Syllabification in Tangale:
a Prosodic Analysis*

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0. Introduction

Tangale is a member of the Chadic language family spoken in Northern Nigeria. The syllable structure of the language is basically CVC, maximally allowing CCVC where the two consonants in the onset are homorganic word-initially or the consonant immediately preceding V is a glide. There is no clustering of consonants at the end of words and there are no medial triconsonantal clusters.1)

To resolve medial clustering of consonants Tangale employs epenthes, degemination and glide vocalization. In this paper I argue that these phenomena are best accounted for by counting mora as subsyllabic constituents and by resorting to the general principles of prosodic structure (Hyman 1985; Hayes 1989; Ito 1986, 1989; McCarthy and Prince 1993). Tangale syllabification is circumscribed by the syllable template allowing maximally one onset as well as coda consonant, in conjunction with right-to-left scansion, and syllable parsing based on the moraic unit is

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1) The data come primarily from fieldwork on the language in 1984 with native speaker Mairo Kidda and her 1985 dissertation.
guided by the prosodic principles such as Maximality, Directionality and Prosodic Licensing. Under the prosodic theory a vowel is inserted to serve as the nucleus of a degenerate syllable whenever one or two moras without syllable peak are mapped onto a syllable. Other strategies of syllabification such as degemination and glide vocalization also turn out to be derivable from the Prosodic Licensing principle.

By comparison, it will be shown that the general rule type of locating an epenthetic vowel in relation to the stray segments (Steriade 1982; Archangeli 1984; Levin 1985) brings in indeterminacy as to the insertion site and the number of epenthetic vowels. In this approach the epenthesis rule crucially interacts with the manner in which resyllabification applies, and hence the application of resyllabification with respect to epenthesis has to be stipulated when the environment of epenthesis is met more than once. Therefore, the prosodic theory singles out the epenthesis site more restrictively than the skeletal approach since in the former the site is invariably determined by prosodic principles.

After outlining the theoretical framework in the following section, section 2 shows that syllable parsing based on mora, rather than skeletal position, is capable of inserting a nuclear vowel in the proper site. Section 3 discusses degemination as another strategy of syllabification, preferring not to break up a cluster of homorganic consonants, and shows that the principle of Stray Erasure falls out from a more general prosodic principle of Prosodic Licensing. In section 4 glide vocalization is dealt with as a language-particular means of syllabifying a string of high sonority segments.

1. Theoretical Framework

In the literature on syllabification, syllable templates have been defined by a sequence of CV-skeletal units with structural nodes such as onset,
nucleus, rhyme, and coda (Steriade 1982; Clements and Keyser 1983; Harris 1983), by unified X-skeletons with X-bar structures (Levin 1985), or by moraic structures (Hyman 1985; Ito 1986, 1989; Hayes 1989; McCarthy and Prince 1993). Following recent studies showing that the moraic unit as a subsyllabic prosodic constituent plays a significant role in various domains of phonology and morphology, this paper takes the position that syllabification is not based on syllable-building rules (Steriade 1982; Levin 1985), but on templates and well-formedness conditions based on moras (Selkirk 1982; Ito 1986, 1989; Archangeli 1989).

Following the position that skeletal slots and the syllable-internal constituents as in Levin (1985) are eliminated from the comprehensive prosodic structure of syllable (Archangeli 1989; Hayes 1989; Tranel 1991), moras are daughter constituents of syllables, whose dominating constituents are feet, which in turn are dominated by prosodic words or phrases.

(1) \[
\text{PrWd}\\
\text{Ft}\\
\sigma\\
\mu \\
\mu \\
\sigma\\
\mu \\
\mu
\]

Of interest at this point are how materials in the terminal string are assigned to moras and what are the principles governing syllabification based on the moraic unit.

We first turn to the prosodic levels of moras and syllables. Moras are composed of the melodies cv, c, or v, as illustrated in (2a), where small letters indicate phonological segments rather than C, V elements in the skeletal tier.
The two expansions in (2a) are interpreted to be disjunctive: otherwise, the first expansion of mora in (2a) bleeds the second. Moras consisting of cv elements as in (2b) takes priority over those consisting of c elements alone as in (2d). In other words, every c element would form a mora regardless of its position with respect to vowel. We may note at this point that the present analysis assumes a mora even for a consonant in order to draw a distinction between light and heavy syllables.

