

ATR HARMONY IN KÖNNI*

Mike Cahill

0. Introduction

Könni, a Gur language of northern Ghana, has a typical nine-vowel system with root-controlled ATR harmony. Its chief interest comes from the extremely flexible characteristics of /a/, which can alternate with [e] and [o]. Unlike its behavior in many other languages, /a/ is not a neutral vowel in Könni. In this paper I examine the vowel harmony system of Könni and in particular, propose a way of accounting for the malleable behavior of /a/ in terms of a feature geometric framework.

The paper is organized as follows. First, in Section 1, I lay out the basic facts of Könni ATR-based vowel harmony within words. In Section 2, I examine an approach incorporating privative features into a feature geometry system. Section 3 contains some concluding remarks. An Appendix of ATR harmony data across words is included.

1. ATR Harmony in Könni

The nine vowel phonemes of Könni divide into two harmony sets based on the Advanced Tongue Root feature:

* Könni is in the Central Oti-Volta subgroup of the Gur language family (Naden 1989). Previous works dealing primarily with Könni phonology are Naden (1987) and Cahill (1992a,b,c, 1994). The data for this study were gathered while living in the Koma village of Yikpabongo during various periods from 1986 to 1992. Special thanks must go to Abdulai Sikpaare, who patiently repeated many of these forms over and over, to Mr. Ben Saibu, who has clarified many aspects of the Könni language for me, and to David Odden, who has suggested many changes for the better in this paper. Any faults which remain are mine.

(1)	+ATR	-ATR
	i u	ɪ ʊ
	e o	ɛ ɔ
		a

With very few exceptions, all vowels in a single-root word come from only one of the two harmony sets¹:

(2)	+ATR words	-ATR words
	súúli 'to be full'	júúli 'to climb'
	bitiéŋ 'beard'	tóbí 'to pierce'
	tókórosí 'windows'	kúrúbá 'cooking pot'

Words from the [-ATR] set comprise about 80% of verbs and nouns.

1.1 Harmony Within Words

The vowel harmony of Kɔ̀nni extends from the root to all affixes of nouns and verbs, as below (noun suffixes for plurals and articles vary with noun class):

(3) Nouns:	+ATR	-ATR
	díí- <u>rí</u> 'the forehead'	kùù- <u>rí</u> 'the hoe'
	siè- <u>kú</u> 'the path'	nìt- <u>kú</u> 'the rain'
	dùùm- <u>bú</u> 'the horse'	nyáá- <u>bú</u> 'the water'
	dèmbi- <u>ké</u> 'the man'	gbàà- <u>ká</u> 'the dog'
	dùn- <u>é</u> 'knees'	tàn- <u>á</u> 'stones'
	dùn- <u>é-hé</u> 'the knees'	tàn- <u>á-há</u> 'the stones'
	tókóró- <u>sí-sí</u> 'the windows'	nánjú- <u>sí-sí</u> 'the flies'
	kùn- <u>tí-tí</u> 'the funerals'	sún- <u>tí-tí</u> 'the brooms'
	tigim- <u>mé</u> 'at house'	mógúm- <u>mà</u> 'at river'

(4) Verbs:	+ATR	-ATR
	kùrì- <u>yé</u> 'has pounded'	pàsì- <u>yá</u> 'has peeled'
	sùgùr- <u>é</u> 'is washing'	pògìl- <u>á</u> 'is holding'
	tù- <u>ó</u> 'is digging'	ku- <u>á</u> 'is killing'
	dígì- <u>wó</u> 'cooked'	gá- <u>!wá</u> 'went'
	chii- <u>mé</u> 'carry!'	dòm- <u>má</u> 'bite!'
	nèn- <u>díí</u> 'will eat'	nàn- <u>gá</u> 'will go'

¹ The word [gaanluj] 'cat' is actually the only example I know of at this point. See further discussion in Sec. 3.

Note that instead of the expected e/e and o/o alternations, which one would expect if there were underlying mid vowels in suffixes, there are several cases of e/a and o/a alternations (dùné / tàn-á 'knees/houses', tù-ó / kù-á 'is killing/is digging'). I will return to these later.

Since adjectives never occur in isolation, I consider them bound morphemes and part of the nominal. However, adjectives have their own value of ATR, which can differ from the root noun:

- (5) jùò-háá'f-ŋ² 'new room' (lit. 'room-new')
 ném'bí-kúf-ŋ 'big bird' (lit. 'bird-big')

The above have [+ATR] vowels in the noun preceding the adjective, and [-ATR] vowels in the adjective. However, when the adjective has [+ATR] vowels, this value spreads to the noun:

- (6) gbè-niŋ 'female dog' (cf. gbááŋ 'dog')
 né-niŋ 'female cow' (cf. náá'gíŋ 'cow')
 né-biŋ 'small cow' (cf. náá-kpí'íŋ 'big cow')
 jè-vùkiŋ 'snake' (lit. 'thing wriggling'; cf. jááŋ 'thing')
 kùò-biŋ 'small hoe' (cf. kùááŋ 'hoe')
 múgú-biŋ 'small river' (cf. múgúŋ 'river')
 bùntù-biŋ 'small toad' (cf. bùntùúŋ 'toad')

However, some nouns seem to be immune to this ATR spread:

- (7) ná-biŋ 'small leg' (cf. náŋ 'leg')
 gùráá'biŋ 'small lizard' cf. (gùrá'áŋ 'lizard')

These latter cases are exceptional ones. Beyond the fact that they all have [a] in the last syllable (which is the second most frequent vowel in words anyway, after [i]), there is no apparent pattern to explain their exceptionality, and they will be treated as lexical exceptions here.

