Bantu Tone spreading and displacement as alignment and minimal misalignment

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0. Introduction

A rigorous examination of tonal phenomena initiated revolutionary changes in phonological theory in the 1970's, ultimately resulting in the adoption of a non-linear autosegmental approach to tone. While subsequent research has shown that the mechanisms and tools developed to account for tone can be profitably extended to non-tonal phenomena, tone still possesses a residue of idiosyncratic properties not shared by non-tonal features for which any theory of phonology must account for. These include, e.g., cases in which every tone in the word shifts one Tone Bearing Unit (TBU) in a certain direction (e.g. Kikuyu), or certain tenses being marked by the assignment of a High tone to some TBU of the stem (e.g. the first for certain tenses, the second for other tenses, and the final for yet other tenses.) Nontonal parallel counterparts to these types of phenomena have yet to be found.

In this paper, I examine an array of tonal phenomena attested in a variety of Bantu languages, focusing on those which have no non-tonal counterpart. For the most part, I will limit myself to discussing "Narrow Bantu" type systems in which only High tones are present underlyingly.[1] I utilize a small number of arguably universal constraints which depending on their ranking yield the attested tone patterns. I crucially rely on the interplay between ALIGN and *ALIGN constraints, which I propose must be able to target not only edges, but the edges of peripheral feature bearing units. The ALIGN and *ALIGN constraints sometimes relate output High Tone Spans (HTS) to morphological constituents and sometimes relate the input and output of a single HTS. Give this latter point, I propose that ALIGN and *ALIGN can be formalized in such a way as to fit into (a slightly modified form of) McCarthy's (1995) constraint schema used to account for rule opacity effects. Finally, I contrast this proposal where appropriate to other analyses (of both OT and derivational varieties) of similar phenomena. My approach differs from others found in the literature in two mains ways. First, my account of the Bantu phenomena discussed here does not necessitate any overlay of metrical structure (although nothing I propose here would prohibit the use of metrical constituents in a tone language). Second, my approach makes no explicit reference to association lines themselves.

The outline of the paper then, is as follows. In section 1, I outline the basic tenets of Optimality Theory which I will be assuming. In section 2, I examine both bounded and unbounded spreading and displacement of both linked and floating tones, and introduce the use *ALIGN to effect "minimal misalignment". In section 3, I extend the present analysis to cases involving multiple High tones in a single form. In section 4, I show how the (*)ALIGN constraints can be characterized in the constraint schema formalism introduced in McCarthy (1995). In section 5, I contrast the use of *ALIGN with NON-PERIPHERALITY, and in section 6, I summarize and conclude.

1. Optimality Theory: basic principles and assumptions

Within Optimality Theory, instead of deriving surface forms from underlying representations via the serial application of a number of phonological rules, a form is grammatical if it satisfies a ranked set of constraints better than any other possible candidate. The candidate set consists of forms created from a given input form by GEN, the component which generates permutations of the input. With respect to tone, it is assumed that GEN can manipulate both tonal autosegments and how they are related to TBU's. Thus, minimally, GEN can add and delete tones, as well as extend or reduce the number of TBU's which bear that autosegment.

While the set of well-formedness constraints is considered to be universal, the constraints are violable and languages differ in how these constraints are ranked with respect to each other. The form judged to be grammatical is the one that is more harmonic or optimal than any other. Specifically a candidate C_x is more optimal than a candidate C_y if the highest ranking constraint which differentiates them (i.e. for which their violations are distinct) is violated more seriously by C_y. C_y violates a constraint more seriously than C_x if 1) C_y violates the constraint in any fashion and C_x does not or 2) if C_y violates a gradient constraint more egregiously than C_x. Examples of each will be examined below.

In the discussion that follows, I will assume the theory of Correspondence outlined in McCarthy & Prince (1995). This theory accounts for the fact that in the absence of an overriding constraint, an input representation does not change. I present two principal constraint families below:

(1) a. MAX-IO (X): Every element of type X in the input has a correspondent in the output.

b. DEP-IO (X): Every element of type X in the output has a correspondent in the input.

I understand element here to be either a segment, or floating subsegment (cf. Zoll (1996)). In simple terms, MAX-IO penalizes the deletion of any element and DEP-IO penalizes any insertion. In order to penalize feature changing, we rely on IDENT, given below.

(2) IDENT(F)

Correspondent segments have identical values for the feature F.

If x and y are segments and x is [ɣF] and xRy, then y is [ɣF]

As given in McCarthy & Prince (1995) this would assign a penalty both in cases where 1) a TBU bearing an H in the input no longer bears an H in the output and 2) a TBU not bearing an H in the input bears an H in the output. I will demonstrate below that these penalties must be distinguished.[2] Therefore, we follow Orgun (1995, 1996) and Zoll (1996) in proposing that this penalty is only incurred in cases of absent or differing specifications, but not when the output correspondent is more specified than the input—here, then, it will only assign a penalty when input H-toned TBU surfaces as toneless. (The penalization of added features is discussed below.) This kind of interpretation certainly assumes that, in the case here, Low tones are unspecified. This assumption found overwhelming support in the entire (derivational) literature on Narrow Bantu tone (cf. Clements & Goldsmith 1984, Pulleyblank 1986, Goldsmith 1990).

McCarthy & Prince (1995) note that the theory of correspondence can be used not only to relate input elements with output elements, and base elements with reduplicant elements, but can also be used to relate tones and tone bearing units. Their proposals in this regard are given below.

(3) DEP-ET (M&P (1995)) (=*FLOAT)

Every tone must have a correspondent TBU

(4) MAX-ET (M&P (1995)) (=SPECIFY (T))

Each TBU must have a correspondent tone

In the discussion which follows, for heuristic reasons I choose to refer to these two constraints under the more mnemonic names of *FLOAT and SPECIFY (T) respectively.

Let us begin by examining a hypothetical case where no spreading or delinking takes place on a linked H, using the constraints motivated above. The input form is shown above each tableau. Crucial rankings are shown below. Association lines are used as an aid to the reader, but, as will be apparent as we proceed, the relationship between tones and TBU's could just as easily be specified by other means as well (e.g. co-indexing of the type proposed in Hayes (1990), or bracketed feature spans.

(5) Default: maximum faithfulness

CVCVCVCV
|
H

Candidates	*FLOAT	MAX-IO (T)	IDENT (H)	DEP-IO (T)	SPEC(H)
a. ☞CVCVCVCV | H					***
b. CVCVCVCV H	*!		*		****
c. CVCVCVCV		*!	*		****
d. CVCVCVCV | H			*!		***
e. CVCVCVCV | | H H				*!	**

DEP-IO(T) >> SPEC(H)

All the candidates but (a) violate some constraint in addition to SPEC(H). In (5b) the H is floating. In (5c) the tone has been deleted, violating MAX-IO (T). In (5d) the High has been displaced to the TBU to the right, violating IDENT(H). Finally, in (5e) an additional H has been inserted, violating DEP-IO (T). I note here that *FLOAT and MAX-IO (T) have distinct functions. A possibility which naturally arises is whether both (5b) and (5c) could be seen as violations of a single constraint. The problem with this assumption is that it will fail to crucially distinguish candidates involving floating Low tones which induce downstep. For instance, Hyman (1987) discusses the fact that certain Aghem roots induce a downstep on a following suffix, while other roots do not. This is seen below.

(6) Aghem (Hyman 1987): Roots contrast wrt triggering downstep

a.	fú-kɨ́n	'this rat'
b.	bɛ́-ꜜkɨ́n	'this fufu'

Hyman follows Pulleyblank (1986) and others in adopting a representation of, e.g. a downstepped H, as a High preceded by a floating Low tone. Hyman accounts for the forms in (6), then, by positing an underlying floating Low tone after certain roots. Given both MAX-IO(T) and *FLOAT(T) (this time applied to Low rather than High) candidates (6a) and (6b) can be properly distinguished as shown below.

(7) Roots which induce downstep

CV CV
| |
H L H

Candidates	MAX-IO (L)	*FLOAT (L)	IDENT (L)
a. ☞ CV CV | | H L H		*	
b. CV CV | | H H	*!		

We note that if the deletion of L and the non-linking of L were both violations of some single constraint, then the two candidates would each incur one asterisk from that constraint and would not be able to be distinguished.

Let us return now to the issue of feature changing. We noted above that we will interpret IDENT as only penalizing cases where an input feature (in this case H) on some TBU is not realized on that TBU in the output. We therefore still need a way to penalize an input toneless TBU from surfacing as H-toned, as the lack of such a constraint prevents us from discouraging spread where such is necessary. This is illustrated below.

(8) CVCVCVCV
|
H

Candidates	*FLOAT	MAX-IO (T)	IDENT (H)	DEP-IO (T)	SPEC(T)
a. CVCVCVCV | H					***
b. ☞ *CVCVCVCV \ / H					**

Myers (1996) penalizes spreading with a DEP-I/O constraint applied to association lines, requiring that associations in the output have a correspondent in the input. Similarly, proposals have been made such as *SPREAD (Itô, Mester, Padgett 1993), and FILL-LINK (Itô, Mester, Padgett 1995). While this is one possible approach, one wonders whether direct reference to association lines in constraints is the best or only possible approach. The non-reliance of association lines is a central tenet, e.g., in Domains Theory as proposed by Kisseberth (1993) and Cole & Kisseberth (1994) which has been utilized in accounting for a variety of harmony processes. Let us consider, then, constraints which refer to either High tones or to Feature Spans, but do not rely on correspondence of association lines themselves. As noted above, I will make use of association lines in the input forms and the candidates for ease of exposition, but in each case they simply convey which TBU's are High toned, and in some cases where there are two High autosegments, which High-toned TBU belongs to which one. Returning to the problem at hand, then, how can we prevent the spreading of an input H? One approach which would work if the HTS is a single TBU would be a constraint such as MONO-SPAN, given below. (This is tantamount to previously proposed constraints which refer to association lines such as (*MULTIPLE LINK)).

