

What umlaut tells us about the underlying morphological structure of verbs in Sinhala

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ABSTRACT

In this short paper, we investigate the morphophonological process of umlaut in Sinhala with a focus on verbal umlaut. The focus lies on an accurate description of the patterns of application and underapplication of the process in question. In other words: When does umlaut apply and when doesn't it apply? As has been noted in the literature, umlaut itself seems to be triggered by an arbitrary morphological diacritic on specific affixes. What has gone unnoticed so far is the fact that the umlaut-triggers themselves fall into two classes: Strong umlaut-triggers and weak umlaut-triggers. We provide two diagnostics to distinguish these classes and then go on to argue that these two asymmetries are, on an abstract level, due to the same configuration, namely that weak triggers cannot trigger umlaut across a morpheme boundary while strong triggers can. In the final section, we then show that this generalization provides a strong argument for (i) the underlyingly concatenative nature of the verbal morphology of Sinhala and (ii) the necessity to refer to the notion of the morpheme.

1 Introduction

The typological literature has seen a longstanding discussion about whether there is a fundamental difference between fusional and agglutinating languages. Fusional languages tend to allow only for very few, often only one or two, affixes attaching to a given root whereas agglutinating languages allow for more. Similarly, affixes in agglutinating languages are often very independent; they rarely change depending on the specific roots and rarely interact with other affixes. In fusional languages, we often find more complex interactions between the different morphemes. Affixes and roots usually show complex patterns of allomorphy and suppletion. In addition, we often find various non-concatenative processes like reduplication, metathesis, morphological umlaut, etc.

The Indo-Aryan languages are usually viewed as falling on the fusional side of this distinction, and Sinhala, the language that we will be discussing in this paper, is no exception to this (see *e.g.*, the characterization in Garland 2005). In Sinhala, we find many instances of root suppletion, affixal allomorphy, reduplication and a complex pattern of morphologically triggered umlaut as well as a whole array of non-trivial phonological rules. As a result, the surface forms in Sinhala do not straightforwardly lend themselves to morphological subanalysis. In other words, it is often very hard to tell what the individual morphemes are in complex forms.

In this short paper, we take a closer look at one of these (seemingly) non-concatenative

processes, namely the process of umlaut in the verbal domain. Building on this investigation, we set out to present arguments for two claims: First, we will show that the application of umlaut crucially presents a strong argument that the verbal morphology is, underlyingly, perfectly concatenative. The non-concatenative appearance that is a characteristic of fusional languages arises only since superficial additional processes, which apply on the basis of the concatenative, underlying structure, obscure the systematicity of the base pattern. Secondly, we argue that in order to formulate a correct generalization of when umlaut can and when it cannot apply, we need to make reference to morphemes and morpheme boundaries. Approaches that reject the notion of the morpheme will have difficulties describing the pattern accurately.

The paper is structured as follows: In Section 2, we will introduce the topic of this paper, namely the phenomenon of umlaut in the verbal domain in Sinhala. In Section 3, we will present a curious puzzle of underapplication of umlaut. In some cases, umlaut does not apply even though we might expect it to. In Section 4, we take a closer look at the morpheme structure and the phonological processes obscuring it. This paves the way towards describing the empirical generalization about umlaut in a simple and straightforward way. This will be done in Section 5. Finally, Section 6 discusses the generalization we arrived at from a broader perspective and in reference to the two claims of this paper mentioned above.

2 Introduction to umlaut in Sinhala

The main topic of this paper is a detailed description of the morphophonological phenomenon of umlaut in the Indo-Aryan language Sinhala and a short discussion about what the phenomenon tells us about the morphological system of the language. Umlaut in general can be characterized as a change of vowel quality (usually on a stem) induced by certain affixes. In Sinhala, we find that some affixes change all vowels on a stem from back vowels to front vowels. Every /a/ changes to /æ/, every /o/ changes to /e/ and every /u/ changes to /i/. This is shown in (1) with some simple examples from the nominal domain. Here the feminine affix /i/ attaches to stems and as a result all vowels on the stem change to their fronted counterpart.¹

- (1) a. kurullu - i → /kirilli/
 bird - FEM
 ‘female bird’^{2,3}
- b. baləla - i → /bæləli/
 cat - FEM
 ‘female cat’

¹Note that the stem-final vowel in some cases deletes in order to avoid a vowel hiatus. Also, the schwa /ə/ does not change its form as it does not have a fronted counterpart.

²Unless stated otherwise, all examples are from our own data collection and have been constructed or confirmed by a native speaker of Sinhala. The tasks involved either providing grammaticality judgements for sentences constructed by the authors or translations from English.

³In what follows, umlaut-triggering morphemes will be boxed in all examples.

