Yuhup Prosodic Morphology and a Case of Augmentation[1]

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1.   Introduction

The Yuhup language (Maku; Brazil) presents two intriguing cases of suffixation that are composed of a fixed segmentism together with stem-determined material. Examples of the suffix forms attaching to consonant-final stems are given in (1) from Lopes & Parker (1999). The locative suffix, in (1a), has the form -*CVt*, where "C" and "V" represent a consonant and vowel, respectively, with variable content. The "C" matches the final consonant of the stem (i.e. it forms a geminate), and the "V" matches the last stem vowel. The future suffix is formed in the same way but with the final consonant [p], as in (1b).

(1)   a.   yam-LOC   →   ỹãm-mãt   'in the village'
       b.   key-FUT   →   key-yep   'will see'

A previous analysis of these suffixations by Lopes & Parker (1999) posits that the segment matching between the stem and suffix arises from material spreading to fill empty skeletal slots. Under that approach, the final consonant of the suffix is fully specified in the underlying representation and is preceded by empty CV skeletal slots, as shown in the structure on the left in (2). Consonant gemination then takes place via root node spreading to the empty C slot, as shown on the right in (2). The matching vowel is posited to arise from a vowel harmony that spreads features from the preceding vowel.

(2)   /C V C-C V C/   →   C V C-C V C
       | | | | | | \/ |
       ỹ ã m   t   ỹ ã m   t

Although the stem-determined material in these suffixations might seem to necessitate an empty skeletal frame or fixed template, I argue in this work that these structures are actually the product of an augmentation that is atemplatic in nature. In this account I draw a connection between the structure of these suffixations and an independent property of the prosodic morphology of Yuhup: every morpheme contributes

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one and only one syllable to a word. I propose that the locative and future suffixes are subminimal — underlyingly they consist solely of the fixed consonant, i.e. /-t/ 'locative' and -/p/ 'future'. Augmentation in the form of epenthesis then occurs to fulfil general conditions in the language on prosodic-morphological requirements. A schematic preview of the approach is given in (3). In the underlying form, the suffix consists of a single consonant, and in the output, augmenting segments are inserted (capital letters denote inserted segments). The notion suggested by Lopes & Parker (1999) that the segment identity has a basis in material spreading from the stem is maintained.

(3)   /yam-t/   →   ỹãm-MÃt

This paper is organized as follows. Section 2 provides background on Yuhup segmental phonology. Section 3 examines conditions on the prosodic shape of morphemes in Yuhup. Section 4 turns to the locative and future suffixes and develops an analysis of their formation involving augmentation, and section 5 presents the conclusion.

2.   **Background: Yuhup Segments**

Yuhup is an endangered language of Brazil spoken by about 400 people. Except where noted otherwise, the data and description are drawn from Lopes & Parker (1999) (henceforth L&P 1999), who provide an important sketch of Yuhup phonology.

The inventory of Yuhup consonants consists of [p, t, k, ʔ, č, h, m/^{m}b/b^m, n/^{n}d/d^n, ŋ/^{ŋ}g/g^ŋ, w, y]. As notated in this set, nasal stops in Yuhup alternate with pre- and postnasalized stops. Their distribution is elaborated below. Notice that Yuhup is unusual in having no phonemic oral fricatives, although [š] occurs as a phonetic variant of /č/. The Yuhup vowel inventory consists of the following symmetrical nine member system: high [i, ɨ, u], mid [e, ə, o], and low [æ, a, ɔ].

By way of background, I will briefly outline some allophonic phenomena involving vowel length and nasalization that will be witnessed in the data. These distributions will not be the focus of study in the present work, but a knowledge of them will facilitate interpretation of the prosodic-morphological issues under examination.

In Yuhup, vowel length is not contrastive. However, vowels regularly lengthen under main stress, which falls on the last stem syllable, as in (4a). Suffixes are generally excluded (see (4b)) — they appear to stand outside of the stem domain (L&P 1999: 332).