Similarly, each component of a compound noun can contribute its own value of ATR to the word:

² /ŋ/ is the singular indefinite suffix, and is found on over 95% of nouns in citation form. It occurs as the final morpheme on a noun. For simplicity's sake, I will not indicate this morpheme boundary in the remainder of this paper.

(8) dâà-gbùgé	'stumps' ('wood-short')
n̄m-bó ¹ l̄iŋ	'lightning' ('rain-fire')
nàà-chíŋiŋ	'lion' ('cow-running?')
núú- ¹ tálf	'palm of hand' ('hand-??')
bitié-gbáríŋ	'chin' ('jaw-lower part')

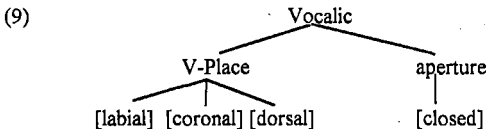
In contrast to adjectives, there is no spreading of ATR from one component of a compound noun to another.

1.2 Summary

As seen above, affixes take their specification of ATR from the root to which they are affixed, whether noun, verb, or adjective. I assume, then, that in Kõnni only nouns, verbs, and adjectives are lexically specified for ATR, with each being specified for only one value of ATR. There are two separate processes of ATR spreading. Besides the rightward spreading from nouns and verbs to suffixes, leftward spreading of [+ATR] occurs in most noun-adjective complexes. There is no spreading in compound nouns.

2. Analysis in a Feature Geometric Framework

A plausible way of representing Kõnni vowels is in a feature geometric framework, as in Clements and Hume (1995). In this model, vocalic features are split into two groups, under a V-place node and an aperture node, as below (placement of [ATR] is discussed below):



2.1 The Representation of Underlying Vowels

Unlike previous work on Kõnni vowels which utilized a traditional binary feature system (Cahill 1992b,c, 1994), the privative vocalic features above will be assumed here.

2.1.1 [closed]

The [closed] under the aperture node is taken from Parkinson (1996), rather than the [open] feature used in Clements and Hume (1995). There may be multiple occurrences of [closed] to differentiate different degrees of vowel height. Thus in a three-height vowel system, /i/ has two features of [closed], /e/ has one feature of [closed], and /a/ has no [closed].

2.1.2 [labial]/[dorsal]

In Clements and Hume's (1995) framework, a back round vowel such as /u/ or /o/ has properties of both [labial], since the vowels have lip-rounding, and [dorsal], since the articulator is the tongue dorsum. The question I will consider now is whether both of these are active. If not, which one is the active one? This is closely related to the classic [back]/[round] feature question: which one should be specified? In Kõnni, as in many

languages, the traditional features [back] and [round] are intimately related. All [+round] vowels are also [+back], and with the exception of /a/, all [+back] vowels are also [+round].³ In the feature geometry model I am using here, I treat [dorsal] as the active feature, and formulate a crucial rule in terms of [dorsal] rather than [labial] (see 20), but formulate no process that refers to [labial].

Evidence for choosing [dorsal] comes from the behavior of /w/. The phoneme /w/ is identical to /u,ʊ/ in features except for being in a non-syllabic position rather than a syllabic one. As with /u,ʊ/, /w/ could conceivably have [dorsal], [labial], or both as its place of articulation feature(s). In the nasal assimilation process, a nasal consonant assimilates in place of articulation to a following consonant:

(10) Nasal assimilation across words in Könni⁴

ŋ wo jaan	'I lack anything.'
m baart wiin	'I discuss a matter'
ŋm gbaligya	'I am tired'

Before /w/, the nasal becomes [ŋ], the [dorsal] nasal, leading us to use the [dorsal] feature as its place of articulation. Also relevant is the fact that nasals may assimilate as [m] before labial consonants (/p,b/) and [ŋm] before labiovelar consonants (/kp,gb/). If /w/ were specified as [labial], it would group with /b/, with [m] preceding it. If /w/ were specified as both [labial] and [dorsal], it would group with /gb/, with [ŋm] preceding it. Of the possibilities for specifying features for /w/, only [dorsal] fits. Extending the properties of /w/ to the back round vowels, I will use [dorsal] here to refer to them.

2.1.3 [ATR]

Languages which make a distinction in tongue root position may have either [ATR] or [RTR] specified, but it seems much more common to have [ATR] as the marked value (e.g. Archangeli & Pulleyblank 1989, Pulleyblank 1986). Also, in Nawuri, a Guang language of Ghana, Casali (1988) points out that it is only the positive value of [ATR] that optionally spreads both left and right across word boundaries:

(11) Nawuri:

/ɪpʊ ## leŋbiri/ → [ɪpulembiri] 'black soup'
 (some phonetic detail suppressed for clarity)

In Akan as well, it is the positive value of ATR which spreads to the left, usually for one syllable, across words (Dolphyne 1988:23-24):

³ In the framework of Cahill 1992c, I maintained that [round] is the feature which is needed underlyingly, since there is a lexical rule referring to [+round], but not to [back]. If this could be directly translated into the present theoretical framework, it would mean that [labial] would be needed in an underlying representation of /u,ʊ/. However, we shall see that [dorsal] rather than [labial] is needed here.