- c. wanduru - i → /wændiri/
 monkey - FEM
 ‘female monkey’
- d. kolu - i → /keli/
 lad - FEM
 ‘lass’ Chandralal (2010)

In this paper, we will be concerned with the verbal domain and umlaut behaves essentially the same here. It changes all vowels on a stem to their fronted counterparts and it applies without exception to all verbs alike. Consider the examples below. In (2), we see a verb with a back vowel followed by a class marker, a causative, a non-past marker, and an indicative marker. Since none of these affixes trigger umlaut, the verb stem surfaces with a back vowel. If we now exchange one of the affixes for an umlaut-trigger such as the passive morpheme in (3) or the past tense morpheme in (4), then the verb stem will change to a front vowel.

- (2) bal-ə-wə-nə-wa
 look-CL1-CAUS-NPST-IND
 ‘causes to look’
- (3) bæ-l-Ø-e-nə-wa
 look-CL1-PASS-NPST-IND
 ‘is looked at’
- (4) bæ-l-ə-wə-u-wa
 look-CL1-CAUS-PST-IND
 ‘caused sb. to look’

Other umlaut-triggers include the perfect marker /-la/, the informal imperative marker /-pan/ and the repetitive aspect marker, which is realized by a full reduplication of the verb stem. Consider the examples below, which involve the verb stem /ad-/ (‘to pull’). In the regular imperative, which is not a trigger, the stem has a back vowel but in the informal imperative in (6), in the perfect in (7) and in the repetitive in (8), the stem has been umlauted as each of these morphemes is an umlaut-trigger.⁴

- (5) ad-i-nnə
 pull-CL2-IMP
 ‘Pull!’
- (6) æd-ə-pan
 pull-CL2-INF.IMP
 ‘Pull, my friend!’
- (7) æd-ə-la tie-nə-wa
 pull-CL2-PERF be-NPST-IND
 ‘have pulled’
- (8) æd-ə æd-ə in-nə-wa
 pull-CL2 RED.REP be-PRS-IND
 ‘be pulling’

The table below gives a selection of verbal affixes and classifies them into umlaut-triggers and non-umlaut-triggers.

What this table illustrates is that whether an affix is an umlaut-trigger is an arbitrary property of morphemes (or exponents) as it cannot simply be reduced to its morphological or phonological properties of the affixes in question. We see that derivational affixes such as causative or passive can differ as to whether they are triggers and the same holds for

⁴Perfect and repetitive aspect are both expressed by means of auxiliary constructions where tense and mood are realized on the copula.

Non-Umlaut-triggers		Umlaut-triggers	
CAUS	<i>-wə / -wa</i>	PASS	<i>-e</i>
NPST	<i>-nə</i>	PST	<i>-u/-GEM</i>
IMP	<i>-nnə</i>	INF.IMP	<i>-pan</i>
COND	<i>-ot</i>	PERF	<i>-la</i>
FOC	<i>-e</i>	REP	<i>-RED</i>

Table 1: Overview of the umlauting properties of Sinhala verbal affixes

inflectional affixes such as non-past or past or the difference between the regular imperative and the informal imperative. Further, we see that it is, synchronically, no longer possible to attribute the property of being an umlaut-trigger to the phonological properties of the affix itself. We see that some of the affixes that trigger umlaut are or contain back vowels themselves (such as one allomorph of the past tense marker, or the perfect). Similarly, we see that some affixes that are front vowels, do not trigger umlaut such as the verbal focus marker */-e/* (or the class marker for Class 2 - see example (5) above). Furthermore, some of the umlaut-triggers do not even contain segmental material (such as the other allomorph of the past tense, which is marked by gemination or the repetitive, which is marked by reduplication).

The conclusion that the property of being an umlaut-trigger is an arbitrary property of specific morphemes or exponents is in line with the general consensus in the literature on Sinhala: Geiger (1938); Parawahera (1990); Letterman (1997) all note that a synchronic treatment of umlaut in Sinhala will have to stipulate which affixes trigger umlaut and which ones do not. In what follows, we will ascribe to that view and assume that some affixes (namely the ones on the right in the table above) carry some sort of diacritic that specifies them to be an umlaut-trigger.

This observation sets the stage for the discussion in the next section that introduces an observation that, to our knowledge, is not found in the literature.

3 Two types of umlaut-triggers

In this section, we will introduce two asymmetries illustrating differences between two classes of umlaut-triggering morphemes.

3.1 The intervening causative

In this subsection, we illustrate the first asymmetry between the different umlaut-triggers. The first one concerns the question of whether umlaut applies across intervening morphemes. The asymmetry is stated below:

- (9) The intervention asymmetry:
Some umlaut-triggers such as [PST] or [PASS] will trigger umlaut on the stem across

intervening morphemes such as the causative. Other umlaut-triggers such as [PERF], [REP] and [INF.IMP] will not.

In order to illustrate this we need to test a configuration, where a low affix linearly intervenes in between the verb stem and the umlaut-triggers. Of course, the intervener cannot be a trigger itself, otherwise we would not be able to test whether the outer morpheme had any effect on the stem. The ideal candidate for an intervener is the causative morpheme /wə/, which is not a trigger itself and which is close enough to the stem so that it can appear in between the stem and all the affixes we want to test.

