ:m-b-Λr/<br>'weed- 1S'   | (*HD<br>[ATR] &<br>ID[ATR])<br>&<br>*[Low] | FAITH<br>HD[ATR]<br>&<br>[+ATR,<br>_HIGH] | *HD[ATR]<br>&<br>*[+ATR,<br>_HIGH] | ALIGN<br>HD[ATR]<br>RIGHT | *HD<br>[ATR] | ID<br>[ATR] |
|-----------------------------|--|---|------------------------------------|---------------------------|--------------|-------------|
| a. [dɪ:°mbΛr]               | *!   | *   |                                    | *                         | *            | *           |
| b. $\text{↗}$ [dɪ:°m][bΛ°r] |  |   | *                                  |                           | **           |             |
| c. [dɪ:mbΛ°r]               | *!   |   | *                                  |                           | *            | *           |
| d. [dɪ:°mbar]               | *!   |   |                                    | *                         | *            | *           |

(30) Low-vowels are not targets of harmony

| /kɪc-ak/<br>'bee-pl'      | (*HD<br>[ATR] &<br>ID[ATR])<br>&<br>*[Low] | *HD<br>[ATR] &<br>*[+ATR,<br>_HIGH] | *HD<br>[_ATR] &<br>ID[ATR] | ALIGN<br>HD<br>[ATR]<br>RIGHT | *HD<br>[ATR] | ID<br>[ATR] |
|---------------------------|--|-------------------------------------|----------------------------|-------------------------------|--------------|-------------|
| a. [kɪ°c-ak]              | *!   |                                     | *                          | *                             | *            | *           |
| b. $\text{↗}$ [kɪ°c][a°k] |  |                                     |                            |                               | **           |             |
| c. [kɪc-Λ°k]              | *!   | *                                   |                            |                               | *            | *           |
| d. [kɪ°c-Λk]              | *!   |                                     |                            | *                             | *            | *           |
| e. [kɪc-a°k]              | *!   |                                     | *                          |                               | *            | *           |

## 4. Variation

### 4.4. Low Vowels

While it is generally true that low vowels are not harmony targets, there is at least one exception: the singular suffix [-a<sub>ɪ</sub>]/[-ʌ<sub>ɪ</sub>] is an exceptional target for [+ATR] harmony

(31) Low vowels as harmony targets

- (a) [kum-a<sub>ɪ</sub>] ‘egg- singular’
- (b) [ruj-ʌ<sub>ɪ</sub>] ‘worm- singular’

(32) This variation can be accounted for if we treat alternating morphemes as WEAK, thus inducing elevated \*HD (similar to a partial order of constraints such that \*HD will outrank (\*HD[ATR] & ID[ATR]) & \*[LOW] in the presence of WEAK morphemes (Anttila 1995, 2000))

(33) Using elevated constraints has an advantage to underspecification in that elevated constraints overtly capture the morphological nature of the variation.

(34) Low-vowels as targets of harmony

| /kum-a <sub>ɪ</sub> /<br>WEAK<br>‘egg-<br>Singular’  | *HD<br>[ATR]<br>WEAK | (*HD<br>[ATR] &<br>ID[ATR])<br>&<br>*[LOW] | *HD[ATR]<br>& *+[ATR,<br>_HIGH] | *HD<br>[_ATR] &<br>ID[ATR] | ALIGN<br>HD<br>[ATR]<br>RIGHT | ID<br>[ATR] |
|--|----------------------|--|---------------------------------|----------------------------|-------------------------------|-------------|
| a. [ku <sup>o</sup> m][a <sup>o</sup> <sub>ɪ</sub> ] | **!                  |  |                                 |                            |                               |             |
| b. ↻ [ku <sup>o</sup> m-ʌ <sub>ɪ</sub> ]             | *                    | *  |                                 |                            | *                             | *           |
| c. [kum-ʌ <sup>o</sup> <sub>ɪ</sub> ]                | *                    | *  | *!                              |                            |                               | *           |
| d. [kUm-a <sup>o</sup> <sub>ɪ</sub> ]                | *                    | *  |                                 | *!                         |                               | *           |
| e. [kU <sup>o</sup> m-a <sub>ɪ</sub> ]               | *                    | *  |                                 | *!                         | *                             | *           |

### 4.5. Non-Low Vowels

A set of high vowel suffixes undergoes harmony in the presence of [+ATR] low vowels. These can be accounted for if we treat these undergoing suffixes as WEAK, and thus not subject to the conjunction (\*HD[ATR] & ID[ATR]) & \*[LOW].