(9) MONO-SPAN (MS)

A HTS cannot be more than one TBU

We see below, that in the event the H in the input is borne by only one TBU, this will effectively block spreading.

(10)
```
CVCVCVCV
  |
  H
```

Candidates	MS	SPEC(T)
a. ☞ CVCVCVCV | H		***
b. CVCVCVCV \ / H	*	**

However, in the case where the H is multiply linked in the input, MS fails to predict the correct output form.

(11)
```
CVCVCVCV
   \  /
    H
```

Candidates	MS	SPEC(T)
a. CVCVCVCV \ / H		**
b. ☞ *CVCVCVCV \ | / H		*

Another possible approach is to define a constraint which is essentially the inverse of IDENT, penalizing cases where a segment does not bear a feature in the input, but does in the output. This is dubbed as *ADD-FEATURE in (12), and is illustrated in (13).

(12) *ADD-FEATURE

If x and y are segments and x is [øF] and xRy, then y is [ɣF]

(13) CVCVCVCV
\ /
H

Candidates	*FLOAT	IDENT (H)	MAX-IO (T)	DEP-IO (T)	*A-F	SPEC(T)
a. ☞ CVCVCVCV \ / H						**
b. CVCVCVCV \ | / H					*!	*

*FLOAT, IDENT(H), MAX-IO(T), DEP-IO(T), *A-F >> SPEC(T)

Yet another approach would be to invoke a constraint which simply penalized every TBU which bears a High. This is essentially inverse of SPEC (T) for languages with only one underlying tone. This constraint seems independently necessary on the basis of establishing a cross-linguistic markedness hierarchy along the lines of non-tonal features discussed in Prince & Smolensky (1993).

(14) *H

A TBU cannot be High-toned

This will correctly prohibit the spread of H, as seen below.

(15) CVCVCVCV
|
H

Candidates	*FLOAT	IDENT (H)	MAX-IO (T)	DEP-IO (T)	*H	SPEC(H)
a. ☞ CVCVCVCV | H					*	***
b. CVCVCVCV \ / H					**!	**
c. CVCVCVCV H	*!					****

*H >> SPEC(H)

For the purposes of this paper I will employ *H to prevent spread, but note here that ADD-FEATURE could also be used.

The constraints discussed above, then, if ranked in the manner shown, can effectively insure the default state of the output being identical to the input. There is, however, one additional tonal case which could profitably be discussed here. Odden (1986) discusses cases, such as Kishambaa, where downstep occurs between adjacent TBU's linked to distinct Highs.

(16) nwáná ‘child’ + dú ‘only’ → nwánáꜝdú ‘only child’

ní-kí + chí-kóm-á → ní-kí-ꜝchí-kóm-á ‘I was killing it’

A schematic case is given below.

```
(17)    CVCVCVCV  →      [Cv́Cv́ ꜝCv́Cv́]
          \ /    \ /
           H      H
```

Odden points out that while it is possible to formulate an additional rule which would insert a floating Low between adjacent H’s in such cases, such a process is otherwise unmotivated and serves only to insure adherence to the OCP. He therefore advocates another possible representation of downstep—one which occurs between any two adjacent TBU’s linked to distinct H’s. While Myers (1996) DEP-I/O and MAX-IO as applied to association lines can distinguish between (18a) and (18b), it is clear that *H (14) (or *A-F (12)) cannot, as seen in (19).

```
(18)    CVCVCVCV  [Cv́Cv́ ꜝCv́Cv́]
          \ /    \ /
           H      H
```

Candidates	IDENT (H)	MAX-IO(A)	DEP-IO (A)	SPEC(T)
a. ☞CVCVCVCV \\/ \\ / H H				
b. CVCVCVCV \\ | / | H H		*	*	

```
(19)    CVCVCVCV  [Cv́Cv́ ꜝCv́Cv́]
          \ /    \ /
           H      H
```

Candidates	IDENT (H)	*H	SPEC(T)
a. CVCVCVCV \\ / \\ / H H		****	
b. CVCVCVCV \\ | / | H H		****	

We therefore propose that IDENT be reformalized to assign penalties based upon a FBU’s membership in particular feature spans. This is given below:

(20) IDENT’ (F)

If x is a segment in [ɣF]-span$_i$ and xRy, then y is a segment in [ɣF]-span$_i$

This reformalized constraint can distinguish between the candidates as illustrated in the tableau below.[3]

```
(21)     CVCVCVCV
           \ /   \ /
            H     H
```

Candidates	IDENT' (H)	*H
a. ☞ CVCVCVCV \ / \ / H H		
b. CVCVCVCV \ | / | H H	*	

2. Bounded and unbounded displacement and spreading in Bantu

Now that we have presented a way to account for maximal faithfulness of the input, let us turn to cases of dynamic interaction of tones and TBU's, specifically, tone docking, tone spreading and tone displacement.

2.1 Brief overview of Bantu Tonology

First, let us outline a couple of tonal generalizations across Bantu. First, we note that the contrastiveness of tone within verbs is often different than that within nouns. Historically, Bantu verb roots were only tonally contrastive on the root-initial TBU whereas every TBU of a noun was tonally contrastive (cf. Guthrie 1971). It is not surprising, then, that synchronically Bantu verb roots typically exhibit only a two-way tonal contrast, with a predictable surface High tone pattern varying with the language.[4] There are many Bantu languages which generally mirror the historical pattern in this respect. One of these, Haya, is shown below. (*oku-* is the infinitival marker; *-a* is an aspect/mood marker.)

(22) Haya toneless and High-toned verb roots (Byarushengo 1977)

oku-banz-a	'to begin'	oku-léet-a	'to bring'
oku-hindul-a	'to deflect'	oku-hángu-a	'to be big'
oku-lagaan-a	'to promise	oku-tékelez-a	'to think'

The analytical question which arises here is whether the H-tone in the root is a feature of the root-initial TBU (= "prelinked") or is floating morpheme level feature which predictably gets associated with the stem/root-initial TBU. (Another way to talk about this is whether the High tone is 'sponsored' by the TBU or the morpheme.) As there does not seem to be a consensus in the field as to how much predictable information should be present in the lexicon, we will provide an account below which will handle both cases (of prelinked and floating tones).

A somewhat clearer case for floating Highs in Bantu can be made regarding what is referred to as a grammatical or suffixal High, which is assigned by various tenses. This floating grammatical High docks onto some TBU within the verb. Previous studies of Bantu languages showing that certain tenses assign a grammatical High tone to some TBU at a fixed position in the stem (e.g. the initial, the second, the penultimate or final, depending on the tense) include Goldsmith (1987) on various Lacustrine Bantu languages, including KiHunde, Bukusu, Haya, Luganda & Shi; Odden (1988) on Kinga, Safwa, Hibena-Kihehe, Kimatuumbi, Makua and Kikuria; Hyman & Katamba (1993) on Luganda; Hubbard (1994) on Runyambo & Kikerewe; Hyman & Ngunga (1994) on Ciyao; Hewitt and Prince (1989) on Shona.[5]

This verbal tonology often contrasts with Bantu nominal tonology where the location of the High tone can be contrastive. Guthrie (1971) clearly shows, e.g. that in Proto Bantu CVCV nominal roots, all four logical tone patterns are attested: i.e. LL, LH, HL, HH. This tonal contrastiveness in location can be seen below in Ekegusii (which, as noted above, exhibits bounded spreading).

(23) Ekegusii Nouns (Roots are preceded by noun class prefixes.)

a.	ó-mò-gànò	‘story’
	é-gè-tàmàsè	‘scar’
	é-bààswèètì	‘python’
b.	é-kè-ró̲gó	‘chair’
	ó-mò-nyí̲rírà	‘drizzle’
	é-gè-tá̲báràmàtò	‘bat’
c.	rí-kùné̲ní	‘bean leaf’
	ó-bò-ìsé̲rú	‘need’
	é-sùrú̲áàdì	‘shorts’
d.	ó-rò-gùùnchá̲rá	‘horn’

The roots in (23a) are toneless while the roots in (23b-d) have a High tone on two subsequent TBU’s where the High tone span can begin at various points in the noun root. The surface patterns in each case can be accounted for if we assume that the High is a feature of (= “prelinked to” or “sponsored by”) the first TBU in (23b), the second TBU in (23c) and the third TBU in (23d). Bounded spreading will apply in each case, yielding the patterns seen above. It is unclear how (23b-d) would be differentiated were the High tones morpheme level floating features.

With that brief introduction to general Bantu tonology, let us now examine individual cases of bounded and unbounded spreading and docking. We will examine these tonal phenomena as they play out in verbs, and cover both possibilities that the High is floating as well as prelinked. I note here that is goes without saying that the tonal phenomena to be accounted for below represent only gross tendencies in the languages to be discussed. I expect that in each case there will be other constraints ranked between or above those which I will propose which will obscure these patterns in certain instances. Still, in each case I argue the overarching patterns can be insightfully accounted for with this proposal.

2.2 Unbounded Displacement

The phenomenon of unbounded displacement is illustrated by Digo in (24), where the H on the verb root is displaced to the word-final vowel. (Data taken from Goldsmith 1990; *ku-* is infinitive marker; *-a* is aspect/mood marker).[6]

(24) Unbounded displacement in Digo (Goldsmith 1990)

ku-rim-a	‘to cultivate’	ku-reh-á	‘to bring’
ku-vugir-a	‘to untie’	ku-puput-á	‘to beat’
ku-gandamiz-a	‘to press’	ku-gongome-á	‘to hammer’

To account for this feature movement we invoke general alignment constraints on feature spans, in this case High Tone Spans (HTS), aligning them with the edge of some prosodic constituent, in this case the prosodic word.

(25) ALIGN (H,R,PW,R) (Cf. Kisseberth 1993, Akinlabi 1994, Padgett 1995)

The right edge of a HTS must align with the right edge of a prosodic word

This constraint will induce unbounded displacement as shown below. (Brackets will be used to mark the left edge of the morpheme contributing the High tone, in this case the verb root).