Consider first the configurations in (10) and (11). In both cases, we have constructed a configuration where an umlaut-trigger (past tense in (10-a) and passive voice in (11-a)) attaches to a verb that already bears a causativizing morpheme. And in both cases we see that that verb stem does undergo umlaut as it shows a front vowel. The abstract representations in (10-b) and (11-b) indicate that the umlaut-property that comes from the past or the passive morpheme can reach the stem vowel despite an intervening causative.

(10) Past Tense:

- a. bæɫ-ə-wə-u-wa
 look-CL1-CAUS-PST-IND
 ‘made so. look’

(11) Passive:

- a. bæɫ-ə-w-e-nə-wa
 look-CL1-CAUS-PASS-NPST-IND
 ‘is caused to look’

Now consider the examples in (12), (13) and (14). On the surface, we have the exact same configurations as above. The respective umlaut-triggers, the perfect, the informal imperative and the repetitive, are separated from the stem by an intervening causative. And even though we have seen that all three morphemes are umlaut-triggers in the basic forms (see examples (6), (7) and (8)), they do not trigger umlaut in the configurations at hand. The umlaut-property of these three morphemes cannot reach the stem across an intervening causative.

(12) Perfect:

- a. ad-ə-wə-la tie-nə-wa
 pull-CL2-CAUS-PERF be-NPST-IND
 ‘have made so. pull’

(13) Informal Imperative:

- a. ad-ə-wə-pan
 pull-CL2-CAUS-IMP
 ‘Make so. pull, my friend!’

(14) Repetitive:

- a. and-ə-wə and-ə-wə in-nə-wa
paint-CL2-CAUS RED.REP BE-NPST-IND
'making someone paint repeatedly'

So, what we see is that there seems to be a dichotomy of umlaut-triggers. Some of them can trigger umlaut at a distance (namely, PST and PASS), while others (namely, PERF, INF.IMP and REP) cannot. The latter need to be adjacent to the verb stem in order to trigger umlaut. As noted above, we refer to these two classes of triggers as weak and strong umlaut-triggers. The umlaut-property of weak triggers (PERF, INF.IMP, REP) cannot reach the stem across an intervener, while the umlaut-property of a strong trigger (PST and PASS) can.

3.2 Verb class sensitivity

Below we illustrate the second asymmetry concerning the split between the two types of umlaut-triggers we have seen above. This time, it concerns the application of umlaut in the two verb classes in Sinhala.

(15) Verb class asymmetry:

- Some umlaut-triggers such as [PST] or [PASS] will trigger umlaut in verb classes 1 and 2 whereas other umlaut-triggers such as [PERF], [REP] and [INF.IMP] will only trigger umlaut in Class 2 but not in Class 1.

According to standard descriptions (see *e.g.*, Geiger 1938; de Silva 1960; Gair 1970; Chandralal 2010) Sinhala has three classes of verbs, which can be distinguished by the class markers. In what follows, we only focus on the first two verb classes.⁵ The verb classes in Sinhala are most easily distinguished in the infinitive. The marker in Class 1 shows up as /a/ (16-a) and as /i/ in Class 2 (17-a). Note that in many examples, however, the underlying differentiation between the classes is neutralized because both vowels /a/ and /i/ are reduced to schwa in open syllables ((16-b) and (17-b)).

- (16) a. bal-a-nnə
look-CL1-INF
'to look'
b. bal-ə-la
look-CL1-PERF
'look'

Class 1

⁵What is usually referred to as the third class is a class that contains only intransitive verbs (including many verbs that also appear in classes 1 or 2 in a transitive version). The marker of this so-called class 3 is an /e/ and obligatorily triggers umlaut, which is why verbs of class 3 always come with a front vowel, which is why they are uninformative for our purposes. We want to note that the exponent of the so-called class marker in class 3 (/e/), is also the exponent of a passive marker, which we assume to not be a coincidence given that the class only contains intransitive verbs (see Beavers & Zubair (2012) for discussion).

- (17) a. ad-i-nnə
pull-CL2-INF
'to pull'
- b. æd-ə-la
pull-CL2-PERF
'pulled' Class 2

Apart from the different realizations of the class marker, these verb classes behave differently with respect to a number of other processes including their property to undergo umlaut. Strong umlaut-triggers (PST and PASS) will trigger umlaut in both verb classes while weak triggers (PERF, INF.IMP, REP) will only trigger umlaut in Class 2. Consider first the behavior of PST and PASS in the examples below. PST in (18) and PASS in (19) will trigger umlaut on both verb classes. All the verb stems in (18) and (19) have undergone umlaut.

- (18) Past Tense:
- a. bæ-l-∅-u-a
look-CL1-PST-IND
'looked' Class 1
- b. æd-∅-d-a
pull-CL2-PST-IND
'pulled' Class 2
- (19) Passive:
- a. bæ-l-∅-e-nə-wa
look-CL1-PASS-NPST-IND
'is looked at' Class 1
- b. æd-∅-e-nə-wa
pull-CL2-PASS-NPST-IND
'was pulled' Class 2

Again, that can be contrasted with the behavior of weak umlaut-triggers PERF, INF.IMP and REP in the examples below. In these examples, we see that the Class 1 verb *bal-* ('look') does not undergo umlaut but the Class 2 verb *ad-* ('pull') does.