We now turn to syllabification based on the moraic unit. Given the syllable template CVC, syllables can bear up to two moras and have the following structures:

(3) a. \[ \mu (\mu) \]

b. \[ \sigma \]

c. \[ \sigma \]

d. \[ \sigma \]

---

2) Note that "c" is not moraic in every language. The present analysis assigns a mora to a consonant for syllabification purpose, as in languages where a light vs. heavy metrical distinction is called for (Hayes 1989; Tranel 1991), although Tangale, as a tonal language, is not motivated to draw metrical distinction in terms of syllable types.
As stated in (3a), the initial mora always contains the peak of the syllable, and hence sonority decreases toward the syllable margin. Coupled with the nature of syllabic nature, one syllable peak per syllable, the Sonority Principle (Venneman 1972; Kiparsky 1979; Steriade 1982; Selkirk 1984; Clements 1990) disallows structures like (4).

\[
\begin{array}{c}
\text{(4)} \\
\begin{array}{c}
\text{\( \ast \sigma \)} \\
\text{\( \mu \)} \\
\text{\( \mu \)} \\
\text{\( c \) \( \text{V} \) \( c \) \( \text{V} \)} \\
\end{array}
\begin{array}{c}
\text{\( \ast \sigma \)} \\
\text{\( \mu \)} \\
\text{\( \mu \)} \\
\text{\( c \) \( \text{c} \) \( \text{V} \)} \\
\end{array}
\begin{array}{c}
\text{\( \ast \sigma \)} \\
\text{\( \mu \)} \\
\text{\( \mu \)} \\
\text{\( \text{V} \) \( \text{c} \) \( \text{V} \)} \\
\end{array}
\end{array}
\]

The structures in (4) are excluded since there are either two peaks within the same syllable, hence increasing sonority after a peak, or the syllable-initial mora does not constitute the peak of the syllable.

Having examined the prosodic structure of moras and syllables, we now turn to discussion of the prosodic principles of syllabification. First, the Maximalprinciple holds that the prosodic unit is of maximal size to the extent that it does not violate other constraints on its output. As for the moraic unit, it follows from this principle that the moraic structure (2b) consisting of cv elements takes precedence over the one in (2d) with a c element only. In relation to the syllable, Maximalprinciple is interpreted as maximally assigning moras to the syllable structure, insofar as it does not violate specific syllable well-formedness (Ito 1986, 1989; Hayes 1989; Kenstowicz 1994b).

Given the maximal syllable template CVC, consider a Tangale form /sogl-no/ (with the stem /soglo/ 'fish'; the first person possessive /no/; and the deletion\(^3\) of the stem-final vowel /o/). Of interest is the syllable

---

\(^3\) As will be discussed in section 2, Tangale shows evidence of a morphologically conditioned deletion rule.
parsing of the intervocalic triconsonantal clusters since Tangale syllables only allow one onset as well as coda consonant.

(5) a. $\sigma$ $\sigma$
    $\mu$ $\mu$ $\mu$ $\mu$
    sog lno

b. $\sigma$ $\sigma$
    $\mu$ $\mu$ $\mu$ $\mu$
    sog lno

c. $\sigma$ $\sigma$ $\sigma$
    $\mu$ $\mu$ $\mu$ $\mu$
    sog lno

d. $\sigma$ $\sigma$ $\sigma$
    $\mu$ $\mu$ $\mu$ $\mu$
    sog lno

The parsing in (5a,b) is ill-formed since syllables contain either a complex onset or coda; syllabification in (5c) is incomplete since the medial syllable lacks a nucleus. Syllabification in (5d) satisfies the template and well-formedness since syllables have simple onsets or codas and all have peaks without violating the Sonority Principle, provided that a nucleus is inserted, as will be discussed in detail in the following section.