⁴ The full account of nasal assimilation in Könni is somewhat more complex. Before labial-velar stops [gb,kp], a nasal assimilates as [ŋm] across word boundaries, as shown above, but within words, the nasal assimilates as [ŋ], as in [sɪŋkpaan] 'peanut.' For further details, see Cahill 1995a.

(12) [oko fie] 'he goes home' (cf. oko 'he goes')

In common with these languages, I claim [ATR] is the marked value in Kɔnni rather than [RTR] and will be specified in underlying representation⁵. There are lexical items that are [-ATR] in isolation but are [+ATR] when adjacent to a [+ATR] morpheme, but there are no morphemes which are [+ATR] in isolation and [-ATR] when adjacent to a [-ATR] morpheme. In Kɔnni, it is the positive value of [ATR] that spreads across words and within words (data below are repeated from (6) and (29):

(13) gbɛniinj 'female dog' (cf. gbàáj 'dog')
 ge ye 'go see' (cf. ga 'go')

Since [ATR] is a feature of the morpheme, it will not be a feature of an individual vowel, but rather of a lexical morpheme: noun, verb, or adjective. In a phonetically [ATR] word, the [ATR] autosegment will associate to all vowels in the word. There is no evidence of left-to-right or right-to-left association, nor could there be, if the [ATR] associates to every vowel in the word. Affixes are unspecified for [ATR], and if the root has an [ATR] autosegment associated to it, the [ATR] will spread into the affix. The domain of automatic spreading of [ATR], then, is the word in Kɔnni. Additional spreading of [ATR] across words is by rules to that effect.

There has been some question as to whether [ATR] is the best term for the relevant feature. For example, Clements (1991) and subsequent work (Clements and Hume 1995) have proposed that [ATR] can be subsumed under the feature [pharyngeal], unifying other phenomena besides "ATR" harmony. For expository purposes, however, I will use the more traditional [ATR] in this paper.

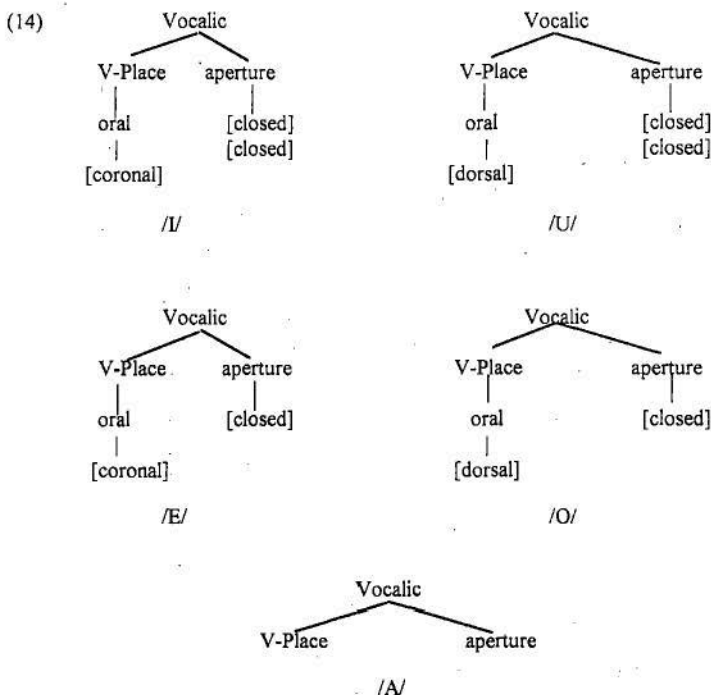
2.1.4 [coronal]

The feature [coronal] will be used for front vowels, as justified extensively in Hume (1994).

2.1.5 The Geometry of Kɔnni Vowels

Abstracting [ATR] away from the specifications of individual vowels in Kɔnni, since [ATR] functions as a property of the morpheme, we are left with five vowels. Specification of these five vowels, then, would be:

⁵ Possibly relevant to markedness is the relative frequencies of [+ATR] vs. [-ATR] in Kɔnni. We note again that approximately 80% of Kɔnni nouns and verbs belong to the [-ATR] set, intuitively consistent with [-ATR] as the redundant value and [+ATR] as the marked one.



The front vowels /I/ and /E/ above are [coronal] in place, while the round back vowels /U/ and /O/ are [dorsal] in place. The high vowels /I/ and /U/ have two features of [closed], while the mid vowels /E/ and /O/ have only one feature of [closed], and the low vowel /A/ has no [closed] at all. The place representation of /a/ is particularly worthy of comment. In different languages /a/ can pattern as either a central or back vowel, which would lead to either no specification or a [dorsal] specification, respectively. In Kōnni, there is no evidence linking /a/ to other back vowels, and I argue below that /a/ is particularly vulnerable to change. A null specification fits its behavior nicely, under the assumption that unspecified segments are more vulnerable to spreading than are specified segments. It is relevant to note here that Clements and Hume (1995) also note that central vowels will have no place features.