- (20) Perfect:
- a. bal-ə-la tie-nə-wa
look-CL1-PERF be-PRS-IND
'has looked' Class 1
- b. æd-ə-la tie-nə-wa
pull-CL2-PERF be-PRS-IND
'has pulled' Class 2
- (21) Repetitive

- a. bal-ə **balə** in-nə-wa
look-CL1 RED.REP be-PRS-IND
'be looking' Class 1
- b. æd-ə **ædə** in-nə-wa
pull-CL2 RED.REP be-PRS-IND
'be pulling' Class 2
- (22) Informal Imperative:
- a. bal-ə-**pan**
look-CL1-INF.IMP
'Look, my friend!' Class 1
- b. æd-ə-**pan**
pull-CL2-INF.IMP
'Pull, my friend!' Class 2

So, as with the asymmetry concerning the intervention, we note that there is a difference in behavior between the umlaut-property of strong triggers and the umlaut property of weak triggers. Strong triggers will always trigger umlaut on a verb regardless of its class membership while weak triggers will only do so in Class 2.

4 Arriving at the Generalization

In the preceding section, we have seen two asymmetries that suggest that a further subdivision of umlaut-triggers is needed. There are umlaut-triggers which will trigger umlaut regardless of the verb class in question and regardless of whether there are intervening morphemes or not. The other umlaut-triggers will only trigger umlaut iff they are adjacent to the verb stem and iff the verb in question is a Class 2 verb.

Notably we find that both asymmetries make reference to the same sets of umlaut-triggers. In both cases, it is the passive and the past tense morpheme which always trigger umlaut and in both cases, it is the perfect, the informal imperative and the repetitive which trigger umlaut only under a specific condition.

We take this as sign that there is systematicity to the process, and that ultimately the two asymmetries have the same underlying cause. And, as we will see below, indeed the two asymmetries can be reduced to one when taking a closer look at the nature of the two verbal class markers mentioned in the preceding subsection.

We have seen above that the two verb classes we are interested in for the purposes of this paper can be distinguished by the theme vowels in the infinitive (16) and (17) above. But they can also be distinguished by looking at the exponents of the causative and the past tense morphemes (bolded):

- | | | | |
|------|---|------|--|
| (23) | Class 1: | (24) | Class 2: |
| | a. and-a-nnə
cry-CL1-INF
'to cry' | | a. ad-i-nnə
pull-CL2-INF
'to pull' |
| | b. and-ə-wə-nə-wa
cry-CL-CAUS-NPST-IND
'make so. cry' (causative) | | b. ad-də-nə-wa
pull-CAUS-NPST-IND
'make so. pull' (causative) ⁶ |
| | c. ænd-∅-u-a
cry-CL1-PST-IND
'cried' (past tense) | | c. æd-∅-d-a
pull-CL2-PST-IND
'pulled' (past tense) |

For Class 1, the causative is realized as /-wə-/ and the past tense is realized with /-u-/. For Class 2, however, the causative and the past tense involve gemination rather than a purely segmental exponent. Based on Abhayasinghe (1973), Letterman (1997) argues that this actually suggests that Class 2 does not have a class marker underlyingly at all. According to her, the /i/ in the infinitive above as well as the /ə/ in Class 2 in many of the other forms are merely epenthetic material.⁷

To be concrete, Letterman (1997) argues that the past tense exponent is a more abstract element, an empty mora μ which is realized as /u/ when it is adjacent to a vowel and as gemination when it is adjacent to a consonant. In Class 1 (25), the past marker will always be adjacent to a vowel since there is the class marker present. In Class 2, however, according to Letterman (1997), there is no class marker and hence the empty mora that is the tense exponent will be next to the stem-final consonant, leading to gemination (see (26)).⁸

- (25) Class 1 - Past:
bal-ə + μ → /bælu/
look-CL1 + PAST

- (26) Class 2 - Past:

⁶For Class 2, there is some speaker-variation as to the exponent of the causative. Either the causative is exponed by gemination of the stem-final consonant (plus a schwa), by adding the suffix /-wə/, or by a combination of both, resulting in a /-Cəwə/ affix. So, in addition to the form *ad-də-nə-wa*, we also find the forms *ad-ə-wə-nə-wa* and *ad-dəwə-nə-wa*.

⁷Letterman discusses various forms of hiatus resolution in the language, and shows that in both the nominal and verbal domain there is a high vowel that can be epenthesized. Note that it is not uncommon to have high epenthetic vowels in Indo-Aryan languages (so-called *svarabhakti*-vowels) (see *e.g.*, Masica 1991; Jena 2006).

⁸Maybe it is a bit unusual to assume that the empty mora will be realized as a vowel when it is next to a vowel as this creates a marked phonotactic structure. We have the impression that the /u/ that is usually taken as the exponent of past tense in Class 1 often also has more glide-like properties as it then appears in between the class marker vowel and the verb-final indicative marker /a/. In that sense what is transcribed as the past tense marker /u/ is a combination of the class marker schwa plus a back vowel glide. We leave this for future research.

ad + μ → /ædd/
 pull + PAST

In Class 2 in the present tense where the tense exponent is an /nə/, the resulting consonant cluster requires the subsequent application of an epenthesis rule that inserts an /i/ in the position where usually the class marker would appear.