(4)   a.   [ˈtæːħ]   'son'
                [mĩħ-ˈnãːw̃]   'paca rodent'
        b.   [ˈnɔ̃ːʔ-ĩħ]   'selling; giving'   (/-ih/ 'progressive')
                [ˈweːp-ʔah]   'to be full'   (/-ʔah/ 'to be')

Morphemes in Yuhup are either oral or nasal, as illustrated in (5). In nasal morphemes, vowels, glides and glottal segments are nasalized. (See Walker & Pullum 1999 on the issue of nasalization of glottal stop in nasal contexts.) If voiced, a stop is nasal in a nasal morpheme, and if voiceless, a stop (or affricate) is oral. In oral morphemes, segments are wholly oral with the exception of voiced stops, which are realized as prenasalized in initial position and postnasalized in final position.

(5)   **Oral**   **Nasal**
        [paːyh]   'rock, stone'   [pã̃ỹħ]   'paternal uncle'
        [hoːd^n]   'hole'   [hɔ̃ːn]   'to vomit'
        [^{n}doːg^ŋ] 'species of fruit'   [nãːŋ]   'grease; fat; oil'

Suffix segments usually agree with the nasal/oral quality of the root. Examples of the resulting alternation are given in (6) with the progressive suffix /-ih/.

(6)   a.   [šaːw-ih]   'shouting'
       b.   [pãːħ-ĩħ]   'hearing'

3.   The Prosodic Shape of Yuhup Morphemes

3.1   Data

Before proceeding to the details of the locative and future affixations, I examine some general properties of the prosodic shape of Yuhup morphemes. L&P (1999: 325) identify a close correlation between syllables and morphemes in the language: each morpheme contributes one, and only one, syllable to a word. The set of syllable types and morpheme shapes is given in (7). (In the underlying representation of nasal morphemes that do not contain a nasal stop, I indicate nasalization on the vowel.)

(7)   CV   /ke/   'wing'   /ču/   'coati (Procyon')
       CVC   /puk/   'to pull out'   /hæw/   'to peel'
       VC   /ɔt/   'to cry'   /ĩh/   'species of ant'
       CVyC   /pəyn/   'species of bee'   /tayt/   'to kick'
       VyC   /uyn/   'bat (*Desmodus rotundus*)' / æ̃yh/   'species of tail-less monkey'

Notice that the relevant generalization is that each morpheme *contributes* a syllable rather than *equals* one. While morphemes in isolation are isomorphic with a syllable, this is not regularly true in concatenated strings. Suffixation of /-ih/ 'progressive' to a (C)VC root is a case in point (see (6)). For example, in [ũm-ĩħ] 'killing', the root and suffix each fail to match up with syllabic organization, as illustrated in (8).

(8)   σ σ
           | / |\   Syllable structure
           ũm-ĩħ
           \/   \/   Morpheme structure
           m   m

3.2   Analysis

I develop the analysis in the framework of Optimality Theory (OT; Prince & Smolensky 1993). I assume a familiarity with the underpinnings of OT and its formalisms as well as the correspondence-theoretic approach to faithfulness (McCarthy & Prince 1995).

First I address the morpheme size *minimum*, i.e. that each morpheme contributes (no less than) one syllable to the overall number of syllables in the word. I propose that the morpheme size minimum is the effect of a correspondence relation between morpheme structure and prosodic structure (MP correspondence). The relevant constraint(s) refer to a mapping between morphemes and prosodic heads, as in (9).[2]

(9)   FAITH-MPhead (henceforth MORPH-TO-SYLL-HD or MSH):
       For each morpheme in the output, there is an affiliated phonological segment that

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[2] Sensitivity of correspondence to prosodic heads is discussed in work by Alderete (1997) and Revithiadou (1999), among others. On MP correspondence, see Walker (2000) (note also Fitzgerald 2001).

belongs to a syllable head, and for each syllable head, its string of segments belongs to no more than one morpheme.

The syllable head is taken here to be the rime (after Nelson 1998, Feng 2001). For expositional convenience, MORPH-TO-SYLL-HD (MSH) collapses two constraints. One demands a correspondent for every morpheme in a syllable head, i.e. MAX-MPσ-head: "Every morpheme must have a corresponding segment in a syllable head". The other requires uniqueness: only one morphological correspondent for each syllable head — in concrete terms, UNIQUENESS-MPσ-head: "For each syllable head, the string of segments of which it is composed must not correspond to more than one morpheme". The latter constraint is a type of UNIFORMITY requirement (McCarthy & Prince 1995).