(35) High-Vowels Undergoing Harmony From Low Vowel Source:

- (a) /gɔj-ɔk/ [gɔjuk] ‘bowl- PL’
- (b) /jʌŋ-ɔk/ [jʌŋuk] ‘crocodile- PL’

(36) Low-vowels as targets of harmony

| /jʌŋ-ɔk/<br>‘crocodile’<br>PL<br>WEAK    | *HD<br>[ATR]<br>WEAK | (*HD<br>[ATR] &<br>ID[ATR])<br>&<br>*[LOW] | *HD[ATR]<br>& *+[ATR,<br>_HIGH] | *HD<br>[_ATR] &<br>ID[ATR] | ALIGN<br>HD<br>[ATR]<br>RIGHT | ID<br>[ATR] |
|--|----------------------|--|---------------------------------|----------------------------|-------------------------------|-------------|
| a. [jʌ <sup>o</sup> ŋ][ɔ <sup>o</sup> k] | **!                  |  |                                 |                            |                               |             |
| b. [jʌ <sup>o</sup> ŋuk]                 | *                    | *  | *!                              |                            | *                             | *           |
| c. ↻ [jʌŋu <sup>o</sup> k]               | *                    | *  |                                 |                            |                               | *           |
| d. [jaŋɔ <sup>o</sup> k]                 | *                    | *  |                                 | *!                         |                               | *           |
| e. [ja <sup>o</sup> ŋuk]                 | *                    | *  |                                 | *!                         | *                             | *           |

## 5. Conclusions

(37) Headed feature domains are a fruitful tool to account for vowel harmony. By using the feature domain as a domain for local conjunction, it is possible to account for complex data using simple constraints.

(38) Mayak, as a case of dominant recessive harmony, shows that headed-feature domains are a viable approach to this class of harmony (in addition to stem-controlled harmony cited in Smolensky (1997, 2005)).

(39) In addition, I have chosen to account for variation using elevated constraints (as opposed to Anderson’s proposal for using underspecification). Elevated constraints better capture the morphological specification of variation.

## 6. Appendix A: Grammatically-Conditioned Vowel Alternations

Mayak exhibits a type of realizational morphology in which the derivational anti-passive suffix and select nominal suffixes (including the plural) trigger changes in vowel quality in the verbal/nominal root

(40) Vowel Quality Alternation (Andersen 2000)

| Suffix Environment | Root Vowel | Anti-Passive | Root + Anti-Passive | Change                        |
|--------------------|------------|--------------|---------------------|-------------------------------|
| High Vowels        | /ɪ/, /i/   | /-ɪr/        | [i -ɪr]             | Root and Suffix Become [+ATR] |
|                    | /ʊ/, /u/   | /-ɪr/        | [u -ɪr]             |                               |
| Mid Vowels         | /ɛ/        | /-ɪr/        | [ɪ -ɪr]             | Root Vowel Raises             |
|                    | /ɔ/        | /-ɪr/        | [ʊ -ɪr]             |                               |
| Low Vowels         | /a / , /ʌ/ | /-ɪr/        | [ʌ -ɪr]             | Root Vowel Becomes [+ATR]     |

- (41) High vowels and low vowels become [+ATR],  
 Mid-vowels become [+HIGH].  
 The anti-passive and plural morphemes are thus associated with the features [+ATR] and [+HIGH].

The fact that this set of morphemes triggers vowel change on the root is accounted for by associating the features [+ATR] and [+HIGH] with the set of morphemes. To account for why these features apply on the root (the left edge of the word), we use morpheme-specific L-ANCHOR [+ATR], L-ANCHOR [+HIGH]

- (42) To account for the realization of the features [+ATR] and [+HIGH], the correspondence constraint L-ANCHOR is used. (McCarthy & Prince 1995):
- (a) L, ANCHOR- MORPH [<sub>F</sub>]: The [F] feature of MORPH must be in correspondence with the leftmost vowel of the lexical domain (which therefore must be [<sub>F</sub>])
  - (b) L-ANCHOR is violated once for every input vowel in which the feature of the morpheme is not in correspondence with the vowels in the output form (ANCHOR will always be violated if no vowels bear the harmonic feature (i.e. the morpheme is not realized)).<sup>2</sup>

Variation as to which features are realized is accounted for by the relative ranking of L-ANCHOR to identity constraints and inventory constraints

For High root vowels, L-ANCHOR[HIGH] is vacuously satisfied.  
 L-ANCHOR[HIGH] is ranked above ID[HIGH], so both [+HIGH] and [+ATR] are realized.