(27) Class 2 - Non-Past:

ad + nə → /adnə/ $\xrightarrow{\text{Epenthesis}}$ /adinə/
 pull + NPAST

The same conclusion that Class 2 does not have a class marker is drawn by Geiger (1938)⁹ on the basis of diachronic data. He shows that the vast majority of Class 2 verbs are historically all part of the consonant-final verb class in Sanskrit. Further, he shows that older stages of Sinhalese often do not show the apparent /i/-class marker with Class 2 verbs:

- (28) a. vad-i-nnə
 enter-CL2-INF
 ‘enter’ (modern Sinhala)
- b. vadnā
 enter.INF
 ‘enter’ (medieval Sinh. (7th-12th CE)) Geiger (1938:140)

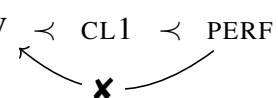
This assumption by Geiger (1938) and Letterman (1997) that Class 2 (unlike Class 1) actually has no class marker patterns extremely well with our observation that Class 2 is more likely to undergo umlaut as this allows us to reduce the both asymmetries to one which can simply be phrased in terms of locality. The reason that Class 1 does not undergo umlaut with the weak umlaut-triggers is that it has a class marker intervening. We already saw that intervention of the causative blocks umlaut triggered by the weak triggers so it is not surprising that intervention by any other morpheme such as the class marker does the same thing. Class 2, on the other hand, does not have a class marker. The segment that looks like a class marker is merely epenthetic and, at the point when umlaut applies, it is not present and thus cannot intervene. In what follows, we will now no longer gloss the /i/ as the class marker for Class 2 but rather gloss it as part of the stem.

Consider the representations in (29) and (30), both of which feature a verb with a weak umlaut-trigger. In (29), we have a Class 1 verb, which comes with its class marker. Thus, the umlaut-property that is introduced by the weak trigger (PERF) cannot reach the stem because there is a morpheme intervening. In (30), we see a Class 2 verb, which does not have a class marker. Therefore, when the weak umlaut-trigger attaches to it, there

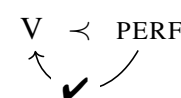
⁹Geiger calls the /i/ in Class 2 a *svarabhakti vowel* noting that (i) it was not present in older stages of the language and (ii) given its vowel quality and its position in the verb, it would be expected to trigger umlaut at the stage when umlaut was still triggered by the phonological properties of the affix itself.

is no intervening morpheme and thus the umlaut-property of PERF can reach the stem as indicated in (30-b). The schwa that is usually taken to be the reduced class marker is merely the result of subsequent epenthesis of /i/ plus additional vowel reduction.

Class 1:

- (29) a. and-a-la → /andəla/
 cry-CL1-PERF
 ‘has cried’
- b. V < CL1 < PERF


Class 2:

- (30) a. ad-la → /ədəla/
 pull-PERF
 ‘has pulled’
- b. V < PERF


In essence this means that the asymmetry between the two verb classes can be reduced to whether the class has an overt class marker or not. Class 1 does have a class marker and therefore is not affected by the umlaut-property of weak triggers. Class 2 does not have a class marker and therefore will be affected by weak triggers. What this means is that we managed to reduce the two asymmetries we saw in Sections 2.2.1 and 2.2.2 to one, given in (31):

- (31) The Empirical Generalization:
 [PASS] and [PST] can trigger umlaut on the stem across intervening morphemes while [PERF], [REP] and [INF.IMP] cannot.

5 Discussion

In the preceding section, we arrived at the empirical generalization about the application of umlaut in the verbal domain in Sinhala. In this section, we go on to discuss two important implications of this finding:¹⁰

- The empirical generalization in (31) strongly motivates a concatenative analysis of the seemingly non-concatenative morphophonological process of umlaut in Sinhala.
- The generalization in (31) also illustrates the need for a morpheme-based analysis of the verbal complex in Sinhala.

We will elaborate on these implications in the following subsections.

¹⁰Arguably, we want to model the asymmetry between the two types of umlaut-triggers as the result of independent aspects of the verbal morphology in Sinhala. For that the reader is referred to Fenger & Weisser (2022), where we discuss various locality-based solutions to that asymmetry.

5.1 Concatenativity

Umlaut is, descriptively, a non-concatenative process. Some morphosyntactic features are expressed not (just) with a segmental affix but (also) with a change of the vowel quality of the stem.