(26) CV[CVCVCV
|
H

Candidates	*FLOAT	AL(H,R)	*H	IDENT (H)	SPEC (H)
a.☞ CV[CVCVCV | H			*	*	***
b. CV[CVCVCV H	*!				****
c. CV[CVCVCV | H		**!	*		***
d. CV[CVCVCV | H		*!	*	*	***
e. CV[CVCVCV \ | / H			***!		*

AL (H,R) >> IDENT ; *FLOAT >> *H >> IDENT(H), SPEC

Candidate (26b) is not optimal as it violates *FLOAT. (26c), the candidate which is most faithful to the input, violates AL(H,R) which insists that the right edge of the output HTS be aligned with the right edge of the word. (26d) also violates this constraint, though not as egregiously. Finally (26e) does not violate AL(H,R), but incurs a stiffer penalty from *H, as there are two output High-toned TBU's.

We note here that a floating H in the input could be accounted for with exactly the same ranking of constraints, the only difference being that IDENT (H) will not be violated as the H had no affiliation to any particular TBU in the input.

(27) CV[CVCVCV V$_f$ Docking

H

Candidates	*FLOAT	AL(H,R)	*H	IDENT (H)	SPEC (H)
a.☞CV[CVCVCV | H			*		***
b. CV[CVCVCV H	*!				****
c. CV[CVCVCV | H		*!	*		***
d. CV[CVCVCV | H		**!	*		***
e. CV[CVCVCV \ / H			**!		**

*FLOAT >> *H >> SPEC

We note here that the Haya data presented above in (22), where a High tone winds up on the left edge of the stem rather than the right edge, would be accounted for in exactly the same way (with a left alignment constraint rather than a right one).[7]

2.3 Unbounded Spreading

Next, let us consider how to induce unbounded tone spreading (in this case to the right). Such spreading can be seen clearly in the Chilungu verbal paradigms below, where an underlying H spreads rightward in an unbounded fashion, subject only to word-final extraprosodicity (cf. Bickmore & Doyle 1995). As can be seen below, this unbounded spreading can be seen to affect the H on the infinitival prefix /ku-/, attached to toneless roots in the left-hand column, as well as the High on verb roots in the right-hand column. (The raised exclamation point in the forms on the right indicates a tonal downstep. Only the unbounded nature of the High spreading will be accounted for here.)[8]

(28) Unbounded rightward spread in Chilungu (subject to word-final extraprosodicity) of /kú/ and verbal H.

kú-vúl-à	'to be enough'	kú-$^{!}$vúl-à	'to inquire'
kú-víímb-à	'to thatch'	kú-$^{!}$víímb-à	'to swell'
kú-fúlúmy-à	'to boil over'	kú-$^{!}$físám-à	'to hide'
kú-sáákúl-à	'to comb'	kú-$^{!}$físám-ír-à	'to hide for'
kú-sóóbólól-à	'to sort out'	kú-$^{!}$páápáátík-à	'to flatten'

To account for unbounded spreading of this kind we again assume the constraint in (25) requiring that an output HTS be aligned with the right edge of the word. The crucial difference between unbounded displacement and unbounded spreading of linked H's involves the ranking of *H and IDENT (H). Whereas reducing the number of H-toned TBU's is more important than preserving an input H-toned TBU in displacement, the reverse is true in spreading.[9] Finally, in the account of spreading, we assume a constraint prohibiting "gaps" within a HTS, such as the one proposed in the literature given in (29). A case of unbounded rightward spread (with no extraprosodic considerations) is illustrated in the tableau in (30).

(29) NO GAPPING (Kiparsky 1981, Kirchner 1993, A&P 1994)

```
*CVCVCV
    \     /
      H
```

(30) CV[CVCVCV Unbounded Spreading

```
CV[CVCVCV
      |
      H
```

Candidates	*GAP	IDENT(H)	AL(H,R)	*H	SPEC (H)
a. ☞ CV[CVCVCV \ | / H				***	*
b. CV[CVCVCV \ / H	*!			**	**
c. CV[CVCVCV | H		*!		*	***
d. CV[CVCVCV | H			*!*	*	***
e. CV[CVCVCV \ / H			*!*	**	**
f. CV[CVCVCV \ / H			*!	**	**
g. CV[CVCVCV \ \ / / H				***!*	

*GAP, IDENT(H), AL(H,R) >> *H >> SPEC (H)

Candidate (30c), representing the displacement case is not optimal here as IDENT(H) is ranked more highly than *H. Candidates (30d-f) are ruled on as the right edge of the output HTS is not aligned with the right edge of the word. (30g) is worse than the optimal candidate only because of gratuitous leftward spreading of the High which results in a worse violation of *H.

What if we assume that the High in cases like (30) is floating? For cases of the High contributed by the verb root, we could insure that the left edge of its output HTS is aligned with the left edge of the stem, using the constraint below.

(31) ALIGN (H,L,S,L)

The left edge of a HTS must align with the left edge of the stem

We must consider the possibility, however, that the High tone on the infinitival /ku-/ in (28) is also floating, as its output location is also predictable.[10] We assume, then, a constraint (taken from Ham 1996) which insures that the left edge of the output HTS is aligned to the leftmost TBU of its lexical source/sponsor.

(32) ALIGN (H,L,So,L) (Ham 1996)

The left edge of a HTS must align with the left edge of its lexical source

This constraint is employed in the tableau below which illustrates a case of unbounded spreading of a High contributed by a morpheme whose left edge is marked with a bracket.

(33) CV[CVCVCV Unbounded Spreading of floating H

H

Candidates	IDENT	AL(H,L)	AL(H,R)	*H	SPEC (H)
a. ☞ CV[CVCVCV \ | / H				***	*
b. CV[CVCVCV | H		*!		*	***
c. CV[CVCVCV \ \ / / H		*!		****	
d. CV[CVCVCV | H			*!*	*	***
e. CV[CVCVCV \ / H			*!	**	**

AL(H,L), AL(H,R) >> *H, SPEC (H)

Both (33b) and (33c) are not optimal as the left edge of the output HTS is not aligned to the left of the morpheme which contributed the High. Candidates (33d) and (33e) are less optimal than (33a) in that the right edge of the output HTS is not aligned with the right edge of the word. We note here that the ranking in (33) will suffice to predict the optimal form for unbounded spreading regardless of whether the input H is prelinked (cf. (30)) or not.

2.4 Bounded Displacement

Let us now turn to bounded displacement. Rightward bounded displacement of High tones is illustrated in Kikuyu verb forms. While we will examine both the possibility that an input H is prelinked and the possibility that it is floating, let us begin by assuming that it is prelinked. As the data below (taken from Clements 1978) illustrate, a High tone is displaced from its input position (marked by an underlined V) to the following TBU.

(34) Bounded displacement in Kikuyuu (Clements 1984)
(Subject Marker - (Object Marker) - Root - Tense/Aspect)

a.	to-tɛŋɛr-aɣa	‘we run’
	to-mo-rɔr-aɣa	‘we look at him/her’
	to-ɣaraɣar-aɣa	‘we roll’
b.	to-mo-to̱m-áɣa	‘we send him/her’
	to-he̱tók-aɣga	‘we go’
	to-ri̱ríkan-aɣa	‘we remember’
c.	to-ma̱-rɔ́r-aɣa	‘we look at them’
d.	to-ma̱-tó̱m-áɣa	‘we send them’

We see that the displacement effects not only the High on the verb root (34b), but on a verbal prefix (34c) as well. (34d) illustrates displacement on both a verb root and prefix. The question now becomes one of how to account for boundedness in displacement or spreading. Right alignment to prosodic or morphological edges is of no avail, as the output right edge of the displaced H does not correspond to any consistent edge (as can be seen in (34)). One way to deal with such cases is to assume that the rightward displacement (or spreading) is still induced by AL(H,R,PW,R), but that this is mitigated by a higher ranking constraint which insures that the input H cannot move more than one TBU. This is the approach taken by Myers (1996) (for other Bantu data) who proposes a LOCAL constraint, formalized below.

(35) LOCAL (Myers 1996)

An output TBU a bearing tone t must be adjacent to TBU b, where b’ bears t’.

This constraint, ranked above AL(H,R), correctly insures that displacement is bounded, as illustrated below.

(36) CV[CVCVCV
|
H

Candidates	LOCAL	*H	AL(H,R)	IDENT (H)	SPEC (H)
a.☞ CV[CVCVCV | H		*	*	*	***
b. CV[CVCVCV | H	*!	*		*	***
c. CV[CVCVCV \ / H		**!			**
d. CV[CVCVCV | H		*	**!*	*	***
e. CV[CVCVCV | H		*	**!		***

*H >> AL (H,R) >> IDENT (H); LOCAL >> AL(H,R)

Candidate (36b) violates LOCAL as the High tone has moved two TBU's to the right. Candidate (36c) is out due to excessive violations of *H. Finally candidates (36d) and (36e) are less optimal than (36a) in that the HTS does not align with the right edge of the word.

Before addressing the question as to whether LOCAL is the best way of handling boundedness, let us consider the case where we assume the H is floating. First, we note that since a floating H is not a feature of any TBU in the input, LOCAL will be of no avail as it crucially relies on an input position of the H. What is needed in the case of a floating H is to get it as close to the left edge of its lexical source as possible without actually being aligned to it—something I will refer to as "minimal displacement." To help accomplish this, we propose a *ALIGN constraint as follows:

(37) *ALIGN (H,L,So,L)

The left edge of a HTS must not align with the left edge of its lexical source

We assume that this constraint is interpreted categorially, i.e. if the two edges align, a penalty is incurred; if they do not, regardless of the distance between them, no penalty is incurred. As illustrated in the tableau below, if *ALIGN dominates ALIGN, then the High will be minimally misaligned with the specified edge.