<sup>2</sup> This assumes that an established featural correspondence is required by the existence of ANCHOR, in line with Rose's (1997) instantiation of ANCHOR for ethio-semitic 'mobile morphemes'. An analysis without such requirement is possible in which MAX[+ATR] is high-ranked.

## (43) High vowels and grammatical alternations

| /ʔiᵗ-ir/<br>[+HIGH]<br>[+ATR]<br>'eat- anti-<br>passive' | L-ANCHOR<br>[ATR] | (*HD[ATR]<br>&ID[ATR])<br>&*[LOW]. | ALIGN<br>HD[ATR]<br>RIGHT | *HD<br>[ATR] | ID<br>[ATR] |
|--|-------------------|------------------------------------|---------------------------|--------------|-------------|
| a. [ʔiᵗ-ir <sup>o</sup> ]                                | *!*               |                                    |                           | *            |             |
| b. [ʔi <sup>o</sup> ][ᵗir]                               |                   |                                    |                           | **!          | *           |
| c. [ʔiᵗi <sup>o</sup> r]                                 |                   |                                    |                           | *            | **          |
| d. [ʔi <sup>o</sup> ᵗir]                                 |                   |                                    | *!                        |              | **          |

For mid vowels, only [+HIGH] is realized.

There is [+ATR] and [+HIGH] (by a conjunction of ID[ATR] & ID[HIGH])


Because L-ANCHOR[HIGH] >> L-ANCHOR[ATR], [+HIGH] only is realized

## (44) Mid vowels and grammatical alternations

| /dej-ir/<br>[+HIGH]<br>[+ATR]<br>'grind, anti<br>passive'<br>present<br>tense | L-<br>ANCHOR<br>[HIGH] | ID<br>[ATR]<br>&<br>ID<br>[HIGH] | L-<br>ANCHOR<br>[ATR] | ID<br>[HIGH] | *HD<br>[ATR]<br>&<br>*[+ATR,<br>_HIGH] | *HD<br>[ATR] |
|---|------------------------|----------------------------------|-----------------------|--------------|--|--------------|
| a. [dej-ir <sup>o</sup> ]   | *!                     |                                  | **                    |              |  | *            |
| b. [de <sup>o</sup> ir <sup>o</sup> ]   | *!                     | *                                |                       |              | *                                      | **           |
| c. [deji <sup>o</sup> r]  | *!                     |                                  |                       |              |  | *            |
| d. [diji <sup>o</sup> r]  |                        | *!                               |                       | *            |  | *            |
| e. [dijir <sup>o</sup> ]  |                        |                                  | **                    | *            |  | *            |

For low vowel [ʌ], inventory constraints/ high-ranked ID[LOW] prevent [+HIGH] from being realized. (I also assume a high-ranked ID[BACK]/ID[ROUND] to prevent /a/ from becoming [i]/[u])

(45) Low vowels and grammatical alternations

| /ʔam-ir/<br>[+HIGH]<br>[+ATR]<br>'eat- anti-<br>passive'   | *[i] | L-ANCHOR<br>[HIGH] | L-ANCHOR<br>[ATR] | FAITH<br>HD | (*HD<br>[ATR] &<br>ID[ATR])<br>&<br>*[LOW] | *HD[ATR]<br>&<br>*[+ATR,<br>_HIGH] |
|--|------|--------------------|-------------------|-------------|--|------------------------------------|
| a. [ʔam <sup>o</sup> r]  |      | *                  | *!*               |             |  |                                    |
| b.  [ʔΛ <sup>o</sup> ][mr <sup>o</sup> r] |      | *                  |                   |             | *  | *!                                 |
| c. [ʔΛmi <sup>o</sup> r]   |      | *                  |                   |             | **!  |                                    |
| d. [ʔimi <sup>o</sup> r]   | *!   |                    |                   |             |  |                                    |
| e. [ʔΛ <sup>o</sup> mir]   |      | *                  |                   |             | *  | *                                  |

**6.6. Grammatically-Controlled Vowel Alternations and Vowel harmony**

In the examples above, the triggering suffix was [\_ATR].