Nonetheless, we argue that the systematicity of application patterns of umlaut in the verbal domain in Sinhala strongly suggest that it should be derived by means of an underlyingly concatenative mechanism. Umlaut should be conceived of as a floating feature that is introduced by certain suffixes in the structure. The floating feature tries to attach to the stem vowels and depending on the configuration it can or it cannot. This strongly supports the treatment of umlaut that has been proposed for in German(ic) by Lodge (1989); Yu (1992); Lieber (1992); Wiese (1996); Trommer (2021), and the treatment of umlaut in Sinhala in Parawahera (1990); and it falls in line with recent attempts to reduce all sorts of seemingly non-concatenative morphophonology to concatenative processes (*i.e.* affixation). This line of research has been dubbed “Generalized non-linear affixation” (see amongst many others Bermúdez-Otero 2012; Trommer & Zimmermann 2014). The illustration in (32) shows the underlying mechanics. The umlaut process is triggered by a floating feature (here, [–back] (see Lieber (1992))) which originates on the affix that expresses past tense. The affix expressing past tense appears in the correct position where we would expect it to be given the general rules of Sinhala morphology (and the Mirror Principle). From that position, the floating feature will then go on to attach to the vowel of the stem leading to fronting. This way, umlaut is essentially reanalyzed as a concatenative process. The morphology introduces an affix which simply happens to contain a suprasegmental phonological information that needs to associate somewhere to be realized. The actual process of association, its locality or its specific properties is not a matter of morphology; it is outsourced to the phonology.

(32) The Concatenative Nature of Umlaut:

$$\begin{array}{l} \downarrow \\ /And/ - /ə/ - /u^{[-back]}/ - /wa/ \quad \longrightarrow /ænduwa/ \\ \text{V} \quad - \quad \text{CL} \quad - \quad \text{PAST} \quad - \quad \text{IND} \end{array}$$

So, in order to see the necessity for a concatenative approach, consider a non-concatenative alternative according to which stem forms of a given verb were simply selected based on the morphosyntactic feature configuration. Under such an approach we could thus say that, for every verb, we choose the umlauted stem in a past or a passive context and the non-umlauted stem elsewhere. Such an approach works for the “strong” umlaut-triggers passive and past because their ability to trigger umlaut does not depend on the configuration.

However, this simplistic approach runs into problems when we consider the “weak” umlaut-triggers (*i.e.* perfect, repetitive and the informal imperative). It is not possible to say that we choose the umlauted stem for a given verb in the perfect simply because we also have to consider whether the verb has a class marker or whether there is a causative in the structure or not. Finally, it is absolutely unclear why it is the presence or an absence of a

causative or a class marker that should matter for the realization of umlaut but the presence or absence of, say a negative prefix for example does not.

Under a concatenative approach, all of these questions receive straightforward answers. The umlaut feature is introduced at the position of the respective segmental exponents. From that position on, it tries to attach to the stem but it is blocked by any intervening morphemes. A causative as well as a potential class marker is linearly intervening and thus can potentially block association of the floating feature introduced by the affix but negation, being a prefix, cannot.¹¹



We thus take this as a strong argument in favor of a concatenative approach to umlaut in Sinhala.

5.2 The necessity to refer to morphemes

The empirical generalization we arrived at in Section 4 states that weak umlaut-triggers cannot trigger umlaut on the stem when there are intervening morphemes between the trigger and the stem. The crucial minimal pair was the one in (7) and (12) repeated in (34). As we have seen above, the exact same pattern also appears with the repetitive and the informal imperative.

- (34)
- | | |
|----|--|
| a. |
pull-PERF be-NPST-IND
'have pulled' |
| b. |
pull-CAUS-PERF be-NPST-IND
'have made so. pull' |

As we have argued, this blocking of umlaut is not specific to the causative morpheme. In Section 4, we argued that the same logic underlies the asymmetry between the two verb classes. The reason that Class 1 does not undergo umlaut in the perfect is that it has, unlike Class 2, an overt class marker that intervenes:

¹¹ Alternatively, a non-concatenative approach might assume that umlaut is conditioned by linear adjacency in the same way as allomorphy or suppletion often is. However, this explanation then would fall short of explaining the umlaut properties of strong triggers which can trigger umlaut across other morphemes. Note as well, that in Fenger & Weisser (2022) we also compare verbal root suppletion and umlaut in more detail and find that their locality contexts are different in exactly that respect: Umlaut is potentially non-local (with past or passive) whereas suppletion is only ever possible under adjacency.

- (35) bal-ə-la
 look-CL1-PERF
 ‘have looked’

We arrived at the generalization that any intervening morphemes between the stem and weak umlaut-triggers block the application of umlaut.¹² This of course raises the question, how this generalization can be rephrased in morphological frameworks that do not adopt the notion of the morpheme.

One prominent example of such a theory is Stump’s (2001) Paradigm Function Morphology (PFM). Unlike in *lexical* theories, where phonological features and morphosyntactic features of individual morphemes are directly associated, the association in *inferential* theories such as PFM is indirect. In other words, the concept of the morpheme as a one-to-one mapping between form and function of affixes is rejected and thus it is interesting to look at whether PFM has a plausible way of dealing with the Sinhala pattern. In PFM, the morphosyntactic features are associated with the word as a whole and the phonological makeup of a given word is determined by a sequence of realization rules (Stump 2001, p32f). In order to model stem changes, PFM allows for two distinct mechanisms. Stem changes can either be modelled (i) by means of realization rules or (ii) by metageneralizations.