(38) CV[CVCVCV V$_2$ Docking “Minimal Misalignment”

H

Candidates	*AL(H,L)	AL(H,L)	*H	AL(H,R)	SPEC (H)
a.☞ CV[CVCVCV | H		*	*	*	***
b. CV[CVCVCV | H	*!		*	**	***
c. CV[CVCVCV | H		**!	*		***
d. CV[CVCVCV \ / H		*	**!		**

*AL (H,R) >> AL (H,L); AL(H,L), *H >> AL(H,R)

Candidate (38b) violates *ALIGN (H,L), the most highly ranked constraint, as the left edge of the output H is aligned with the left edge of the stem. Candidate (38c) does not violate *ALIGN, but violates ALIGN more egregiously than (38a). We see here that ALIGN must crucially be gradational in its violability. (This is consistent with the way it seems to be interpreted cross-linguistically. Cf. McCarthy & Prince 1983.) Candidate (38d) is less optimal than (38a) due to additional violations of *H.

We note here that the ranking of constraints in (38) will also successfully account for bounded displacement of H’s linked to the initial TBU’s of their respective morphemes. In a case where H’s are prelinked because their location is contrastive (e.g. in nouns), then the *ALIGN and ALIGN constraints would simply be modified to target the left edge of an input HTS rather than the left edge of the morpheme contributing the High.[11]

(39) (*)ALIGN (H,L)-I/O

The left edge of a HTS in the output must (not) align with the left edge of a HTS in the input.

Let us briefly contrast this minimal misalignment approach to one involving displacement to metrical heads. Before reanalyzing the Kikuyu case, let briefly consider the Chizigula verbal infinitives in (40) , where a High tone from a verb root (40b) or a prefix (40c) is displaced to the penultimate TBU of the word.

(40) Chizigula (Kenstowicz & Kisseberth 1990)

a.	ku-guh-a	‘to take’
	ku-lagaz-a	‘to drop’
	ku-damany-a	‘to do’
b.	ku-lombéz-a	‘to request’
	ku-lombez-éz-a	‘to request for’
	ku-lombez-ez-án-a	‘to request for each other’
c.	ku-wa-gúh-a	‘to take them’

Under the present proposal, this pattern can be accounted for straightforwardly as minimal misalignment of the right edge of an output HTS and the right-edge of the word. (Alternatively, we could assume some sort of final extraprosodicity and account for them simply with ALIGN (H,R,PW,R)). Kenstowicz and Kisseberth (1990) analyze Chizigula H tone movement as being metrically motivated. They set up a word-final trochaic foot, the head of which attracts a High tone to it. While this type of metrical analysis seems quite viable in cases like Chizigula where the High tone attraction is consistently one or near a particular prosodic edge, its viability is less obvious in a case like Kikuyu. One possible metrical account of Kikuyu would be to require High displacement to the head of an iambic foot where the weak member of the foot is established by the location of an input H-toned TBU. This is illustrated in (41) for *to-mo-tom-áɣa* ‘we send him/her’.

(41) Input: to-mo-tom-aɣa
              |
              H

Output: *
to-mo-(tom-a)ɣa
              |
              H

While I will not sketch out a full metrical analysis of the facts here, the basic tenets of such an account seem clear. One constraint would insure that the left edge of an iambic foot is aligned with the left edge of an input H (or, assuming the H is floating, the morpheme contributing that H); another would insure that the head of a foot must be aligned with a High tone (cf. Goldsmith’s (1987) “Tone to Accent Attraction Condition”).[12] It seems unclear, however, how such an approach would account for forms in which two adjacent Highs in the input both undergo bounded displacement, illustrated by the form (34d) above. The input for that form (assuming prelinked H’s for concreteness) is given below.

(42) Input: to-ma-tom-aɣa ‘we send them’
         | |
         H H

In the case above, it is not clear what the metrical constituents would be. The constraints would endeavor to establish iambic feet whose left edges aligned with the left edges of the two TBU’s bearing the input H’s; however this would yield overlapping metrical domains. While some notion of multiple metrical planes might be invoked, I conclude here simply be contrasting this sort of metrical account with the one being presented here, which, without additional stipulations correctly accounts for the correct surface form as seen in the tableau below. (Violations for the leftmost H are shown above those for the rightmost H in any given constraint column.)

(43) to-ma-tom-aɣa

H H

Candidates	*AL(H,L)	AL(H,L)	*H	AL(H,R)	SPEC (H)
a.☞ to-ma-tom-aɣa | | H H		* *	**	* **	***
b. to-ma-tom-aɣa | | H H	*! *		**	*** **	***
c. to-ma-tom-aɣa | | H H		* **!	**	**	***
d. to-ma-tom-aɣa | | H H		* *	**	**** *** !	***

Candidate (43b) is not optimal as the Highs are aligned with the left edge of the morphemes which contributed them. (43c) is worse than (43a) as the rightmost H is misaligned from its source by two TBU's. (43d) is better than (43c) in that the H's are only minimally misaligned from their morphemic sources, but the form is less optimal than (43a) as the output H's in (43d) are further from the right edge of the word.

2.5 Bounded Spreading

Let us now turn to bounded spreading, illustrated by the Ekegusii verbal forms below.[13]

(44) Bounded rightward spreading: Ekegusii verbal infinitive

ó-gò-kór-á	'to do'
ó-gò-kór-ér-à	'to do for'
ó-gò-káán-èr-à	'to deny for'
ó-gò-símék-èr-à	'to plant for'

One possible way of accounting for these forms, prima facie, would be to simply require that High Tone Spans be binary (i.e. contain exactly two TBU's). This is given below.

(45) DOM BIN (HTS) (cf. M&P 1993)

A High Tone Span must contain exactly two TBU's

If we require that the left edge of an output HTS must be aligned with the left edge of an input H (or, assuming the H is floating, the morpheme contributing the H), then DOM BIN will successfully force bounded spreading in the forms in (44) as illustrated below.

(46) CV[CVCVCV
|
H

Candidates	AL(H,L)	DOM BIN	*H
a. ☞ CV[CVCVCV \ / H			**
b. CV[CVCVCV \ / H	*!		**
c. CV[CVCVCV | H		*!	*
d. CV[CVCVCV \ | / H		*!	***

DOM BIN >> *H

Candidate (46b) is not optimal as the left edge of the output HTS is not aligned with the left edge of the stem. Candidates (46c) and (46d) are less optimal than (46a) as they do not contain exactly two TBU's.

An analysis involving DOM BIN run into problems, however, in other forms. Ekegusii has another tonal process which spreads a High tone leftward onto an adjacent tautosyllabic mora. This can be thought of as a process in which Rising Tones, unattested in the language, are resolved into level High tones. (/o/ glides before a following V in the forms in (47) inducing compensatory lengthening on that V.)

(47) Resolution of Rise to High in Ekegusii

tò-kà-nà-gw-áá̲t-ér-à	'and we still divided for'	(< /to-ka-na-ko-át-er-a/)
tò-kà-nà-kw-áá̲ór-à	'and we still yawned'	(< / to-ka-na-ko-áor-a/)
tò-kà-nà-kw-ɔ́ɔ̲́mán-èr-à	'and we still quarreled for'	(< / to-ka-na-ko-ɔ́man-er-a/)
tó-ó̲-gó-tìmòk-à	'we rest'	(< /to-ó-go-timok-a/)

As can be seen in the forms in (47), the rightward bounded spreading of an input H occurs even when (bounded) leftward spreading takes place to resolve a potential Rising tone to a level High. It turns out, then, that while is DOM BIN can force bounded spreading in (44) by insisting the HTS domain is binary, it will not induce any rightward bounded spreading in (47) as the leftward spread of the High already creates a binary tonal domain. This is clearly seen in the tableau below.

(48) CV -VCVCV
|
H

<table>
<tr><th>Candidates</th><th>*RISE</th><th>DOM BIN</th><th>AL(H,R)</th><th>*H</th></tr>
<tr><td>a. CVVCVCV
\| /
H</td><td></td><td>*!</td><td>*</td><td>***</td></tr>
<tr><td>b. CVVCVCV
| /
H</td><td>*!</td><td></td><td>*</td><td>**</td></tr>
<tr><td>c. CVVCVCV
\\ / /
H</td><td></td><td>*!</td><td></td><td>****</td></tr>
<tr><td>d. ☞ * CVVCVCV
\|
H</td><td></td><td></td><td>**</td><td>**</td></tr>
</table>

Candidate (48b) is not optimal as it violates *RISE. Candidates (48a) and (48c) are both worse than (48d) in that they violate DOM BIN, incorrectly predicting (48d) to be the optimal form. I therefore conclude that DOM BIN by itself it not sufficient to account for bounded spreading, at least in Ekegusii.

While, due to considerations of space, I will not fully flesh out a metrical analysis of bounded spreading, I simply note here two problems that a metrical solution runs into. First, it seems clear that in the case of Ekegusii it does not seem possible to equate any output HTS with any type of metrical foot (among, e.g., those proposed in Hayes (1995)). In the case of the forms in (44) the output HTS is bimoraic (sometimes monosyllabic and sometimes bisyllabic). The domain of these HTS's are isomorphic with iambic feet or even moraic trochees. However, in the case of the forms in (47), the output HTS consists of a bimoraic syllable followed by a monomoraic one, consistent with a different foot type, viz. the syllabic trochee. Thus, any attempt to define output HTS's as being co-extensive with some foot type seems unlikely.

A second type of metrical approach might try to metrically define only the right edge of an output HTS (instead of the whole output HTS). This might be defined as the right edge of an iamb, whose left edge is defined by the left edge of an input H. While this approach seems possible, we note that it has the disadvantage that the left edge of the feet established in forms such as those in (47) will violate syllable integrity as the foot edge will fall in the middle of a bimoraic syllable as seen below.

(49) Input: to-ka-na-go-at-er-a ‘and we still divided for’
|
H

Output: to-ka-na-gwa-(at-er)-a
\ | /
H

Let us now consider bounded spreading of a floating High. As we did for cases of unbounded spreading, we will employ ALIGN (H, L, So,L), insuring that the left-edge of the output HTS is aligned to the left edge of its morphemic source, but how can we insure that spreading is local? LOCAL is of no avail as the High tone is floating. To account for this case (as well as others to be presented below), I propose that we modify (*)ALIGN. Up to this point (*)ALIGN has specified only the right-most or left-most edge of a domain. Drawing on the formalism developed in Idsardi (1992) for stress, we extend the power of this constraint to be able to specify the edges of a peripheral TBU of an element (i.e. feature span, morpheme, or prosodic unit) being aligned. The parameters are noted in (50).