In conjunction with the Maximality principle, Directionality has been amply attested in the literature to be a parameter required in the analysis of stress (Hayes 1986), nonconcatenative morphology (McCarthy 1986), and reduplication (Marantz 1982; Prince and Smolensky 1993). Directionality is also invoked in parsing syllables on the moraic level and plays a crucial role in locating the epenthesis site, as will be shown presently. Language typology shows that an intervocalic biconsonantal sequence is parsed either as a complex onset as in many cases of English and Spanish, or as a coda followed by simple onset as in Korean and Klamath. This dichotomy is circumscribed by the extrinsic ordering between onset rule and coda
rule: the former is phonologically accounted for by the Onset First Principle, whereas the latter by applying coda formation prior to onset maximization. Under the prosodic approach, however, the extrinsic ordering of syllable building rules does not have to be stipulated. Given the syllable template, syllable parsing now comes in line with parsing of other prosodic units, allowing either left-to-right or right-to-left scansion.

Third, the principle of Prosodic Licensing (Selkirk 1982; Ito 1986, 1989; Prince and Smolensky 1993) requires that all phonological units in each level be exhaustively dominated by a higher prosodic unit, as depicted in the prosodic structure in (1). Since an unsyllabified segment is represented as prosodically unincorporated, Prosodic Licensing, by excluding the possibility of having stray materials on the surface, automatically does the job of Stray Erasure (Steriade 1982; Clements and Keyser 1983; Harris 1983; Borowsky 1986, 1989). In relation to syllable parsing, epenthesisizing a nuclear vowel or eliminating an unlicensed segment may be viewed as mechanisms motivated entirely by the requirement for Prosodic Licensing.

Coupled with the Maximality Principle, Prosodic Licensing ensures the exhaustive syllable parsing of a phonological string. Consider the following prosodic structures, assuming a language with CVC templates.

(6) a. \[ \sigma \quad \sigma \]
\[ \mu \quad \mu \quad \mu \quad \mu \quad \mu \]
\[ c \quad c \quad c \quad c \quad c \]

b. \[ * \quad \sigma \quad \sigma \]
\[ \mu \quad \mu \quad \mu \quad \mu \]
\[ c \quad c \quad c \quad c \quad c \]

C. \[ * \quad \sigma \quad \sigma \quad \sigma \]
\[ \mu \quad \mu \quad \mu \quad \mu \]
\[ c \quad c \quad c \quad c \quad c \]

The prosodic structure in (6a) is well-formed since segments are exhaustively licensed and each syllable contains the maximal number of moras. By contrast, the syllable parsing in (6b) is ill-formed since it violates both Maximality and Prosodic Licensing by excluding the second
mora from the first syllable; so is the one in (6c), since here Maximality militates against the syllable template.

So far, we have examined how general prosodic principles, rather than rules on syllabification per se, interact in syllable parsing based on moraic units instead of skeletons. We now turn to the prosodic analysis of Tangale syllabification.

2. Epenthesis
2.1. Skeletal Epenthesis

Tangale gives evidence of a morphologically conditioned rule that deletes the final vowel of a morpheme when it is followed by another morpheme. In (7) we see absence of the stem-final vowel before the definite and possessive suffixes.

(7)

<table>
<thead>
<tr>
<th></th>
<th>'pigeon'</th>
<th>'fish'</th>
<th>'foul'</th>
</tr>
</thead>
<tbody>
<tr>
<td>indefinite</td>
<td>bagda</td>
<td>soglo</td>
<td>kwatra</td>
</tr>
<tr>
<td>definite</td>
<td>bagdi</td>
<td>sogli</td>
<td>kwatri</td>
</tr>
<tr>
<td>my</td>
<td>bagudno</td>
<td>sogulno</td>
<td>kwawrno</td>
</tr>
<tr>
<td>your(f)</td>
<td>bagud3i</td>
<td>sogul3i</td>
<td>kwawr3i</td>
</tr>
<tr>
<td>his</td>
<td>bagudni</td>
<td>sogulni</td>
<td>kwawrni</td>
</tr>
</tbody>
</table>

A morphological rule deleting the stem-final vowel /o/ in the underlying representation /soglo+no/, results in three consonants in a row. Since Tangale allows maximally one consonant in onset as well as coda position, the possessive forms require an epenthetic vowel in order to fully syllabify the triconsonantal sequence.