MSH is reminiscent of the MORPHEME-TO-STRESS PRINCIPLE (MSP) proposed by Fitzgerald (2001) in her study of stress in Tohono O'odham. The MSP "requires each morpheme to be in a stressed syllable, where stress levels correspond with being prominent on a grid" (Fitzgerald 2001: 950). Both the MSP and MSH express some kind of condition on the mapping between morphemes and prominent prosodic structure — in the case of MSH, the constraint refers to syllable heads in the prosodic hierarchy rather than stress and grid prominence. Although the MSP is violated in the phonology of Tohono O'odham when compelled by higher ranked constraints, the MSH constraint stands undominated in the constraint hierarchy for Yuhup — all morphemes in the language meet the size minimum effected by MSH.

At first blush it might seem that morpheme to syllable edge alignment constraints, such as ALIGN(Morpheme, L, Syllable, L) (or its right-edge counterpart), or MORPH=σ, could be substituted in place of MSH to obtain the size minimum (ALIGN after McCarthy & Prince 1993b). Such constraints would require that each morpheme begin (or end) a new syllable, with the result that there be (at least) one syllable present for each morpheme. While this approach would be adequate for morphemes pronounced in isolation, where the morpheme is coextensive with a syllable (see (7)), it will not be sufficient for concatenated strings. For example, [.(C)V.C-VC.] is a possible structure, as seen in (6) and (8) ("." denotes a syllable boundary). In this structure, morpheme/syllable alignment fails at both the left edge for the second morpheme and the right edge for the first morpheme. The generalization is not one of edge-matching but rather that each morpheme contribute one syllable to the overall syllable-count in the word.

Next I consider the morpheme size *maximum* in Yuhup: a morpheme does not contribute more than one syllable to the overall syllable-count in the word. I attribute this upper limit to a constraint that minimizes the number of syllables in words (Zoll 1996):

(10)   *STRUC-σ: No syllables. (A mark is incurred for each syllable.)

The *STRUC-σ constraint competes with MAX-IO, which penalizes segment deletion (McCarthy & Prince 1995).

(11)   MAX-IO: Every segment of the input has a correspondent in the output.

In Yuhup the ranking, MSH >> *STRUC-σ >> MAX-IO, limits the number of syllables in the output to only those necessary to satisfy the MSH requirement, that is, there will be exactly one syllable head per morpheme. The ranking is illustrated in (12). This tableau operates over a hypothetical input for [mĩħ-nã:w̃] 'paca rodent' with two vowels in the first morpheme. In candidate outputs, material affiliated with first morpheme is indicated by [＿] and with the second morpheme by [＿].

(12)   MSH >> *STRUC-σ >> MAX-IO

/mihe-naw/	MSH	*STRUC-σ	MAX-IO
a. ☞ mĩh̃.nã:w̃		**	*
b. mã:w̃	*!(MAX-MP)	*	****
c. mĩ:n	*!(UNIQUENESS)	*	****
d. mĩ.h̃ẽ.nã:w̃		***!	

The winner in (12a) deletes one of the two vowels in the first morpheme in order to minimize the number of syllables while obeying MSH. The faithful candidate in (12d) preserves all input segmentism but incurs a fatal violation for its additional syllable. Alternatives in (12b) and (12c) each have one fewer syllable than (12a) but are eliminated on the basis of MSH violations. With respect to the constraints that MSH collapses, (12b) violates MAX-MPσ-head, because the first morpheme does not have a correspondent in a syllable head, and (12c) violates UNIQUENESS-MPσ-head, because the rime material of the only output syllable corresponds to more than one morpheme.

There are some exceptions in Yuhup to the prosodic size maximum on morphemes. Some polysyllabic words are formed via fusion of monosyllabic morphemes. Also, loanwords can be polysyllabic, e.g. [papera] 'paper' (from Portuguese *papel*), [kuyera] 'spoon' (Portuguese *colher*), [muturu] 'motor' (Portuguese *motor*). The relaxed maximal size restriction in loans and exceptions could be handled via the lexically specific constraint approach proposed by Pater (2000) (alternative approaches to exceptional/loan forms might also be successful here).