To give an example from Stump (2001:33) for the first mechanism, the German word form *Müttern* ‘mothers.DAT’ is formed by applying two realization rules: The first one chooses the umlauted stem of the root *Mutter* ‘mother’ because the word form is associated with a morphosyntactic plural feature and the second rule suffixes an *-n* to that stem because the word form is also associated with a DATIVE case feature.

So, to transfer the example to our case at hand, we could say one of the realization rules for a given verb in Sinhala chooses the umlauted form of the stem when the word form is associated with a morphosyntactic feature that expresses a perfect.¹³

- (36) Choose the umlauted stem if the word-form is associated with the feature [PERF].

Crucially, this will give us the wrong result in some cases, namely when the verb in question is a Class 1 verb or when the word form is also associated with a causative feature. In order to solve this problem, we could invoke more specific realization rules such as (37-a) or (37-b) that overrule the rule in (36). Both are more specific as their context of application

¹²We want to reiterate at that point that the generalization cannot be reformulated by means of purely phonological interveners such as syllables. On the surface the example in (35) is indistinguishable from a similar example in Class 2 (*ədəla* ‘have pulled’). Similarly, as noted in Section 4 causatives can, in Class 2, for some speakers, either be expounded by gemination of the stem-final consonant (plus a schwa), by adding the suffix */-wə/*, or by a combination of both, resulting in a */-Cəwə/* affix. We want to stress that this choice has no impact on whether the stem can undergo umlaut, which suggests to us that the phonological exponent of the intervening affix is largely irrelevant; it is the morpheme boundary that blocks umlaut.

¹³For reasons of accessibility, we will give all realization rules in prose rather than in PFM’s elaborate formalism. To the best of our knowledge, this slight simplification does not affect the point we want to make in this section.

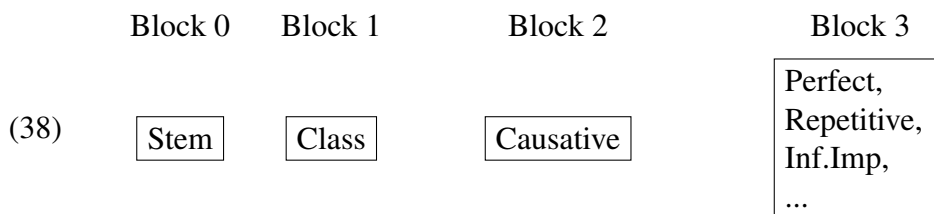
contains a superset of features of that of (36). Hence they take precedence if the more specific context is met.

- (37) a. Choose the non-umlauted stem if the word-form is associated with the features [+PERFECT, CLASS 1]
 b. Choose the non-umlauted stem if the word-form is associated with the features [+PERFECT, CAUS]

This would give us the right distribution of umlaut in perfect contexts but it arguably fails to capture two important generalizations: First, as noted in the previous section, it remains a complete accident that it is precisely the markers that intervene in between the segmental perfect affix *-la* and the stem that block stem umlaut. It could just as well be a negation feature that were to block it. In a concatenative system, where umlaut is introduced by the exponent and literally floats onto the stem if it can, such intervention cases fall out without further ado. The second problem is that we would need to formulate the overruling rules in (37) of course not only for perfect but also for repetitive and the informal imperative. This seems like a fairly redundant way of dealing with the pattern.¹⁴ All in all, an implementation in terms of realization rules (only) does not seem to capture the umlaut pattern of weak umlaut-triggers in Sinhala.

Thus the question is whether we can capture the pattern more adequately by means of meta-generalizations. As a simple toy example for stem choice conditioned by metageneralizations, Stump (2001:179ff) briefly discusses Sanskrit stem alternations between stems like *tasthús/tasthivát* ‘having stood’ that are conditioned by whether the immediately following affix in Rule Block 1 (*i.e.* the set of affixes that can immediately follow the root) is a vowel-initial or a consonant-initial one.

In order to try and mimic this solution for Sinhala, we could assume the following (yet, somewhat simplified) templatic rule blocks for Sinhala verbs. Note that, since the class marker and the causative can co-occur, they cannot be part of the same rule block.



Importantly, we note that when no conditions of the specific rules are met, then there will be an identity function that maps the stem onto the stem without any changes. In other words, if there is no causative feature on the entire word form, the respective rule in Block 2 does not apply. Nonetheless, there will be a default rule that applies and that does not change anything about the morphological make-up of the stem.

¹⁴Recall, that it is not simply possible to have an alternative realization rule stating “Choose the non-umlauted stem if the word form is associated with a causative-feature” because we know that causative verbs can undergo umlaut in the past or the passive.