Syllable building rules (Steriade 1982, Clements and Keyser 1983, Levin
1985) syllabify word-medial triconsonantal clusters as follows:\(^4\):

\[
\begin{array}{c}
\sigma \\
| \\
C \quad V \\
| \\
\sigma \\
| \\
C \quad C' \quad C \quad V \\
\end{array}
\]

As there remains an unsyllabified segment (indicated by "prime" notation), the output is illformed. Syllable phonology ensures that epenthetic vowels are called into play at this point to support stray consonants: otherwise, they are deleted outright.

Typologically, languages have one of the following kinds of epenthesis rules, inserting a vowel either before or after the stray segment, or in between the two stray segments:

(9) Epenthesis

a. \( \phi \rightarrow V / C' \_\_\_\_\_ \)
b. \( \phi \rightarrow V / \_\_\_\_\_ C' \)
c. \( \phi \rightarrow V / C' \_\_\_\_\_ C' \)

Given medial triconsonantal clusters and the output in (7), Tangale apparently chooses the epenthesis rule (9b) available from the options. Thus, regular syllabically-motivated epenthesis phenomena are accounted for by the skeletal epenthesis rule (9b), as illustrated below:\(^5\):

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4) The unified representation of X, rather than CV, is extensively discussed in Levin (1985). CV notation will be used in this paper simply for its representational convenience.

5) In Ito's (1989) terms, the rules in (9) are called skeletal epenthesis, as opposed to prosodic epenthesis, since insertion is made with reference to skeletal positions.
An empty skeletal position is inserted by (9b) before the stray segment /V/. The coda consonant of the preceding syllable is then resyllabified as the onset of the following syllable. Assumed in this analysis is underspecification of features (Kiparsky 1982, 1985; Archangeli 1984; Borowsky 1985; Steriade 1987, Sohn 1987), and [u] is regarded the least marked vowel in this language, hence totally unspecified in underlying representation. The empty matrix with a skeletal position of V is later spelled out as [u] in Tangale by default rule.

In this paper, however, I argue that the skeletal account of epenthesis, parsing the CV skeleton and inserting a vowel before a stray segment, is not tenable in Tangale because it is indeterminate as to the exact epenthesis site. Consider the following data, where intervocalic quadric consonantal clusters arise from morphological elision: the stem- and suffix-initial vowels are deleted in word-medial position (/no/ is the first person accusative and /go/ the past tense marker).

\[
\begin{align*}
\text{(11)} & \quad \text{mbendam te\textsuperscript{l}ungo} (/te\textsuperscript{l}e + no + go/) \quad \text{'He misled me'} \\
& \quad \text{mbendam sog\textsuperscript{d}ungo} (/sogde + no + go/) \quad \text{'He lost me'} \\
& \quad \text{mbendam t\textsuperscript{\text{nd}}\text{ungo} (/t\textsuperscript{\text{nd}}\text{e} + no + go/) \quad \text{He chose me'} \\
& \quad \text{mbendam yimbungo} (/yimbe + no + go/) \quad \text{'He remembered me'}
\end{align*}
\]

---

\[6\] This parallels the Arabic dialect situation as described by Broselow (1980) and discussed by Ito (1989).
Take, for example, [teŋlungs]. Two consonants remain unsyllabified after the application of syllable-building rules in (12a), and a nucleus vowel is supplied as shown in (12b):

Since the epenthesis rule (9b) inserts the obligatory vocalic element of the syllable before the stray segment, epenthesis must operate on the rightmost stray consonant first, bleeding application of the rule with respect to the left one.

Upon application of the skeletal epenthesis rule (9b), however, some stipulation needs to be made in order to block the iterative application of epenthesis (9b) before another unsyllabified segment [l]. Adopting the general practice, if we assume that melody-related rules apply whenever the environment is met, while resyllabification takes place once before or after each cycle, the epenthesis rule (9b) would apply twice in a row when there are two stray consonants, yielding ungrammatical result as shown in (13):

---
Therefore, derivation of the correct output via skeletal epenthesis rule (9b) requires application of resyllabification immediately after epenthesis, so that insertion of another epenthetic vowel before [l] is blocked. Another way of blocking epenthesis with respect to the stray consonant on the left will be simultaneous application of epenthesis and resyllabification, which turns out to be stipulative in the rule component with ordered applications.