In light of the behavior of /a/ in [+ATR] environments and when adjacent to /u,w/, the V-place and aperture nodes of /a/ may actually be dispensed with, leaving a bare vocalic or possibly root node for /a/.

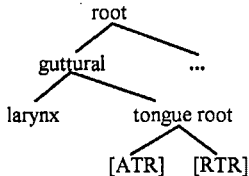
2.1.6 Geometry of [ATR]

If we follow Odden's (1991) argument for grouping [ATR] together with [high], [ATR] will associate to the aperture node. However, the use of [ATR] in some analyses

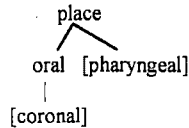
has little to do with actual tongue-root position, but rather is used as an additional mechanism to distinguish vowel heights (Hyman 1988, Odden 1991, *inter alia*). Although it has not been possible to do X-ray studies with Kɔnni of the type done for Akan (e.g. Lindau 1975), [ATR] harmony between vowels of different heights shows that [ATR] in Kɔnni does not represent height so much as true tongue root position. If this is the case, then [ATR] would more naturally group together with the V-Place features. Therefore, I will place [ATR] under the V-Place node.

There is some controversy over where in a geometry the [ATR] feature should be placed. Clements and Hume (1995:274) give two possibilities. (The feature in question there is labeled [pharyngeal].) The model of Halle (1989, 1992) groups the laryngeal articulator and its dependent features together with the tongue root articulator and its features under a higher-level “guttural” node. This model predicts rules that spread laryngeal features (e.g. [voice]) and tongue root features as a unit. The Kɔnni data do not address this possibility. The model of McCarthy (1994) groups the [pharyngeal] (= [ATR]) feature and an “oral place” node together under the “place” node.

(15) a. Halle (1989, 1992)



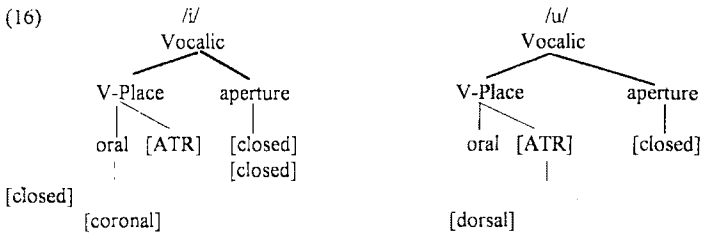
b. McCarthy (1994)



Another conceivable structure is placing [ATR] as a sister to the other place features, under V-Place. However, though some languages allow more than one V-Place feature (e.g. a high front rounded vowel requires both [coronal] and [labial]), Kɔnni does not. One reason for placing [ATR] so it is not a sister to the oral features is that [coronal] can be inserted as a default feature, as we will see later. Since it is assumed that default features are generally inserted onto nodes that are empty, [ATR] cannot be placed under the same node as the oral features such as [coronal]. Thus Kɔnni is consistent with McCarthy's placement of [pharyngeal].

Though there is no conclusive evidence in Kɔnni favoring one version over the other, a simpler analysis is possible with McCarthy's model.

More complete representations of /i/ and /u/, therefore, would be as below. Representations of /i/ and /u/ would be identical except lacking the [ATR] feature.



2.2 Rules and Derivations

With the above representations, we will see that two spreading rules and two default rules are needed to account for the ATR harmony data for suffixes of Könni words.

2.2.1 Non-round Words

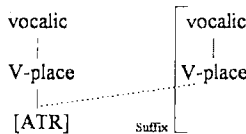
We have seen above that there is no [+ATR] counterpart for /a/, the lowest vowel. This lack of a low ATR vowel is extremely common across languages. Archangeli and Pulleyblank (1994), for example, express this as an ATR/LO Condition holding across many languages: if [+ATR], then [-low]. In terms of the [closed] feature used here, there is a constraint that a [+ATR] vowel must have at least one specification for [closed]. We can formulate this in terms of a linking rule which applies everywhere (as in Mohanan 1991):

(17) ATR/Closed rule: [ATR] → [closed]

This rule will have the effect of inserting a feature [closed] onto a vowel which is specified for [ATR] if no [closed] is already present.⁶

Next, we formulate the basic rule of ATR spreading as:

(18) ATR Spread (note: consonants may intervene between the vowels)