(50) (*)ALIGN (Feature, Edge, Edgemost; Feature, Edge, Edgemost)

Let us now illustrate how this would work. In the case of bounded spread of a verbal H, two options present themselves. The first possibility is to insure that the right edge of the output HTS to be minimally misaligned with the right edge of the stem-initial (or source-initial) TBU. This minimal misalignment is accomplished in the same way it was above, i.e. by ranking a *ALIGN constraint immediately above the corresponding ALIGN constraint.

(51) (*) ALIGN (H,R; S,R,L)

> "The right edge of a HTS in the output must (not) align with the right edge of the leftmost TBU of the source"

The second way to account for bounded spread would be to align the right edge of the stem-initial TBU with the left edge of the rightmost TBU of the output HTS. This is given below and illustrated in (53).

(52) ALIGN (H,L,R; S,R,L)

> "The left edge of the rightmost TBU of a HTS in the output must align with the right edge of the leftmost TBU of the source"

(53) Bounded Spread of floating H

CV[CVCVCV

H

<table>
<tr><th>Candidates</th><th>ALIGN
(H,L,So,L)</th><th>ALIGN (H,L,R;
S,R,L)</th><th>*H</th></tr>
<tr><td>☞a. CV[CVCVCV
\ /
H</td><td></td><td></td><td>**</td></tr>
<tr><td>b. CV[CVCVCV
\ /
H</td><td>*!</td><td>**</td><td>**</td></tr>
<tr><td>c. CV[CVCVCV
|
H</td><td>*!</td><td></td><td>*</td></tr>
<tr><td>d. CV[CVCVCV
|
H</td><td></td><td>*!</td><td>*</td></tr>
<tr><td>e. CV[CVCVCV
\ | /
H</td><td></td><td></td><td>***!</td></tr>
</table>

ALIGN (S,L,H,L), ALIGN (H,L,R; S,R,L) >> *H

Candidates (53b) and (53c) are not optimal as the left edge of the output HTS is not aligned with the left edge of their source. Candidate (53d) is out because the right edge of the stem-initial TBU is not aligned to the left edge of the final TBU of the output HTS. Finally, while candidate (53e) violates neither ALIGN constraint, it fares worse than (53a) by violating *H more egregiously.[14]

In the case of bounded spreading of prelinked Highs (e.g. the Ekegusii nouns in (23)) we simply replace the right edge of the stem-initial TBU with the right edge of the input HTS.

(54) ALIGN (H,L,R; H,R,R)

> "The left edge of the rightmost TBU of a HTS in the output must align with the right edge of the rightmost HTS in the input"

The use of this constraint can be seen in (55).

(55) Local Spread

CVCVCVCV
|
H

Candidates	ALIGN (H,L,So,L)	ALIGN (H,L,R; H,R,R)	*H
☞a. CVCVCVCV \ / H			**
b. CVCVCVCV | H	*!		*
c. CVCVCVCV \ / H		*!	**
d. CVCVCVCV | H		*!	*
e. CVCVCVCV \ | / H		*!	***

ALIGN (H,L,So,L), ALIGN (H,L,R; H,R,R) >> *H

Candidates (55b) is not optimal as the High tone is not aligned with the left edge of its source. (We note that IDENT (H) could have also been employed here.) Candidates (55c)-(55e) are less optimal than (55a) because the right edge of the input H is not aligned with the left edge of the final TBU of the output HTS.

2.6 Further justification for ALIGN parameterization

While the use of parameterized (*)ALIGN constraints to account for the bounded spreading of floating Highs may seem overly powerful, we will now show that it can be used to account for recalcitrant cases of spreading and displacement of a High tone two TBU's to the right found in Zezuru Shona and Sukuma. In these languages the High spreading and displacement (respectively) is neither strictly bounded or unbounded, but rather moves a High tone *two* morae from its input position. Examples of this are given below. (The input TBU of the H in each case is underlined.)

(56) Zezuru Shona (Myers 1987): spreading 2 TBU's to the right

ku-téng-és-ér-an-a	'to sell to each other'
ku-mú-véréng-er-a	'to read to him/her'
va-chí-rég-érer-a	'them forgiving'

(57) Sukuma (Sietsema 1989): displacement 2 TBU's to the right

aka-bon-aníj-a	'he saw at the same time'
ku-tonol-á	'to pluck'
tu-ku-sól-a	'we will choose'
a-ku-ba-sol-á	'he will choose them'

These cases can be accounted for straightforwardly using the parameterized (*)ALIGN constraint proposed here. In the cases reviewed up to this point what has been minimally misaligned were two right edges (51) or two left edges (37). However, given the way (*)ALIGN is formalized we would expect that misalignment might be between a right edge and a left edge (in fact the very two edges aligned in (52) and (54)). Such is exactly what is needed to account for the data in (56) and (57), where the left edge of the rightmost output TBU in the HTS is minimally misaligned with the right edge of the input TBU (or if the H's are floating, the right edge of the leftmost TBU of the source.) The constraints are formalized in (58), and illustrated in the tableau in (59).

(58) (*)ALIGN (S, R,L; H, L,R)

"The right edge of the leftmost TBU of the source must (not) align with the left edge of the rightmost TBU of a HTS in the output"

(59) CV[CVCVCVCV

H

Candidates	ALIGN (H, L; S, L)	*ALIGN (S,R,L; H, L,R)	ALIGN (S,R,L; H, L,R)	ALIGN (H, R; PW, R)
a. ☞ CV[CVCVCVCV \ | / H			*	*
b. CV[CVCVCVCV | H	*!		**	****
c. CV[CVCVCVCV \ / H		*!		**
d. CV[CVCVCVCV \ \ / / H			*!*	
e. CV[CV CVCVCV | H			*	**!*

*ALIGN (S, R,L; H, L,R) >> ALIGN (S, R,L; H, L,R) >> ALIGN (H, R; PW, R)

Candidate (59b) is not optimal as the left edge of the HTS is not aligned with the left edge of the stem. (59c) is not optimal because there is no misalignment between the right edge of the stem-initial TBU and the left edge of the rightmost TBU of the HTS (rather the two are perfectly aligned). Candidate (59d) shows misalignment, but it is not minimal (rather the two edges being targeted are separated by two morae instead of 1). Finally, the two targeted edges are minimally misaligned in (59e), but to the left rather than the right. This is penalized by AL(H,R,PW,R).[15]

Let us briefly compare the Shona and Sukuma cases, where movement of a High is targeted two TBU's to the right of the input position, with cases where the TBU targeted is two TBU's to the left of the right edge of the word, i.e. attraction to the antepenult. This is illustrated in Safwa, where many tenses are marked by High assignment to the antepenultimate mora (60), and in Xhosa, where a stem H (in stems of three TBU's or greater) is attracted to the antepenultimate TBU (61).

(60) Safwa (H assigned to antepenult in most tenses) (Odden 1988)

uha-jeéndile	'you walked'
inhayí-bala	'I will not go'
baá-bala	'and they went'
tuú-bale	'let us go'

(61) Xhosa (Ham 1996)

ndi-bú-liis-a	'I greet'
ndi-bonísiis-a	'I show clearly'
ndi-nyinyithékiss-a	'I make slippery'

In the present framework, these could be handled by minimally misaligning the right edge of the HTS and the left edge of the word-final TBU. How does this contrast with a metrical account? One way to handle the data in (60) and (61) would be to assume final extraprosodicity (cf. (88) below where this is formalized) and set up a single word-final moraic trochee the head of which would attract the High tone.[16]

Again, while we will not flesh out a full metrical analysis here, we point out two potential problems. The first is the same problem of syllable integrity as noted above, which can be seen in the Safwa word uha-eéndile 'you walked'.

(62) Safwa
Input: uha-eendile

H

Output: *
uha-e(endi)<le>
|
H

Second, it is unclear in the Sukuma and Shona cases, how the above metrical analysis could be extended. It does not seem possible to assume that the input TBU bearing the High is extraprosodic as that TBU could potentially be any word-internal TBU.

(63) Sukuma

ku-<to>(nol-á)
a-ku-<ba>-(sol-á)

Sietsema (1989) proposes an account of Sukuma in which the TBU bearing an input H is the head of a trochaic foot. H then displaces to the head of the following trochaic foot. This is seen below.

(64) Sukuma

Input: ku-tonol-a
|
H

Output: *   *
ku-(tono)(l-a)
|
H

Such an analysis seems unduly complicated and suspicious on several fronts. First, in forms such as the one examined in (64), it requires positing degenerate feet. Even if this is accepted, such an account would have to posit constraints which 1) forbid a High from surfacing within the foot whose head bore the High in the input and 2) required a High to surface on the head of the immediately following foot. This complexity must be contrasted against the relative simplicity of the proposal advanced here.[17]

3. Multiple H tones

Let us now consider how the present proposal might account for cases of multiple High tones. In (43) above we accounted for the case in Kikuyu where two adjacent High tones each displaced one TBU to the right. I would now like to turn to cases in which the stem contains a High tone supplied by the verb root, plus a grammatical High tone supplied by certain tenses. The case I will consider here is one found in a number of Bantu languages, dubbed the “Complex Stem Tone Pattern” by Goldsmith (1987) who examined the pattern as it occurs in several Lacustrine languages. The pattern is certainly not limited to the Lacustrine subgroup, however, as essentially this same pattern occurs in Northern Karanga Shona, analyzed by Hewitt & Prince (1989), who draw on discussions from Myers (1987) and Odden (1984,1986).