- (39) a. Rule Block 0:
 (i) Stem choice
 b. Rule Block 1:
 (i) Suffix /a/ to the stem iff the word is associated with a verb of [CLASS 1]
 (ii) Else, add nothing
 c. Rule Block 2:
 (i) Suffix /wa/ to the stem iff the word is associated with a feature of [CAUSATIVE]
 (ii) Else, add nothing
 d. Rule Block 3:
 (i) Suffix /la/ to the stem iff the word is associated with a feature of [PERFECT]
 (ii) Suffix /pan/ to the stem iff the word is associated with a feature of [INF.IMP]
 (iii) Reduplicate the stem iff the word is associated with a feature of [REP]
 (ii) Else, add nothing

So, the question is whether we can formulate a meta-generalization that captures the stem-choice similar to the Sanskrit example above. The problem is however, that the system only allows us to (a) the morphosyntactic features of the entire word-form and/or (b) to the phonological properties of the exponent themselves. In the German example *Mutter/Mütter*, the alternation was conditioned by the plural feature of the word form; in the Sanskrit alternation between *tasthus-/tasthivat-*, it was conditioned by the phonological features of affixes.

Stem-umlaut with weak umlaut-triggers in Sinhala is, however, contingent on two syntagmatic properties: First, there must be an umlaut-trigger in Rule Block 3 and secondly, in Rule Blocks 1 and 2, the default rule must have applied. It is particularly the second condition that seems problematic. A default rule does not add phonological material to the stem that we would be able to refer to in order to formulate our meta-generalization. The only possible solution that we see at this point would be to allow for meta-generalization to refer to whether the default rule has applied in blocks 1 and 2.

- (40) Choose the umlauted stem iff:
 (a) The word form is associated with one of the features [PERF, REPET, INF.IMP]¹⁵
 (b) The rules in (40-b. (ii)) and (40-c. (ii)) have applied.

This meta-generalization does capture the pattern accurately but again, it has some fairly obvious shortcomings: First, the rule, again, treats it as a complete accident that it is precisely Rule Blocks 1 and 2 that intervene between the stem and what we take to be the umlaut-triggering morphemes. In a sense, we could easily formulate the same rule referencing Rule Blocks 4, 5, and 6 (which we have not given above for reasons of simplicity but which are required to accommodate tense, modals and mood marking). The second problem is that, as briefly alluded to above, it is not clear whether PFM actually allows us

¹⁵Alternatively, we could assume that weak umlaut is triggered by a morphomic feature μ that is defined as the set of weak-umlaut-triggers. As we have acknowledged in Sections 1 and 2, every theory needs to model somehow that there does not seem to be a clear natural class (phonologically or morphosyntactically) that sets apart umlaut-triggers from non-umlaut-triggers.

to refer to the application of default rules.¹⁶ In a sense, this is merely a restatement of the fact that no affix (or a undetectable zero-affix) has been added in a given rule block. And given the criticism of zero-affixes used in theories like Distributed Morphology Stump provides (Stump 2001:10f), this cannot really be viewed as a plausible solution. If we can refer to the application of a default rule in a given rule block, then this essentially becomes equivalent to having more zero-affixes in a verbal structure than any theory of DM (we know of) would assume.¹⁷ We think this is an undesirable result against the background of the framework but without actually referring to morpheme boundaries, we do not see at this point how the theory could accommodate the Sinhala facts. What we thus want to conclude from this section is that the generalization we arrived at in Section 4 can straightforwardly modelled and maintained in a theory that allows to make reference to morpheme boundaries and morphemes but a theory that does not will need to make some – as we argue implausible – additional assumptions.

6 Conclusion

In this short paper, we investigated the application of umlaut patterns in the verbal domain of Sinhala. In line with the existing literature, we found that umlaut itself is, synchronically, an arbitrary feature of certain affixes attaching to the verb. We found that the umlaut-triggering affixes fall into two classes: Strong umlaut-triggers like passive and past tense and weak umlaut-triggers such as perfect, repetitive and the informal imperative. This subdivision manifested itself in terms of two asymmetries: First, whether umlaut can skip an intervening causative affix, or secondly, whether umlaut is found in both verb classes or only in Class 2. Based on phonological and diachronic evidence, we argued that the two asymmetries can be reduced to one, namely whether umlaut can skip any intervening morphemes. Umlaut triggered by strong triggers can, and umlaut triggered by weak triggers cannot. Based on this generalization, we proceeded to argue for two independent claims: First, the generalization is most straightforwardly derived if we conceive of umlaut as an underlyingly concatenative process: certain morphemes introduce a floating feature which attempts to associate with the verbal root. In some cases that attempt succeeds, in others it does not. The second claim was that the empirical generalization we arrived at strongly suggests that we need to make reference to morphemes and morpheme boundaries, which turns out to be problematic for amorphematic theories of morphology.

¹⁶Stump's discussion of how to model morphophonological processes (Stump 2001:48) does unfortunately not involve cases where referring to the absence of a phonological exponent would be crucial.

¹⁷There is, to our knowledge, no account formulated in DM that would posit a zero-affix to account for the absence of a causative morpheme. Rather all accounts would simply posit that there is no syntactic causative-head in the structure to begin with. However, if the rule in (40) were on the right track, it does exactly that: It refers to the absence of a phonological marker in the slot that a causative-head would have occupied.

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