Let us recap the chief points of progress thus far. In Yuhup, there is a one-to-one correspondence between morphemes and syllable heads. The morpheme size *minimum* is regulated by MSH, which requires (i) that every morpheme have material in a syllable head, and (ii) that the string of segments in each syllable head correspond to only one morpheme. The morpheme size *maximum* is regulated by *STRUC-σ.

4.   Subminimal Affixes

4.1   Data

I turn now to the two suffixes in Yuhup whose content is composed of stem-dependent material together with fixed segmentism. In addition, their suffix shape is also in part stem-dependent. The locative suffix pattern is as follows. When attaching to a consonant-final stem, the affixation has the shape *-CVt*. As seen in (13), the "C" matches the final consonant of the stem forming the base of affixation, and the "V" matches the last stem vowel.[3] Notice that the usual nasal harmony is operative.

(13)   hɔh-LOC   →   [hɔ:h-hɔt]   'in the canoe'[4]
        tiw-LOC   →   [ti:w-wit]   'on the path'
        yam-LOC   →   [ỹã:m-mãt]   'in the village'

If the stem is vowel-final, the locative suffix shape is *-Vt* (Aurise Brandão Lopes,

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[3] The final [t] has an optional debuccalized variant [ʔ]. Likewise the final [p] of the future suffix in (15) has a free variant [h]. The different quality of the glottal alternants for /t/ and /p/ suggests that they are not epenthesized default consonants. The cause of optional debuccalization is a matter for further research.

[4] Allophonic vowel lengthening is not shown for these data in the source (presumably a phonemic transcription). The lengthening in (13) and (15) is notated following the description of L&P (1999).

personal communication). In such cases, the final stem syllable undergoes the regular allophonic vowel lengthening (recall that the stem generally excludes suffix material), and the suffix forms an onsetless syllable (Aurise Brandão Lopes, personal communication). The resulting pattern is illustrated in (14).

(14)   ke-LOC   →   [keː-et]   'in/on the wing'
        ču-LOC   →   [čuː-ut]   'in/on the coati'

The future tense suffix has a parallel formation to the locative, except that the final consonant of the suffix is [p]. (No description is available for the future suffix attaching to vowel-final stems.)

(15)   ɔt-FUT   →   [ɔːt-tɔp]   'will cry'
        key-FUT   →   [keːy-yep]   'will see'
        hɔn-FUT   →   [h̃ɔ̃ːn-nɔ̃p]   'will vomit'

4.2   Analysis

I propose that the locative and future suffixes consist simply of the fixed consonant underlyingly. Hence, the representations that I posit are /-t/ 'locative' and /-p/ 'future'. Connected with this proposal is a claim that what is unique about these suffixes is their subminimal size — the input material of which they are composed is less than a possible syllable. I suggest that their unusual properties follow from the resulting augmentation.

An overview of the augmentation scenario is as follows. I suggest that the stem-identical vowel and geminated consonant arise through the insertion of segments required to satisfy prosodic-morphological demands in the grammar. The inserted vowel matches the segmentism in the stem via vowel harmony. Likewise, the epenthesized consonant gains its character via spreading of features from the final stem consonant. The account thus preserves the notion suggested by L&P (1999) that the stem-determined segmentism in these suffixes has a source in cross-linked structure. It departs from their approach, however, in attributing the source of vacant structure to augmentation under conditions of subminimal underlying suffix content rather than underlying empty skeletal slots.

Let us begin by concentrating on the augmentative vowel. I propose that vowel insertion takes place at the behest of MSH in order to locate the subminimal morpheme's input consonant — its sole phonological exponence — in a syllable rime. MSH must thereby dominate DEP-IO, which penalizes segment insertion (McCarthy & Prince 1995).

(16)   DEP-IO: Every segment of the output has a correspondent in the input.

Since there is no insertion of an onset consonant in the case of vowel-final stems, DEP-IO must in turn supercede ONSET (Prince & Smolensky 1993).