The quadriconsonantal cases in (11) provide evidence against the assumption that syllabification, like other phonological rules, applies once a cycle, ordered with respect to other rules. Rather, syllabification should be immediately fed by epenthesis, as suggested by the derivation in (12) and (13). That is, unlike other phonological rules, syllabification applies whenever there arises structural change in the course of phonological derivation. If resyllabification is assumed to apply prior to another application of epenthesis, epenthesis of a nucleus allows both of the stray consonants in (12a) to be incorporated into the syllable, although it is the rightmost stray consonant that serves as the environment of the epenthesis rule.

Another way of keeping two epenthetic vowels from the surface in (13) is to resort to Syllable Number Minimization Principle (Selkirk 1982; 1984), so that two epenthetic nuclei reduce to one because a single epenthetic vowel provides the sufficient condition for syllabification of two stray consonants. However, this principle takes the roundabout way of inserting two vowels, one of which is bound for deletion later on. Even worse is that, as pointed out by Ito (1989), the operation of Syllable Number Minimization Principle calls for the global power of reassessing the number of epenthetic vowels in relation to the overall number of stray consonants turning up earlier in the derivational stage.

As shown in (12), even if we accept the view that epenthesis, as a rule crucially referring to structure, immediately feeds syllabification, another assumption is required that the rule takes the rightmost stray consonant
as the environment. It is crucial for the output of epenthesis to insert a single vowel between the two stray consonants. Taking the other one as the environment would result in the wrong form, still leaving a stray segment:

\[
\begin{array}{c}
\sigma \\
C & V & C & V & C & C' & C & V \\
t & e & o & [u] & l & n & g & o \\
\end{array}
\]

\[
\rightarrow \ast [te\textcolor{red}{{u}}l\textcolor{red}{{u}}n\textcolor{red}{{g}}o]
\]

To summarize, the wrong results in (13) and (14) show that the skeletal approach requires certain stipulation in order to locate an epenthetic nucleus in the proper site. The skeletal rule must specify whether the vowel is inserted before or after the stray segment, on the one hand, and redundantly whether the rule examines the environment from right-to-left or left-to-right, on the other. In addition to these directional parameters, the way in which resyllabification interacts with epenthesis is another crucial factor in the skeletal approach. As a consequence, indeterminacy arises concerning the applicability of epenthesis, hence requiring constraints like Syllable Number Minimization Principle to suppress wrong forms.

2.2. Prosodic Epenthesis

We now turn to discussion of how Tangale epenthetic phenomena are dealt with within the prosodic approach. We first take the triconsonantal case /soglo-no/ and see how it is moraified. For convenience, the moraification rule (2a) and syllabification in terms of moraic structure (3a) are repeated below:
Given moraification (15a), the triconsonantal sequence arising from morphological elision has the following moraic structure:

\[
\begin{array}{cccc}
\mu & \mu & \mu & \mu \\
\text{sog} & \text{l} & \text{n} & \text{o}
\end{array}
\]

The Tangale CVC syllable template, in conjunction with syllable parsing rule (15b), results in syllabification of the strings containing an intervocalic triconsonantal cluster in either of two ways: left-to-right or right-to-left. Left-to-right syllable parsing based on the moraic unit of (16) is illustrated below:

(17) Left-to-Right Syllabification

a. 
\[
\begin{array}{cccc}
\sigma & \mu & \mu & \mu \\
\text{sog} & \text{l} & \text{n} & \text{o}
\end{array}
\]

b. 
\[
\begin{array}{cccc}
\sigma & \sigma \\
\mu & \mu & \mu & \mu \\
\text{sog} & \text{l} & \text{n} & \text{o}
\end{array}
\]

c. 
\[
\begin{array}{cccc}
\sigma & \sigma & \sigma \\
\mu & \mu & \mu & \mu \\
\text{sog} & \text{l} & \text{nu} & \text{n} & \text{o}
\end{array}
\]

\ast ([soglu\text{nuo}])
First, the leftmost two moras [so] and [g] are incorporated into the syllable in (17a). Note that the second mora is tautosyllabic with the first mora by the Maximality principle. Then, syllable parsing proceeds to the following mora: the medial mora [l] cannot be incorporated into the preceding syllable, nor is it allowed to form a syllable with its following mora [no], due to the Sonority Principle (Venneman 1972; Selkirk 1982; Steriade 1982) and the language-specific syllable template disallowing complex onsets or codas. Thus, [l] alone is parsed as a syllable and a vowel is inserted into this degenerate syllable since a vocalic nucleus is an obligatory element of the syllable in Tangale. Finally, in (17c) the last mora is incorporated into the syllable, yielding the ungrammatical form.