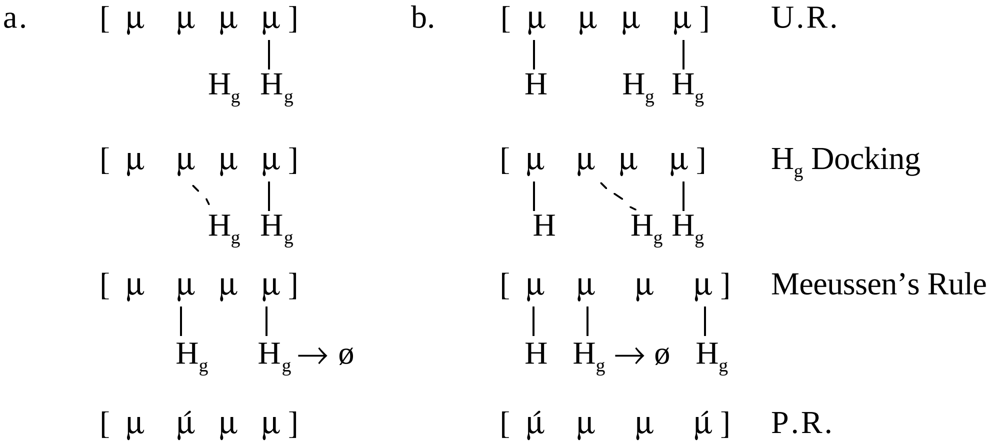
The languages which exemplify this “Complex Stem Tone Pattern” can be characterized as follows. Verb roots are tonally contrastive, following into the usual toneless versus high toned classes, the High tone docking onto the stem-initial TBU. Certain tenses contribute a High tone to the verbal stem. The intriguing aspect of this pattern is that the docking site for the grammatical High is not always on the same TBU of the stem. When added to a toneless root, the grammatical High docks onto the pen-initial TBU. When added to a High-toned root, the grammatical High docks onto the stem-final TBU. This is summarized below.

(65) Complex Stem Tone Pattern

	<u>Tone of VR</u>	<u>Grammatical H?</u>	<u>Surface</u>	<u>Example</u>
a.	toneless	no	no H’s	CaCaCaCa
b.	H-toned	no	H on V_1	CáCaCaCa
c.	toneless	yes	H on V_2	CaCáCaCa
d.	H-toned	yes	H on V_1 and V_f	CáCaCaCá

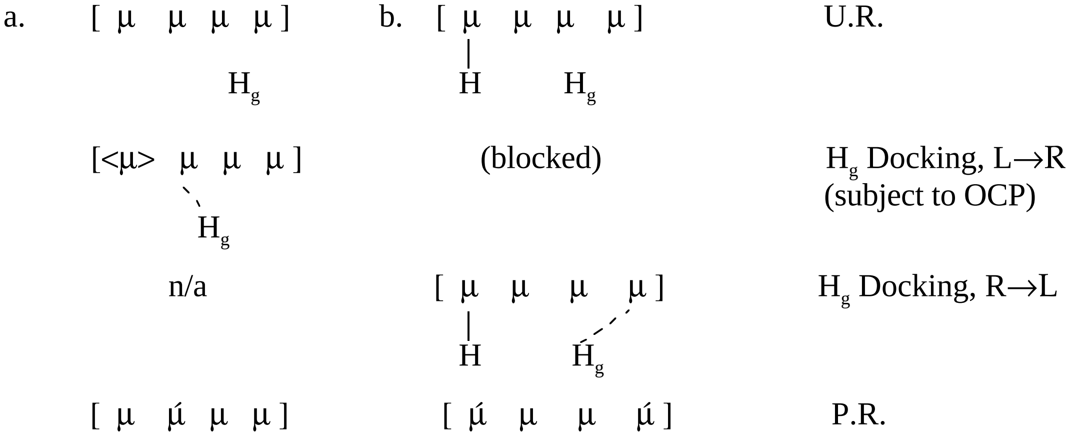
Before providing an account for these patterns, let us briefly review two proposals (in a derivational framework) of these facts, the complexity of which will be contrasted with our account. To account for these patterns involving the grammatical High Goldsmith proposes that there are actually two grammatical High tones present, one which docks onto the second TBU of the stem and one which docks on the final TBU of the stem. The surface patterns of both toneless and High toned roots can be accounted for if we assume that Meeussen’s Rule applies (one time) in a left to right fashion. In the case of stems with High toned roots, the stem-initial lexical High will precipitate the deletion of the High on the second TBU, while in the case of stems with toneless roots, the High on the second TBU of the stem will precipitate the deletion of the High on the stem-final TBU.

(66) Goldsmith's 'complex' pattern



A different account of this pattern is found in Hewitt & Prince's (1989) analysis of the Northern Karanga dialect of Shona in which certain tenses exhibit the pattern shown above in (66). They crucially rely on the "edge-in" association postulated in Yip (1988) whereby a floating High first tries to dock onto the leftmost free TBU, and if this is not possible, onto the rightmost free TBU. To account for the fact that it is the second stem TBU rather than the first which is targeted, they first assume that a stem-initial toneless TBU is made extraprosodic. Subsequently, a floating High tries to dock onto the leftmost visible TBU, unless this would cause an OCP violation, in which case it docks onto the stem-final TBU (due to edge-in association). This is illustrated below.

(67)



Given this background on previous (albeit derivational) accounts of this pattern, let us consider how the present proposal would account for these patterns. First, as we are dealing with two High tones, it is important to remember the difference in the interpretation of (*)ALIGN constraints with respect to the linear order of the arguments. A constraint of the type ALIGN (A,E,B,E) is interpreted as "align the E edge of every A to the E edge of every B." Where we are aligning a single High tone to some domain edge, both orders make the same prediction. Thus, e.g. if we wish to align a single H to the right edge of the word (as in the Digo example above) either of the following constraints would correctly align a H in this fashion.

(68) a. ALIGN (H,R, PW,R)

"The right-edge of every HTS must align with the right edge of a prosodic word"

b. ALIGN (PW,R,H,R)

"The right edge of every prosodic word must align with the right edge of a HTS"

It should be noted that (68b) technically demands that the right edge of a prosodic word be aligned with a High tone, even in forms with toneless roots. Of course, as long as DEP-I/O (H) is ranked above it, no H would be inserted in such cases, which, e.g. would yield the correct result for Digo, discussed in §2.2 above.

I propose that the key to analyzing the complex stem tone pattern in the framework proposed here is to key in on the fact that unlike High tone contributed by verb roots, the grammatical High tone has no lexical source in terms of TBU's. Thus, the constraint in (69) will have the effect of aligning a lexical H to the left edge of the stem, but will not affect the grammatical High at all.

(69) ALIGN (H,L, So,L)

"The left-edge of every HTS must align with the left edge of its lexical source"

The constraint in (69), then, will suffice to align a lexical H from a verb root to the left edge of the stem. How, then, can we account for the fact that the grammatical H winds up on the second TBU in forms with toneless roots. We propose to account for this in exactly the same way we did above, i.e. by minimal misalignment, where the stem edge is the first argument in the (*)ALIGN constraints, given below.

(70) *ALIGN (S,L,H,L)

"The left edge of the stem must not align with the left edge of a HTS"

(71) ALIGN (S,L,H,L)

"The left edge of the stem must align with the left edge of a HTS"

The two constraints above will potentially affect any High tone, as in these statements no reference is made to a lexical source. In the case of a grammatical High these constraints (where (70) dominates (71)) will successfully force it to dock onto the second stem TBU. This will occur regardless of the ranking of (70) and (71) with (69), as the latter constraint is simply inapplicable to grammatical Highs for the reasons discussed above. In the case of a lexical High, if (69) is ranked above (70) and (71), then that High will align to the left edge of the stem, forcing a violation of (70). Finally, when both Highs are present, (69) will insure that the lexical H is aligned to the left edge of the stem, and (71) will not affect the grammatical High, as the lexical High already insures the language's compliance with (71), recalling that (71) does not demand that every HTS align with the left edge of the stem, but only that the left edge of the stem align with some High. A lowly ranked constraint aligning the right edge of the prosodic word with a HTS will insure that the grammatical High aligns to the right when a lexical High is present.

(72) ALIGN (PW,R,H,R)

"The right edge of a prosodic word must align with the right edge of a HTS"

Each of these three cases will now be presented. Let us first consider the case of a single lexical High.

(73) Lexical H

[CVCVCVCVCV

H

Candidates	ALIGN (H,L,So,L)	*ALIGN (S,L,H,L)	ALIGN (S,L,H,L)	*H	ALIGN (S,R;H,R)
a.☞ [CVCVCVCVCV | H		*		*	****
b. [CVCVCVCVCV | H	*!		*	*	***
c. [CVCVCVCVCV | H	*!***		****	*	
d. [CVCVCVCVCV \ \ | / / H		*		**!***	

ALIGN (So,L,H,L) >> *ALIGN (S,L,H,L); *H >> ALIGN (S,R,H,R)

Candidates (73b) and (73c) are both less optimal than (73a) as the left edge of the HTS is not aligned with the left edge of their lexical source, which in this case is the stem. The HTS in candidate (73d) is correctly aligned to the left edge of the stem, and its right edge conforms perfectly to the AL(S,R,H,R). Yet, it is less optimal than Candidate (73a) in its violation of *H which outranks AL(S,R,H,R).

We now turn to the case involving the grammatical High and a toneless root.

(74) Grammatical H

[CVCVCVCVCV

H

Candidates	ALIGN (H,L,So,L)	*ALIGN (S,L,H,L)	ALIGN (S,L,H,L)	*H	ALIGN (S,R;H,R)
a.☞ [CVCVCVCVCV | H			*	*	****
b. [CVCVCVCVCV | H		*!		*	****
c. [CVCVCVCVCV | H			*!*	*	**
d. [CVCVCVCVCV | H			*!****	*	
e. [CVCVCVCVCV | H			*!****	*	
f. [CVCVCVCVCV \ \ / / H			*	**!**	

*ALIGN (S,L,H,L) >> ALIGN (S,L,H,L) >> ALIGN (S,R,H,R); *FL >> ALIGN (S,L,H,L)

None of the candidates violate ALIGN (H,L,So,L) as the grammatical High has no source with a TBU. (74b) is not optimal as it violates the constraint which insures the left edge of the stem is not aligned with a HTS. Candidates (74c-e) are less optimal than (74a) as their misalignment from the left edge of the stem is more than minimal. Finally (74f) is not optimal as it violates *H more than (74a).