(17)   ONSET: Syllables must have onsets.

The rankings are exemplified in (18) with an input containing a vowel-final stem. I continue to show the detail of vowel lengthening in outputs, though I do not analyze it here. As before, material affiliated with first morpheme is underscored by [__] and with the second morpheme by [__]. In this tableau I consider only candidates in which an inserted vowel is identical to the stem vowel. I address the stem-matching character of the epenthesized vowel presently. The optimal candidate in (18a), which obeys MSH,

inserts a vowel before the suffix [-t] to form an onsetless syllable. Notice that interpreting the rime as the syllable head is crucial here. Since the vowel in (18a) is epenthetic, and hence has no morphological affiliation (McCarthy & Prince 1993a), [t] in the rime must serve to satisfy the MSH constraint. The alternative in (18b), which obeys DEP-IO and ONSET, is ruled out by top-ranked MSH, because it contains a syllable rime that corresponds to more than one morpheme. The competitor in (18c) violates DEP twice to supply not only the vowel but also a syllable onset. The second violation of DEP is fatal, however, since the dominating MSH constraint does not drive insertion of an onset. [h] is shown as the possible onset here, because it is plausibly the default consonant in Yuhup (L&P 1999: 338).

(18)   MSH >> DEP-IO >> ONSET

/ču-t̲/	MSH	DEP-IO	ONSET
a. ☞ ču꞉.ut̲		*	*
b. ču꞉t̲	*!		
c. ču꞉.hut̲		**!	

As mentioned above, I posit that the character of the inserted vowel is determined by vowel harmony for all vocalic features (following L&P 1999). Cases of copy epenthesis are not uncommon cross-linguistically (see, e.g., Kitto & de Lacy 1999). Furthermore, within Yuhup, complete vowel harmony is independently observed in the final epenthesized vowel in the loan [muturu] 'motor' (L&P 1999: 341). The quality of vowels inserted in loanwords to syllabify a final [r] (which must be intervocalic) is either fully harmonic with the final stem vowel or it is the vowel [a] (cf. [papera] 'paper').[5] In native words, L&P (1999) detect no cases of vowel epenthesis, because morpheme structures in Yuhup are generally such that unsyllabifiable consonant clusters do not arise. However, under the augmentative analysis developed here, the subminimal suffixes constitute a case where structures arising from affixation necessitate insertion.

The set of constraints that drive vowel harmony, I will label "V-HARMONY". This could be decomposed in term of *Vowel-Feature constraints that minimize autosegments in the output (see Beckman 1997, among others). V-HARMONY will compel a feature to be linked across syllables, violating the CRISP-EDGE[σ] constraint (Itô & Mester 1999).[6]

(19)   CRISP-EDGE[σ]: No multiple linking across syllables.[7]

The ranking is illustrated in (20). The optimal output satisfies V-HARMONY at the cost of cross-syllable linkage.[8] An alternative with epenthetic [a] is ruled out by a violation of V-HARMONY.

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[5] The three examples of vowel epenthesis in loans provided in L&P (1999) are consistent with a pattern in which there is complete harmony if the preceding vowel is high and [a] if it is nonhigh. However, further data are needed to assess whether this generalization is indeed accurate for epenthesis in loanwords.

[6] The prevention of harmony for epenthetic vowels in certain loans could be attributed to lexically specific constraints (Pater 2000) prohibiting cross-syllable linkage for certain features (Walker, to appear).

[7] See Itô & Mester (1999: 208) for a formal definition of the CRISP-EDGE constraint scheme.

[8] Notice that vowel harmony obeys the UNIQUENESS condition of MSH. The harmonizing vowel is inserted (violating DEP), and the segment thus does not correspond to a morpheme, even though it shares features with the preceding vowel. Hence, the segment correspondence relations are: /č₁u₂t₃/ → [č₁u꞉.u₄t₃].

(20)   V-HARMONY >> CRISP-EDGE[σ]

/č̌u-t̲/	V-HARMONY	CRISP-EDGE[σ]
a. ☞ č̌uː.ut̲		*
b. č̌uː.at̲	*!	