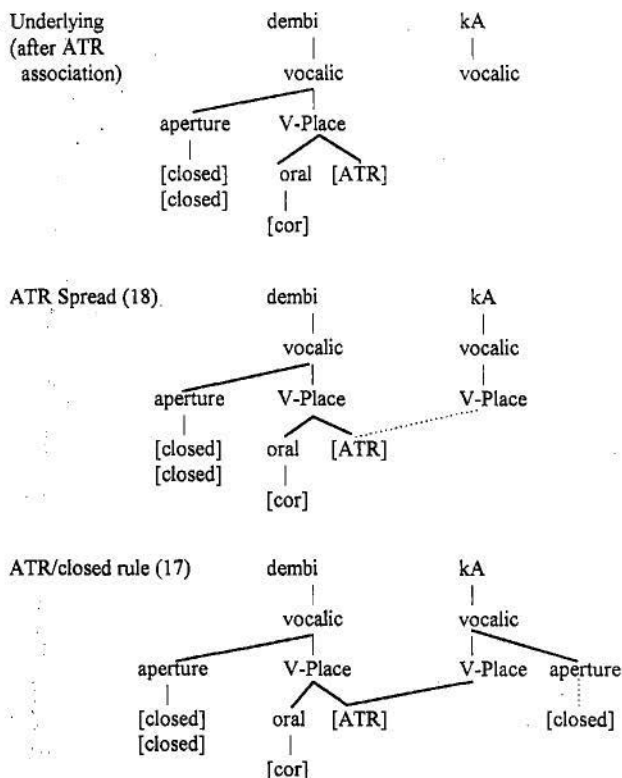


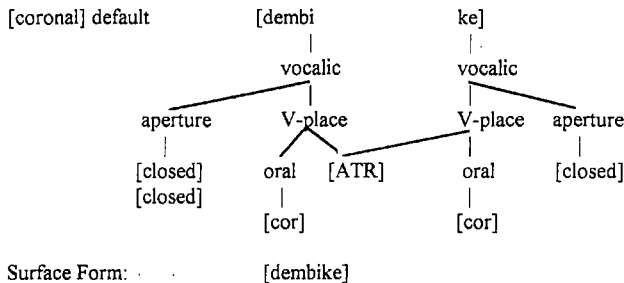
This rule spreads the [ATR] feature from roots to suffixes, which have no underlying [ATR] specification, as in *düüm-bü* 'the horse' vs. *nyáá-bú* 'the water'. Note also that the SUFFIX specification is necessary, since [ATR] does not spread rightward from a root to another root, as in *juo-haalij*, 'new house,' *juo-haal-ka* 'the new house.' If the suffix contains the low vowel /a/, and the root vowels are [ATR], then the [ATR] spreads and /a/ becomes [e], as in /*demi-ka*/ → [dembike] 'the man' and /*dun-a*/ → [dune] 'knees.'

⁶ Note that if [open] were to be used, a constraint something like *[ATR, +open, +open] would be needed, which would have the effect of deleting one of the values of [+open].

Thus, in a word like *dembi-ke* 'the man', the suffix is underlyingly /-ka/, and the vowel is raised and fronted to [-ke] by ATR Spread, the ATR/closed rule, and a Coronal default which applies to non-low vowels with empty Place nodes. The derivation is as follows (features shown for last vowel of stem only):

(19) Derivation of *dembi-ke* 'the man'





The [coronal] default comes as the result of a constraint common in many languages: that non-low vowels must have a Place feature, presumably either [dorsal] or [coronal] (see Parkinson 1996 for more exemplification of this). This would apply to languages which have no three-way distinction in backness for any height, by far the majority of the world's languages. [coronal] is less marked than [dorsal], as shown both cross-linguistically and in particular by the fact that a [coronal] vowel, /ɪ/ (abstracting away [ATR]), is the epenthetic vowel in Könni.⁷ The result is that when a vowel gains a [closed] feature, it also gains [coronal] if no V-Place feature is already present. So, while a low vowel cannot have a place specification in Könni, a non-low vowel must have one. Once ATR spreads to a vowel, that vowel must have some height (gaining a [closed] feature), and when it gains [closed], it must have a Place specification. The process could be repeated for words like *dun-e-he* 'the knees' (see (3)) which have two suffixes. The [ATR] would first spread to the plural suffix /-a/, then to the definite article suffix /-ha/, changing both suffixal vowels to [e] by means of the rules discussed above.

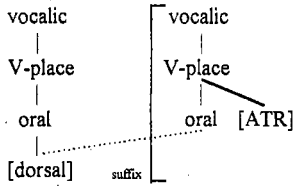
For a [-ATR] form, such as *tɪr-ka* 'the tree,' there is no [ATR] present, and so the conditions for ATR Spread are not met. [coronal] default cannot apply, since there is no [closed] associated with the suffix vowel /a/. Therefore, the /a/ remains [a].

2.2.2 [dorsal] Spread

Recall that if /a/ is in a suffix following an ATR stem and preceded by either /u/ or /w/, it changes to [o], in words like *tu-o* 'is digging', *digi-wo* 'cooked.' This contrasts with the same suffixes following non-ATR stems such as *kò-á* 'is killing' and *gá-ʷá* 'went' (see 4). The process consists of spreading the feature [dorsal] from a vocalic segment to an empty Oral node under V-Place in a suffix:

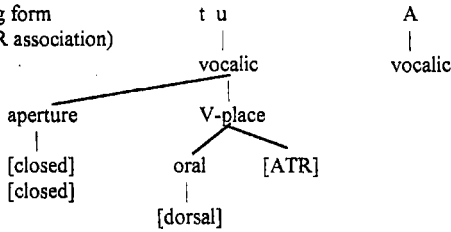
⁷ The epenthetic vowel shows up in loan words (e.g. 'socks' is [sɔkɪsɪ], 'pump' is [pɔmpɪ]). Second, noun plurals provide additional evidence. [daŋɪ/daatɪ] 'stick/s' shows /-ŋ/ is the singular suffix and /-tɪ/ the plural in this class. [tɪgɪɪ/tige] has a different class plural [-e], but its singular suffix here has /ɪ/ inserted to avoid a consonant cluster. Finally, tonal evidence can support an epenthetic vowel in some nouns. Consider [dembɪŋ/dembɪkɛ] 'man/men.' In my present analysis, the [ɪ] is epenthetic, there is a lexical Low tone on the root, and the final High tones in each word come from the suffix, either /-ŋ/ or /-tɪ/. In *dembɪŋ*, the Low is on the root and the High docks to the second syllable. In *dembɪkɛ*, the High from the suffix associates there, rather than the second syllable. The second syllable is formed when epenthesis occurs, and the Low is inserted by an independently required rule of Low default (see Cahill 1995b).

(20) [dorsal] spread (note: vocalic segments must be adjacent)

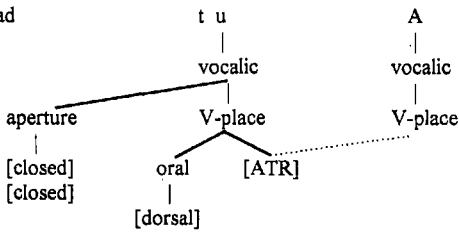


The [ATR] on the suffix above comes from spreading ATR from the stem, not from any inherent value of the suffix itself. The following shows how *tu-o* 'took' would be derived using the model above.

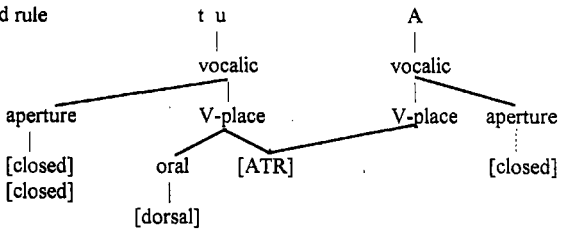
(21) Underlying form
(after ATR association)

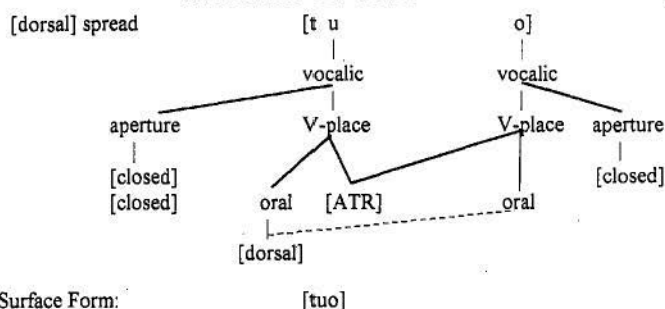


ATR Spread



ATR/closed rule





Note that Coronal Default cannot apply here, since the oral place node is not empty.

In *digi-wo*, ATR must spread from the *i* in the root, and [dorsal] from the *w* in the suffix itself, again emphasizing the independence of the two spreading rules.

2.2.3 Left-Spread of ATR

The only other area to explain within words is the leftward spreading of ATR from an ATR adjective into a non-ATR noun stem, and the lack of spreading in the reverse situation (data repeated from (5-6)):

(22) a. no spreading:

- | | |
|------------|------------------------------|
| jùd-háá'íŋ | 'new room' (lit. 'room-new') |
| ném'bí-kúŋ | 'big bird' (lit. 'bird-big') |

b. spreading:

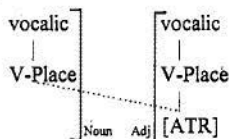
- | | |
|----------|--|
| né-bij | 'small cow' (cf. náág'íŋ 'cow', náá-kpí'ŋ 'big cow') |
| jè-vùkiŋ | 'snake' (lit. 'thing wriggling'; cf. jáán 'thing') |
| kùd-bij | 'small hoe' (cf. kùáŋ 'hoe') |
| múgú-bíŋ | 'small river' (cf. múgúŋ 'river') |

ATR spreads only into noun stems, and not into the other adjective type, as shown by:

- (23) tígí-yééŋí-bí-sì 'small white houses'
house-white-small-PL

Above, the morphemes that are lexically specified for ATR are underlined. The suffix *-si* is ATR by the normal spreading process discussed above, but *yééŋí* is unaffected by ATR spread, though flanked by ATR morphemes. Recall also that ATR does not spread from one noun to another in compound nouns, e.g. *nìŋm-bó'ŋíŋ* 'lightning' ('rain-fire', from (8)). The rule for spreading ATR from an adjective to the root noun, then, must specify both adjective and noun, and can be formulated as:

(24) ATR Left-Spread



This would be an iterative-type application, spreading ATR onto all the vowels of a noun stem, as in *múgú-bîŋ* 'small river' above (cf. *múgúŋ* 'river'). A number of alternative formulations of this rule could be outlined, possibly interacting with morphological levels. For example, one approach would be that a general rule of left spreading applies at the level at which the adjectives are added to the stem. I have no evidence at this point that would be conclusive in choosing between various alternatives, so I leave the formulation above.