Finally, let us turn to the case involving both lexical and grammatical H tones.

(75) Lexical and grammatical H: *ALIGN (S,L,H,L) > ALIGN (S,L,H,L)

[CVCVCVCVCV

H H

Candidates	ALIGN (H,L,So,L)	*ALIGN (S,L,H,L)	ALIGN (S,L,H,L)	*H	ALIGN (S,R;H,R)
a.☞ [CVCVCVCVCV | | H H		*		**	
b. [CVCVCVCVCV | | H H	*!		*	**	
c. [CVCVCVCVCV | \ \ / / H H		*		***!**	
d. [CVCVCVCVCV | | H H		*		**	*!***
e. [CVCVCVCVCV | | H H		*		**	*!*
f. [CVCVCVCVCV | | H H		*		**	*!

Candidate (75b) violates ALIGN (H,L,So,L) as the left edge of the HTS is not aligned with the left edge of its lexical source. Candidate (75c) fares worse than (75a) in that it incurs more violations of *H. Finally candidates (75d-f) are not as good as (75a) in that the right edge of the stem is not aligned with the right edge of any HTS.

It should be noted here that the (*)ALIGN (S,L,H,L) constraints cannot be replaced with a single ALIGN constraint which attempts to align the right edge of the stem-initial TBU with the left edge of an output HTS, as this would pull the grammatical High to the second TBU of the stem. If the OCP were employed to prevent this, then we would expect the High to dock onto the third stem TBU, which it does not.

e have seen that the somewhat recalcitrant case of the complex stem tone pattern can be straightforwardly accounted for using the ALIGN and *ALIGN constraints motivated above. We note that our account of (75) does not need to make use of any metrical constituents, the OCP, or any type of edge-in association principle.

To summarize thus far, two types of (*)ALIGN constraints have been proposed: one which requires (mis-)alignment between the edge of an output HTS and the edge of some morphological or prosodic element (e.g. the stem or word respectively), the other which requires (mis-)alignment between the edge of (a peripheral TBU of) an input HTS and the edge of (a peripheral TBU of) an output HTS. These are summarized below.

(76) (*)ALIGN (H,α) or (α ,H) (constraint on output)

An edge of a HTS must (not) be aligned with an edge of α in the output

(77) (*)ALIGN (H)

An edge of a HTS in the input must (not) align with an edge of that HTS in the output

Type (76) was used in both cases of floating and linked H's, whereas (77), by its very nature, can only be used in cases of linked H's.

4. ALIGN and *ALIGN in a Modified Constraint Schema

I would now like to consider a way to integrate these constraints into a proposal made in McCarthy (1995), which offers a constraint schema to account for phonological opacity effects. He considers, e.g., lenition of a consonant immediately preceded by a vowel. In certain cases lenition is triggered even if the vowel deletes and in other cases it is not triggered if the vowel is epenthetic, both resulting in opaque surface forms. To account for such cases McCarthy develops a schema where the relationship of two elements (α and β) is defined. A penalty is incurred if the two elements are adjacent at either or both the input and output levels. To take one example, in Tiberian Hebrew a stop undergoes lenition if a vowel precedes it at either the input or the output levels, i.e. an input V will induce lenition even if it deletes, and epenthetic vowels induce lenition as well. This is summarized below, where S=stop, F=fricative.

(78) Obstruent lenition summary in Tiberian Hebrew

/CVS/ → CVF
/CS/ → CVF
/CVS/ → CF

To account for this, McCarthy postulates a constraint which penalizes a Vowel-Stop sequence, where the Vowel is found at either the input or the output. This is illustrated below.

(79) *V-Stop Constraint for Tiberian Hebrew (epenthetic V triggers lenition; deleted V does too) (McCarthy 1995)

	Condition	Level
α	V	Indifferent
β	[-son, -cont]	Surface
Linear Order	α > β	Indifferent
Adjacency	Strict	Indifferent

The schema is interpreted as follows. Here, α is a vowel and β is an obstruent. When α precedes β and the two are adjacent at either the input or the output levels, the constraint will assign a penalty.

Bedouin Arabic has a similar constraint inducing lenition. It is similar to the Tiberian Hebrew case in that deleted V's trigger lenition, but it differs in that epenthetic V's do not. This is summarized in (80)

(80) Obstruent lenition summary in Tiberian Hebrew

/CVS/ → CVF
/CS/ → CVS
/CVS/ → CF

Here, what is important is that the constraint is triggered only when the VC sequence is found at the underlying level. This is captured in the constraint below.

(81) *V-Stop for Bedouin Arabic (epenthetic V doesn't trigger lenition; deleted triggers)

	Condition	Level
α	V	Underlying
β	[-son, -cont]	Surface
Linear Order	α > β	Underlying
Adjacency	Strict	Underlying

Putting aside the issue of different types of adjacency for the moment, I would like to slightly modify the constraint schema to require or penalize the adjacency of two elements by referring to the edges of those elements. This is outlined in (82)

(82) Modified schema using edges

	Condition	Level
α (E)		
β (E)		
Linear Order	>, <, =	

Using edges, McCarthy's constraint for Tiberian Hebrew would be as follows:

(83) *V-Stop (Bedouin Arabic)

"Penalty assigned when: the right edge of a V aligns with the left edge of a [-son, -cont] in the input"

	Condition	Level
α	V (R)	Underlying
β	[-son, -cont] (L)	Surface
Linear Order	α = β	Underlying

This modified schema can be used for general cases of alignment as seen below.

(84) ALIGN (PW,R;H,R)

“The right edge of a Prosodic Word must align with the right edge of a HTS in the output”

	Condition	Level
α	Prosodic Word (R)	Output
β	HTS (R)	Output
Linear Order	α = β	Output

Let us now recast the ALIGN constraint of type (77) which relates the input and output of a single HTS.

(85) ALIGN (H,L)

The left edge of a HTS in the input must align with the left edge of a HTS in the output.

	Condition	Level
α	H (L)	Underlying
β	H (L)	Surface
Linear Order	α = β	n/a

The *ALIGN constraint of type (77) can be recast into (86).

(86) *ALIGN (H, R)

“The right edge of a HTS in the input must precede the right edge of a HTS in the output (i.e. they must be misaligned)”

	Condition	Level
α	H (R)	Underlying
β	H (R)	Surface
Linear Order	α > β	n/a

The *ALIGN constraint needed for Sukuma and Zezeru Shona, making use of all the edge parameters is given in (87).

(87) *ALIGN (S, R,L; H, L,R) (for Sukuma, Zezeru Shona)

“The right edge of the leftmost TBU of the stem must precede the left edge of the rightmost TBU of a HTS in the output”

	Condition	Level
α	S (R,L)	Surface
β	H (L,R)	Surface
Linear Order	α > β	n/a

5. *ALIGN and NON-PERIPHERALITY

Finally, let us consider whether the present proposal of minimum misalignment could replace constraints such as NON-FINAL or NON-INITIAL which in essence enforce extraprosodicity. To illustrate one use of NON-FINAL, let us consider the analysis of Chichewa proposed by Myers and Carleton (1996). To account for tenses in which a verbal High tone is attracted to the penult, they employ three constraints given below.

(88) a. LX = PR: ALIGN (MStem-L, PStem-L) & ALIGN MStem-R, PStem-R)

b. NON-FINALITY: *PStem
|
$\sigma]_{\alpha}$ (= PRES HABIT, NEG FUT, STRONG SUBJ,...)

c. ALIGN-R: ALIGN (H_{VStem} -R, PStem-R)

Constraint (88a), LX = PR, attempts to insure that the prosodic stem is isomorphic with the morphological stem. NON-FINALITY, however, (only applicable in certain tenses) forbids the final syllable of the morphological stem from being part of the prosodic stem, within which tonological processes apply. Finally ALIGN-R aligns a stem High tone with the right edge of a prosodic stem (which is defined by (88a) and (88b)). These three constraints will insure attraction to the penult as seen in the tableau below. (Square brackets indicate morphological stem, curly brackets indicate prosodic stem.)

(89) Attraction to penult using NON-FINAL

[CVCVCVCVCV]

H

Candidates	NON-FINAL	ALIGN-R	LX = PR
☞a. [{CVCVCVCV}CV] | H			*
b. [{CVCVCVCVCV}] | H	*!		
c. [{CVCVCVCVCV}] | H	*!	*	
d. [{CVCVCVCV}CV] | H		*!	*

Candidates (89b) and (89c) are not optimal, violating NON-FINAL, as the right edge of the prosodic stem includes the final syllable of the morphological stem. Candidate (89d) does not violate NON-FINAL, but the High tone is not aligned to the right edge of the prosodic stem.

It should be clear that *ALIGN (to the right) is not the same as NON-FINAL. The NON-FINAL constraint in conjunction with A LX=PR constraint can only prevent features from being borne by the final feature bearing unit of a domain. Given an ALIGN-right constraint, this permits pen-peripheral FBU's to be targeted. As demonstrated above, ALIGN and *ALIGN, parameterized for edges can target not only pen-peripheral TBU's, but antepen-peripheral TBU's as well. Furthermore, NON-PERIPHERAL is employed only with respect to morphological domains (e.g. stem or morphological word) or prosodic constituents, whereas I am proposing that *ALIGN can apply to any morphological source. Given that the possible uses of NON-PERIPHERAL seem to be a subset of those of *ALIGN, one might ask whether *ALIGN renders NON-PERIPHERAL unnecessary? One way to address this issue is to consider what would happen if *ALIGN, ALIGN *and* NON-FINAL were employed. In such a case the *ALIGN and ALIGN constraints employed above to target the third TBU from the edge (cf. the cases of Sukuma, Zezeru Shona, Xhosa and Safwa) would, when combined with the type of NON-FINALITY used in the Chichewa case above, be able to target the *fourth* TBU from an edge. While this may initially seem overly-powerful, it turns out that there is in fact a case in which a (floating) High tone is attracted to the fourth TBU of the stem, viz. Kikuria, as described in Odden (1987, 1992).