I consider next the source of the geminate consonant in the case of consonant-final stems. I suggest that what is at issue here is morphological-to-prosodic edge alignment. Consider the representations in (21). The structure in (21a) has an epenthetic consonant (and vowel). This segment will match the preceding consonant via feature spreading, although the detail of feature linkage is not shown here. In (21b), the medial consonant is not geminate. In Yuhup, the structure in (21a) is more harmonic than the one in (21b), as the symbol "≻" denotes. (Later in this section I will argue that an alternative geminate structure with linkage of one root to both syllables is not optimal in Yuhup.)

(21)   a.   σ   σ   b.   σ   σ
            / | \   / |\   /\   / |\   Syllable structure
            ỹ ã m m ã t   ≻   ỹ ã m ã t
            \| / | \ | / | Morpheme structure
             m   m   m   m

I propose that the consonant insertion is driven by stem-to-syllable right-edge alignment, as in (22) (McCarthy & Prince 1993a, b, Prince & Smolensky 1993, Itô & Mester 1999). This constraint is obeyed in the structure in (21a) but not in (21b).

(22)   ALIGN-R: ALIGN(Stem, R, σ, R):
         The right edge of every stem is aligned with the right edge of some syllable.

The different shapes of the augmentative suffixation each obey ALIGN-R while minimizing augmentation. Let us compare the attested shapes and the failed competitors given in (23). The symbol "|" marks a stem boundary. The -CVt shape for the locative suffix attached to a consonant-final stem is shown in (23a). The competition between this shape and an alternative -Vt form, with no geminate, will be decided by ALIGN-R. Following Itô & Mester (1999), I interpret ALIGN-R as fulfilled by coda consonants at the stem edge that share material with a following onset.[9] As discussed by Itô & Mester, such cross-linked structures violate CRISP-EDGE[σ] but obey alignment. An example of the -Vt shape for the locative suffix attaching to a vowel-final stem is given in (23b). This shape and an alternative -CVt form, with epenthetic consonant as well as vowel, both obey ALIGN-R. Here the decisive constraint is DEP-IO, which favors -Vt, because it inserts the minimal number of segments needed to satisfy MSH and ALIGN-R.

(23)   a.   [ỹãːm.|mãt] ≻ [ỹãː.m|ãt]   Decided by ALIGN-R
         b.   [č̌uː.|ut] ≻ [č̌uː.|hut]   Decided by DEP-IO

Although ALIGN-R plays a role in motivating the inserted consonant in the augmented affixations, this constraint is not always obeyed in the grammar. ALIGN-R will conflict with a constraint that holds over suffixes in Yuhup, one requiring that their left edge be aligned with the right edge of the stem (Russell 1997).

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[9] See Itô & Mester (1999) for a formal definition of alignment that is compatible with this interpretation. Similar interpretations of ALIGN-R under circumstances of cross-syllabic consonants or C-place features figure in work by Prince & Smolensky (1993) on Lardil and Merchant (1995a) on German.

(24)   ALIGN-SUFFIX: ALIGN(Affix, L, Stem, R)

　　　Let us now examine the rankings of the constraints at issue. First, recall that the necessity to locate a subminimal suffix in a prosodic head compels vowel insertion. Hence, MSH outranks DEP-IO, as already determined (see (18)). Since vowel insertion produces suffix misalignment, MSH must also dominate ALIGN-SUFFIX. The ranking is illustrated in (25). The candidate in (25a), which inserts a vowel and thereby misaligns the suffix, wins over the faithful alternative in (25b).

(25)   MSH >> ALIGN-SUFFIX, DEP-IO

/ču-t/	MSH	ALIGN-SUFFIX	DEP-IO
a. ☞ čuː.ut̪		*	*
b.　 čuːt̪	*!		

　　　The next point to address is that augmentation occurs only under conditions of subminimality. In suffixation of /-ih/ 'progressive', which meets the size minimum, ALIGN-SUFFIX is obeyed despite stem-to-syllable misalignment. Accordingly, ALIGN-SUFFIX must dominate ALIGN-R, as seen in (26). In /-ih/ attachment, the faithful candidate in (26a) will thus win over alternatives in which a segment is inserted to satisfy ALIGN-R. In (26b) the inserted consonant shares features with the stem-final consonant and in (26c) a default [h] is inserted; however, both of these candidates are ruled out by violations of ALIGN-SUFFIX. The constraint that rules out a fourth candidate which forms a geminate structure via mora epenthesis only will be addressed after the next tableau.