2.3 Summary

To sum up, in the feature geometric approach outlined here:

- ATR is a privative, morphemic-level feature, and spreads within a stem to all vowels.
- Any [ATR] vowel must have at least one feature of [closed] associated to it. If [closed] is not present when ATR spreads to a suffix, one will be inserted.
- A rule of ATR Spread spreads [ATR] to a suffix.
- A rule of [dorsal] Spread spreads [dorsal] from /u,w/ to /A/ in a suffix.
- [coronal] place is inserted by default if there is no [dorsal] present, when there is at least one feature of [closed] present.
- ATR spreads leftward from an adjective to all vowels of the adjacent head noun.

3. Discussion

One of the ways in which languages with vowel harmony vary is the behavior of "neutral" vowels with respect to the vowels of one or the other harmonic set in the same word. In some languages, a neutral vowel is 'transparent,' with its value of ATR not affecting any of the surrounding vowels. In other languages, e.g. Akan, a neutral vowel such as /a/ acts as an 'opaque' vowel with respect to ATR. It starts a new harmony domain, any vowels to the right of /a/ being [-ATR], but those to the left being from either set (Hulst & Smith 1986). Similarly, in Turkana, /a/ also has the same opaque behavior (Vago & Leder 1987).

In contrast to the above cases, the model I have proposed above predicts that in Kɔnni, [a] would never occur in the same monomorphemic word with a [+ATR] vowel. To see why this is so, imagine words such as [bita] and [batu]. In these words, or any like them, /a/ has no underlyingly specified features. The [ATR] spreads automatically to all

vowels in the word. But when [ATR] has spread, the linking rule that supplies a [closed] value comes into play, and /a/ becomes [e] or [o]. Therefore, [a] would not be expected to occur in any word together with a [ATR] vowel. In actual fact, there is only one non-compound word in my data where [a] does occur with a [+ATR] vowel: gaanlun 'cat.' Compound words, with the possibility of each word contributing its own value of [ATR], have been mentioned above in Sec. 1.1. The probability is that gaanlun was a historically compound word, bringing both negative and positive values of [ATR], but the component morphemes have been lost in people's consciousness. For a more detailed treatment of single morphemes which must be treated as phonologically compound words in another Gur language, see Garber (1991). The lack of [a] and [+ATR] vowels occurring in single words thus affirms the analysis that /a/ is unspecified for any place or height features.

I close with an interesting implication of using [closed] rather than [open] to indicate vowel height. This is that /a/ rather than /i/ is the unspecified vowel. This is an interesting analysis in that it claims that the *maximally underspecified* vowel is not the *epenthetic* vowel. In terms of underspecification studies, particularly Radical Underspecification (Archangeli and Pulleyblank 1989, Pulleyblank 1986, *inter alia*), this is an unexpected result.

REFERENCES:

- Archangeli, Diana, and Douglas Pulleyblank. 1989. Yoruba vowel harmony. *LI* 20:173-217.
- Archangeli, Diana, and Douglas Pulleyblank. 1994. *Grounded Phonology*. Cambridge, Mass.: MIT Press.
- Cahill, Mike. 1992a. The Case of the Missing Könni 'P'. *Journal of West African Languages* XXI, 1:15-24.
- Cahill, Mike. 1992b. *A Preliminary Phonology of the Könni Language*. Institute of African Studies, University of Ghana, Legon.
- Cahill, Mike. 1992c. *Vowel Harmony in Könni*. Paper given at Linguistic Association of Ghana meeting, Kumasi, November 1992.
- Cahill, Mike. 1994. *Diphthongization and Underspecification in Könni*. In *UTA Working Papers in Linguistics* 1:109-126.
- Cahill, Mike. 1995a. *Nasal Assimilation and Labiovelar Geometry*. Paper presented at 26th ACAL, UCLA.
- Cahill, Mike. 1995b. *Tone in the Könni Nominal*. ms.
- Casali, Roderic. 1988. *Some Phonological Processes in Nawuri*. MA thesis, University of Texas, Arlington.
- Clements, G.N. 1991. *Place of articulation in consonants and vowels: A unified theory*. In *Working Papers of the Cornell Phonetics Laboratory*, Vol. 5. 77-123.
- Clements, G.N. and Elizabeth V. Hume. 1995. *The Internal Organization of Speech Sounds*. In Goldsmith, John (ed.) *The Handbook of Phonological Theory*. Cambridge, MA: Basil Blackwell, Ltd.
- Dolphyne, Florence. 1988. *The Akan (Twi-Fante) Language: Its Sound System and Tonal Structure*. Accra: Ghana Universities Press.
- Garber, Anne. 1991. *The Phonological Structure of the Senufo Word (Sicite)*. *Journal of West African Languages* XXI, 2:3-20.
- Halle, Morris. 1989. *The intrinsic structure of speech sounds*. ms., MIT.