In Kikuria verb roots are not tonally contrastive. A High tone is assigned to one of the first *four* morae depending on the tense. In a number of tenses, including the perfective seen in (90), the fourth mora is target as the site for tone assignment. (In some tenses where the fourth mora is targeted, the first mora is too.)

(90) Tone docking to the fourth mora in Kikuria

n-[tɛrɛk-eré	‘I have cooked’
n-[ga-tɛrɛk-ére	‘I have cooked them’
n-[karaang-ére	‘I have fried’

The targeting of the fourth stem mora is illustrated below, using NON-INITIALITY rather than NON-FINALITY (as targeting is with reference to the initial edge of the morpheme and not the final one), and the (*)ALIGN constraint below.

(91) (*)ALIGN (S, R,L; H, L,R)

“The right edge of the leftmost TBU of the stem must (not) align with the left edge of a HTS in the output”

(92) Targeting the fourth stem mora

[CVCVCVCVCV]

H

Candidates	NON-INIT	LX = PR	*AL(PS,R,L; H,L)	AL(PS,R,L; H,L)
☞a. [CV{CVCVCVCV}] | H		*		*
b. [{CVCVCVCVCV}] | H	*!			*
c. [CV{CVCVCVCV}] | H		*	*!	
d. [CV{CVCVCVCV}] | H		*		*!*

Candidate (92b) is out because it violates NON-INIT which insures that the leftmost TBU of the morphological stem is not part of the prosodic stem. Candidate (92c) is not optimal because the left edge of the HTS is aligned with the right edge of the leftmost stem TBU. (92d) is worse than (92a) because the left edge of the HTS is not minimally misaligned with the right edge of the stem-initial TBU.

We tentatively conclude here that the Kikuria data suggest that we need both NON-PERIPHERAL and *ALIGN. We note, however, that if the Kikuria data could be acconted for in some other fashion, *ALIGN might well be able to replace NON-PERIPHAL.

6. Conclusion & Summary

To conclude, we have seen that minimal displacement, accomplished by the interaction of (*)ALIGN constraints, enables a floating High tone to target any TBU from the first to the fourth TBU from an edge. It should be noted, however, that this proposal predicts an asymmetry with regard to floating versus linked tones. The present analysis would not enable, e.g. a morpheme-internal linked H from spreading or displacing four TBU's in some direction, as NON-FINAL or NON-INIT would be of no avail in such circumstances (as NON-FINAL and NON-INIT only target stem or word peripheral TBU's).

In the above analysis, *ALIGN always immediately dominated its ALIGN counterpart. The question naturally arises as to whether this is always true of *ALIGN, i.e. will it always be immediately dominated by its ALIGN counterpart.[18] While this certainly seems like a topic meriting future research, let me briefly make three observations here.

The first point is a somewhat obvious one, namely, that in cases where a feature does align to an edge (i.e. where alignment is needed rather than misalignment) ALIGN dominates its *ALIGN counterpart. Thus, both rankings are possible.

Second, within the realm of tone, what would a case look like that employed *ALIGN without it immediately dominating its ALIGN counterpart. First, it should be clear that there are many cases where there will be no evidence for ranking *ALIGN with respect to its ALIGN counterpart. For instance, as seen above, cases of unbounded rightward spreading or displacement are accounted for by means of an ALIGN (H,R,PW,R) constraint. While ALIGN (H,L,PW,L) would crucially be ranked below ALIGN (H,R,PW,R), *ALIGN (H,L,PW,L) wouldn't not be crucially ranked with respect to ALIGN (H,L,PW,L). Next, it's certainly possible to imagine a case where *ALIGN is highly ranked and where its ALIGN counterpart could be lowly ranked not playing any crucial role. In this regard, consider the docking and spreading of a grammatical High tone onto a stem with a toneless root in a language such as Ekegusii. Following the Complex Pattern discussed above in (65), the grammatical High tone docks onto the second stem TBU. In addition, however, every TBU to the right of the second stem TBU is also High-toned as seen in (93).

(93) a. tò-tìmók-ér-á
'we rest (applic)'

b. tò-ìrúrúk-ér-á
'we fly (applic)'

One possible analysis (though not the only one) of such forms to is simply rank *ALIGN(H,L,S,L) above SPEC(T) (where both are specified to be constraints at the level of the stem). For this case, while ALIGN(H,L,S,L) must be ranked below *ALIGN(H,L,S,L), the latter need not immediately dominate the former.

Finally, *ALIGN was crucially employed in only a subset of the tonal phenomena examined above. Specifically, it was found to be needed to account for three things: 1) bounded spreading and displacement of floating High tones, 2) the two-TBU spreading and displacement of a High tone, either linked or floating, and 3) the Complex Stem Tone Pattern involving two High tones in a single stem. We note here that of all the phenomena discussed these three have few if any counterparts in non-tonal phenomena. I.e. a floating feature is an indication that it is a property of the morpheme and not any individual FBU. While certain non-tonal features have certainly been treated as floating (c.f. Zoll (1986) for a range of interesting cases), none of these floating features to my knowledge has undergone a strictly bounded spread or displacement. Furthermore, no other feature but tone, whether linked or floating, has been shown to undergo the two-FBU spreading or displacement seen in Shona or Sukuma. Finally, no non-tonal feature has been shown to have the Complex Stem Tone Pattern discussed above. We are therefore left in the following situation: we must at the same time 1) account for these novel tonal phenomena and 2) explain why the constraints used in such an account do not seem to target non-tonal features. This paper makes an attempt to address the first concern by proposing a notion of minimal displacement, effected by *ALIGN and ALIGN constraints parameterized for edge and edgemost. The second concern, not answered in detail here, is certainly a matter for future research.

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[1] It may be that a small number of Bantu languages have to be analyzed as having both High and Low underlyingly, but such cases are rare (cf. Cassimje's (1987) analysis of Venda).

[2] See (30) and fn. 9.

[3] As the cases to be discussed below are not relevant to this distinction in the formalizatin of IDENT, I simply use IDENT (and not IDENT').

[4] A few Nguni languages where historical vowel length has been neutralized are exceptional in this regard and could be argued to have a three way tonal distinction.

[5] While the TBU which is targeted is usually within the stem, Odden (1988) shows cases where the pre-stem TBU is targeted as well.

[6] It is clear from Kisseberth (1978) that phonetically, forms which have a word-final High-toned TBU are realized with a rise on the penultimate TBU and a fall on the final TBU. As does Goldsmith, we abstract away from that here.

[7] Of course, the alignment constraint in Digo could specifiy the right edge of the stem or the word as the two are isomorphic. The final logical possiblity would be a language where a High from a verb root underwent unbounded displacement to the word-initial TBU. There seems to be no such case. One reason for this may be the fact that most verbal affixes which are contrastive for tone are prefixes rather than suffixes, and therefore given the prohibition on line-crossing it would be less likely that a High tone within a verb root could productively displace to a word-initial TBU over intervening High tones on prefixes.

[8] Luganda seems to illustrate a case of certain High tones undergoing leftward unbounded spreading. (see Hyman & Katamba 1993)

[9] As noted earlier in the discussion of IDENT (2), input toneless TBU's surfacing as H (penalized by *H) must be a distinct constraint than the one penalizing input H-toned TBU's which surface as toneless (IDENT here). Were *H and IDENT consolodated into one and the same constraint, then (30a) would not be optimal no matter what the ranking.

[10] Given that most prefixes in Bantu have a single TBU and that the output location of any High tone they supply is predictable, it makes sense to consider prefix H's floating in the same way as verbal H's. Even if certain prefixes contain more than one TBU, a floating H analysis is viable as long as the location of that H is not contrastive. I know of no case within Bantu where, e.g., it is necessary to set up prefixes such as /Cv́Cv-/ and /CvCv́-/.

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[11] An alternative formalization of this constraint would would be that “the left edge of a HTS in the output must (not) align with the left edge of the sponsor TBU.” These seem notationally equivalent.

[12] The metrical account proposed here borrows ideas from Kisseberth’s 1993 and Kisseberth & Cole’s 1994 Optimal Domains Theory in which High domains can be defined with respect to both input and output edges and where the phonetic realization of a feature (e.g. High tone) is distinguished from the domain of that feature.

[13] I note here that in addition to bounded spreading, Ekegusii has other constraints which insure, e.g. that pre-penultimate bimoraic syllables cannot bear a Falling tone, and that a phrase-final Low-toned syllable cannot be preceded by a Falling tone.

[14] I note here that the ALIGN (H,L,R; S,R,L) constraint in (52) could also be used to account for bounded displacement of a floating H, which was analyzed above in (38) in terms of *ALIGN (H,L,So,L). First, it should not be surprising that there are several possible accounts of a single phenemonon. Second, and more importantly, while parameterizing ALIGN for edge and edgemost provides a way to account for the bounded displacement and spreading cases to be analyzed without *ALIGN, we will see that *ALIGN is indispenable in accounting for the data discussed in §2.6 and §3.

[15] We note here that for the case of Sukuma, which is displacment rather than spreading, the (*)ALIGN constraint could target either the left edge of the rightmost TBU of the HTS (as in (58)) or simply the left edge of the HTS.

[16] Alternatively, one could set up a word-final trochee without final extraprosodicity, and have the H align with the rightmost unfooted TBU. Cf. Kisseberth 1993, Ham 1996.

[17] Another possible analysis of both the Sukuma and Zezeru Shona data, but one which will not be examined in detail here, would inolve some intermediate level of representation, where a rule of local spread or displacement would effected on both the first and second strata.

[18] The relationship between *ALIGN and ALIGN seems quite analogous in most respects to the relationship between NON-PERIPHERAL and ALIGN in that the effects of the first (of each pair) are most clearly seen in the presence of the second.