(26)   ALIGN-SUFFIX >> ALIGN-R

/šaw-ih/	MSH	ALIGN-SUFFIX	ALIGN-R
a. ☞ šaː.w|ih			*
b.　 šaːw.|wih		*!	
c.　 šaːw.|hih		*!	

　　　For the subminimal suffixes, we have determined that ALIGN-SUFFIX is violated in order to satisfy MSH. Under these conditions, ALIGN-R has the opportunity to prevail at the cost of DEP-IO. This is shown in (27) with an input containing a consonant-final stem and the future suffix /-p/. The faithful candidate in (27c) is eliminated by a violation of MSH. The competition then falls to candidates (27a) and (27b), which each insert material, and accordingly violate ALIGN-SUFFIX. Interpreting the magnitude of suffix alignment violations as tied, the decision falls to the dominated ALIGN-R constraint, which — ranked over DEP-IO — favors the *-CVp* shape of future suffixation. In the case of a vowel-final stem, as in (25), consonant insertion does not occur in augmentation, because ALIGN-R is obeyed with vowel insertion only. The result seen in (27) (in contrast to (26)) is that the activity of ALIGN-R emerges when violations of ALIGN-SUFFIX are independently compelled by a higher-ranked constraint, a kind of "parasitic constraint satisfaction" (see Walker, to appear). Notice that ALIGN-SUFFIX is evaluated categorically here, that is, suffix misalignment by one segment or two is tallied as a single violation. This categorical reckoning of marks is crucial in order to pass the decision on to ALIGN-R. Hence, the Yuhup augmentation suggests that alignment encouraging contiguity between morphemes can be a categorical phenomenon. (See McCarthy & Prince 1993b on possible parametric gradient/categorical reckoning of ALIGN violations. Note also Merchant 1995a, b, Noske 1999 on categorical evaluation of MCat-PCat alignment.)

(27)   ALIGN-R >> DEP-IO

/key-p̲/	MSH	ALIGN-SUFFIX	ALIGN-R	DEP-IO
a. ☞ key.|yep̲		*		**
b. ke.y|ep̲		*	*!	*
c. key|p̲	*!		*	

Another candidate to consider is one pronounced as [keyyep] but with a geminate structure that involves mora epenthesis only, that is, a structure in which the root of the stem-final consonant is associated to both the coda of the first syllable and the onset of the second syllable. Such a configuration would tie with (27a) on MSH, ALIGN-SUFFIX, and ALIGN-R, and it would incur one less violation of DEP-IO. Although this candidate will be pronounced the same as the one in (27a), I assume that it is not the optimal structure, because if it were, single-root gemination would then erroneously be predicted to also occur in the case of /-ih/ suffixation. Single-root consonant gemination would obey all three of the constraints in (26). Although DEP-µ and *GEMINATE would be violated by a candidate [ša:wwih] with a single-root geminate structure (homophonous with (26b), which inserts a root node), these constraints cannot be responsible for ruling it out, since both must be dominated by ALIGN-R to achieve the augmentation result in (27) (assuming the coda is moraic). I propose to rule out single-root geminate structures in Yuhup with the SYLL-SEG constraint posited by Rosenthall (1994). SYLL-SEG bans a segment root from being associated with both a mora and a syllable node (in Rosenthall's notation, subscripts represent associations between segments and prosodic elements).