- Halle, Morris. 1992. Phonological Features. In W. Bright (ed.), *Oxford International Encyclopedia of Linguistics*. Vol. 3. New York: Oxford University Press. 207-212.
- Hulst, Harry van der, and Norval Smith. 1986. On Neutral Vowels. In Koen Bogers, Harry van der Hulst, and Maarten Mous (eds.) *The Phonological Representation of Suprasegmentals*. Dordrecht: Foris. 233-279.
- Hume, Elizabeth. 1994. *Front vowels, coronal consonants, and their interaction in nonlinear phonology*. New York: Garland.
- Hyman, Larry. 1988. Underspecification and vowel height transfer in Esimbi. *Phonology* 5:255-274.
- Lindau, Mona. 1975. [Features]for Vowels. (UCLA Working Papers in Phonetics 30). Ph.D. dissertation, UCLA.
- McCarthy, John. 1994. The phonetics and phonology of Semitic pharyngeals. P. Keating (ed.), *Papers in Laboratory Phonology III*. London: Cambridge University Press.
- Mohanan, K.P. 1991. On the bases of radical underspecification. *Natural Language and Linguistic Theory* 9:285-325.
- Naden, Tony. 1987. *Premiere note sur le kɔnni*. *Journal of West African Languages* XVII.2:76-112.
- Naden, Tony. 1989. Gur. In Bendor-Samuel, John (ed.), *The Niger-Congo Languages: University Press of America*. pp. 140-168.
- Odden, David. 1991. Vowel Geometry. *Phonology* 8:261-289.
- Parkinson, Frederick. 1996. Vowel Height Assimilations in African Languages: Implications for the Description of Vowel Height. Paper presented at the 27th Annual Conference on African Linguistics, University of Florida.
- Pulleyblank, Douglas. 1986. Underspecification and Low Vowel Harmony in ɔkpe. *Studies in African Linguistics* 17:119-153.
- Vago, Robert M., and Harry Leder. 1987. On the Autosegmental Analysis of Vowel Harmony in Turkana. In Odden, David (ed.) *Current Approaches to African Linguistics* (vol. 4). pp. 383-396.

APPENDIX: Harmony Across Words

Though this paper concentrates on ATR harmony within words, the data below are presented for the sake of completeness.

The subject and object pronouns agree with the verb in ATR:

(25)	+ATR	-ATR	
ù yè-yé	'he has seen'	ò yì-yá	'he has given'
bè yè-yé	'they have seen'	bà yì-yá	'they have given'
h̄ yé fù	'I saw you (sg)'	h̄ yí fù	'I gave you (sg)'
h̄ yé ni	'I saw you (pl)'	h̄ yí ni	'I gave you (pl)'
h̄ yé wò	'I saw him'	h̄ yí wà	'I gave him'
h̄ yé bè	'I saw them'	h̄ yí bà	'I gave them'
h̄ yé kè	'I saw it'	h̄ yí kà	'I gave it'

The negative particle /kA/ coming between subject and verb also agrees in ATR with the verb root:

(26) hòwwá kè yé wò	'The woman did not see him.'
bè kè yé wò	'They did not see him.'
bà ká yí wà	'They did not give him.'
biikú ká yí wà	'The goat did not give him.'

In noun phrases, where two words with different values of ATR are adjacent, each keeps its own ATR:

(27) jùné chfà	'foundations' ("rooms' bottoms")
násá'rá júón	'white man's room'
tá'sín sikipén	'top of pan' ("pan's head")

Similarly, when two verbs adjoin in a serial verb construction, each has its own value of ATR (tones on verbs will vary with exact context):

(28) h̄ kèn mɪŋa ...	'I come know...' (recognize)
ti nèn díí kòmá mɪŋ	'We will eat crying' (mourn)
<u>náá chíí</u>	'Have carry!' (put it on your head)
<u>hágí túò</u>	'Get-up take!' (go help!)
h̄ gá sùgùrì gáátí	'I go wash clothes.'

There are a few cases in which ATR appears to spread from one verb to another:

(29) ge ye ...	'go see...' (cf. ga 'go')
ge keŋ ...	'go come...'

However, the conditions for spreading are not clear at present, as the case *yaa ga ziele* 'have go stand' shows. At this point, all that can be claimed with certainty is that ATR spread across verbs is very limited in scope and frequency.

An interesting question is what happens when a pronoun comes between serial verbs having opposite values of ATR. The pronoun agrees in ATR with the first verb:

- (30) tɪ yaa ba kiej 'We brought them.'
 1p have 3p come
- be to be dua 'They laid them down.'
 3p take 3p lie down

The domain of ATR can stretch over a phrase with several particles:

- (30) ← [-ATR] → → ← [+ATR] →
- dí ká yá kà kè nyindíké "That (you) do not give it its food."
 that NEG give it it food

As seen above, particles of various sorts, like the suffixes, are also unspecified for ATR and take their value from a nearby lexical morpheme. Occasional spreading of ATR across verbs has been observed, but not across nouns.⁸

⁸ There are also cases like the following, which is more properly analyzed as a case of elision and compensatory lengthening:

dùné !átá → [dùná !áta] 'three knees'
 kpíínè àtá → [kpíínà àtá] 'three guineafowls'

In the similar item *bié !átá* → [bíá !áta] 'three goats,' an unresolved question is whether the final phonetic form includes [bia] or [bía].