When the suffix is [+ATR], as in the anti-passive past tense, the suffix will trigger [ATR] harmony, allowing for both [+HIGH] and [+ATR] to be realized.

This is only predicted if we treat the directionality effect of high vowels as parasitic, such that high vowels must always share ATR domains.

This is captured by the conjunction of:

(46) \*HD[ATR] & \*HD[+HIGH]

(47) High vowels bi-directionally triggers and targets

| /ʔidi/<br>'ear- 1S'   | *HD<br>[ATR]<br>& *HD<br>[+HIGH] | *HD[ATR]<br>&<br>*[+ATR,<br>_HIGH] | *HD<br>[_ATR]<br>&<br>ID[ATR] | ALIGN<br>HD[ATR]<br>RIGHT | *HD[ATR] | ID[ATR] |
|---|----------------------------------|------------------------------------|-------------------------------|---------------------------|----------|---------|
| a. [ʔi <sup>o</sup> ][di <sup>o</sup> ]   | *!                               |                                    |                               |                           | **       |         |
| b. [ʔidr <sup>o</sup> ]   |                                  |                                    | *!                            |                           | *        | *       |
| c. [ʔi <sup>o</sup> di]   |                                  |                                    | *!                            | *                         | *        | *       |
| d.  [ʔidi <sup>o</sup> ] |                                  |                                    |                               |                           | *        | *       |
| e. [ʔi <sup>o</sup> di]   |                                  |                                    |                               | *!                        | *        | *       |

This is the predicted result of the parasitic nature of vowel harmony. Since the grammatically-controlled vowel raising puts the root and the suffix in a [+HIGH] domain, they must share their [+ATR] domain as well. (Note that this is vacuously satisfied in the [\_ATR] root case)

(48) Past Tense Anti-Passives

| /dɛc-uð-i/<br>'grind' Anti-Passive, Past<br>[+ATR]<br>[+HIGH] | *HD<br>[ATR]<br>&<br>*HD<br>[+HIGH] | L-ANCHOR<br>[HIGH] | ID[ATR]<br>&<br>ID<br>[HIGH] | L-ANCHOR<br>[ATR] | FAITH<br>HD[+ATR] | *HD<br>[_ATR]<br>&<br>ID[ATR] | *HD<br>[ATR] |
|---|-------------------------------------|--------------------|------------------------------|-------------------|-------------------|-------------------------------|--------------|
| a. [dɛ <sup>o</sup> c][uð <sup>o</sup> i]                     |                                     | *!                 |                              | *                 |                   |                               | **           |
| b. [dɛcð <sup>o</sup> i]                                      |                                     | *!                 |                              |                   | *                 |                               | *            |
| c. [dɪ <sup>o</sup> c][uð <sup>o</sup> i]                     | *!                                  |                    |                              | *                 |                   |                               | *!*          |
| d. $\text{ɛ}^{\circ}$ [dicuð <sup>o</sup> i]                  |                                     |                    | *                            |                   |                   |                               | *            |

7. Appendix B: More Tableaux

(49) Low-vowels do not trigger harmony, [ɔ] in stem

| /dɔ: i ir/<br>ID<br>[ATR]<br>[+LOW]         | *HD[ATR]<br>&<br>*HD[+HIGH] | *HD[ATR]<br>&<br>*[+ATR,<br>_HIGH] | (*HD<br>[ATR] &<br>ID[ATR])<br>&<br>*[LOW] | *HD<br>[_ATR]<br>&<br>ID[ATR] | ALIGN<br>HD<br>[ATR]<br>RIGHT | *HD<br>[ATR] | II<br>[AT |
|---|-----------------------------|------------------------------------|--|-------------------------------|-------------------------------|--------------|-----------|
| a. [dɔ: <sup>o</sup> i ir]                  |                             |                                    | *!   |                               | **                            | *            | *         |
| b. [dɔ:mi <sup>o</sup> ][bɪ <sup>o</sup> r] | *!                          |                                    |  |                               |                               | **           |           |
| c. [dɔ:mbi <sup>o</sup> i]                  |                             |                                    |  | *                             | *!                            | *            | *         |
| d. $\text{ɔ}^{\circ}$ [ɔ i i <sup>o</sup> ] |                             |                                    |  | *                             |                               | *            | *         |

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