(28)   SYLL-SEG: If Rt_i is linked directly to σ, then $*µ_i$

SYLL-SEG will necessarily dominate ALIGN-R to prevent single-root gemination in instances of vowel-initial suffixes, such as /-ih/ 'prog.', attaching to consonant-final stems. Its implication for the structure of augmentation in the case of consonant-final stems is that the geminate will be formed by inserting a root node (a possibility that becomes viable only under circumstances of suffix misalignment, as seen above). The identity of the inserted consonant with the stem-final consonant will be driven by *[F] constraints, which favor feature spreading over inserted features, parallel to vowel harmony. Although a recent broad study of geminates by Keer (1999) posits a single-root moraic structure instead of a two-root alternative (e.g. Selkirk 1991), the Yuhup augmentation pattern lends support to the possible existence of two-root geminates. Keer raises the potential objection that a two-root geminate with shared features might not be expected to exhibit the geminate characteristic of resisting vowel epenthesis; however, as Keer acknowledges, this problem is eliminated under an assumption that well-formed phonological representations prohibit line crossing (Goldsmith 1976). In light of these rich surrounding issues, further research on Yuhup could fruitfully be directed towards exploring the structure and patterning of geminates in the language.

An overview of the main constraint rankings determined for Yuhup is given in (29). The ranking in (29a) achieves the size maximum observed in Yuhup morphemes. The one in (29b) achieves the size minimum and the augmentation patterns. Although SYLL-SEG is located at the top of the hierarchy in (29b), the constraint that it crucially dominates is ALIGN-R. A key result here is that no morpheme-specific constraints are needed to obtain the augmentative nature of the locative and future suffixations. The inserted material follows from general morphological-prosodic constraints.

(29) a.   MSH >> *STRUC-σ >> MAX-IO
      b.   MSH, SYLL-SEG >> ALIGN-SUFFIX >> ALIGN-R >> DEP-IO >> ONSET[10]

Let us briefly consider some alternative approaches. First, as mentioned in section 1, L&P (1999) propose empty skeletal slots in the underlying representation of the locative and future suffixes. The key drawback of a skeletal slot analysis is that it misses a connection between the properties of these suffixations and general morphological/ prosodic constraints operative in the grammar. The atemplatic augmentative account proposed here not only obviates any need to call upon empty skeletal slots, but it also brings explanation to the shape and size of suffixation.

Another conceivable approach involves reduplication. Although the stem-dependent nature of the onset consonant and vowel in the locative and future suffixation might seem to suggest a possible source in reduplication, the mirror-image relation of segment repetition denies this. Let us consider the example of [key-yep]. If the [ye] sequence had its source in reduplication, it would violate both left anchoring and right anchoring constraints (McCarthy & Prince 1995). A reduplicant that consists of [ke] ([key-*ke*p]) or [key] ([key-*key*p]) would always be preferred — under no re-ranking of the anchoring constraints could the mirror-image copy be obtained. The consequent prediction is that mirror-image reduplication does not occur, a generalization that meshes well with the cross-linguistic facts. However, given this generalization, epenthesis will necessarily be the source for at least one of the augmentative segments. Moreover, I have demonstrated above that it is capable of capturing both of them. This result is also a positive one in light of recent studies arguing against prespecified segmentism in reduplication (see Alderete et al. 1999 and citations therein, Walker 2000, Feng 2001).

5.   Conclusion

In conclusion, in this paper I have argued that the locative and future suffixes in Yuhup are subminimal in size and undergo augmentation. In this account, vowel insertion is driven by the MSH constraint, which characterizes an independently-observed condition on the relation between morphemes and prosodic heads in the language. I posit that consonant insertion is driven by right stem-to-syllable alignment, a constraint that has solid cross-linguistic motivation and accurately predicts variability in the form of augmentation. A central result is that the shape and content of the locative and future suffixes is atemplatic in nature and is determined through the interaction of general morphological/phonological constraints operating in the grammar. This study thereby contributes to the growing body of research on the varied sources of affixation patterns that combine fixed material with stem-dependent content.

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[10] The onsetless syllable in locative suffixation ([C1V2:.V2t]) points up an area of Yuhup phonology that demands further research. L&P (1999: 326) notice that (a) word-medial violations of ONSET are not commonly observed in Yuhup, and (b) Yuhup shows a strong preference for consonant-final morphemes. No cases of /CV-VC/ structures are reported in L&P (1999), and if such forms do occur in nonaugmentative affixation, it is unclear how the language would resolve them. The locative suffixation indicates, however, that onsetless word-medial syllables are tolerated under at least some circumstances.

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