Now adopting the other choice from the Directionality parameter, the string in (16) is parsed in the opposite direction, as illustrated below:

(18) Right-to-Left Syllabification

\[ \begin{align*}
&\text{a.} & &\text{b.} \\
&\sigma & &\sigma & &\sigma \\
&\mu & &\mu & &\mu \\
&\mu & &\mu & &\mu \\
&\mu & &\mu & &\mu \\
&so & &g & &lo \\
\end{align*} \]

\[ \begin{align*}
&\sigma & &\sigma & &\sigma \\
&\mu & &\mu & &\mu \\
&\mu & &\mu & &\mu \\
&\mu & &\mu & &\mu \\
&so & &g & &u & &l & &no \\
\end{align*} \]
Starting from the right edge, the word-final mora is parsed as a syllable. The preceding mora [l] is not tautosyllabic with [no] because this would violate the Sonority principle and the syllable template. Two moras [g] and [l] are mapped onto a single syllable by Maximalinity and a default nuclear vowel is inserted into the first mora of this degenerate syllable. Finally the word-initial mora is parsed as a syllable, and syllabification operating on the moraic unit is completed. In the resulting structure (18c), we get the desired form [sogulno]. The fact that the correct form for Tangale is derived not by (17) but by (18) indicates that the language opts for right-to-left scansion. As in the skeletal epenthesis discussed in the previous section, Directionality plays a crucial role in the moraic analysis. The difference lies in that in the prosodic approach Directionality, being an independently motivated parameter, governs syllable parsing, and the direction of syllabification reflects the site of the epenthetic vowel. By contrast, in the skeletal analysis the scansion parameter of directionality becomes opaque on the surface due to the intervention of Syllable Number Minimization Principle.

Setting right-to-left scansion as the parameter for Tangale syllabification, we now turn to examining syllabification of quadriconsonantal clusters, as shown in (19). The examples are drawn from (11).

(19) Right-to-Left Syllabification

\[
\begin{align*}
\text{a.} & \quad \text{b.} \\
\begin{array}{c}
\sigma \\
\mu \mu \mu \mu \mu \mu \\
\text{telingo}
\end{array} & \quad \begin{array}{c}
\sigma \quad \sigma \\
\mu \mu \mu \mu \mu \\
\sigma
\end{array} & \quad \begin{array}{c}
\sigma \\
\mu \mu \mu \mu \mu \\
\text{telin go}
\end{array}
\end{align*}
\]
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c.
\[
\begin{array}{ccc}
\sigma & \sigma & \sigma \\
\mu & \mu & \mu \\
\mu & \mu & \mu & \mu \\
tento & lungo
\end{array}
\]

Starting from the right edge, the first mora is syllabified. Proceeding then to the medial position in (19b), two moras [l] and [n] are mapped onto a single syllable by Maximality, and the nucleus is inserted to save the degenerate syllable. As shown in (19c), the two remaining moras in the word-initial position also form a single heavy syllable, as dictated by Maximality. Thus, the right-to-left scansion yields the correct form [teŋ lungo].

Unlike left-to-right scansion of the triconsonantal sequence in (17), however, in the case of quadricsonsonantal clusters, left-to-right scansion also yields the correct form, as illustrated in (20):

(20) Left-to-Right Syllabification

\[
\begin{array}{ccc}
\sigma & \sigma & \sigma \\
\mu & \mu & \mu & \mu & \mu \\
\mu & \mu & \mu & \mu & \mu & \mu \\
tento & lungo & lungo
\end{array}
\]

What is crucial in obtaining identical results from the syllable scansion (19) and (20) is that, as shown in (20b), the medial two moras [l] and [n] are mapped onto a single syllable, [n] being allowed as coda by Maximality. This, of course, is made possible since the word-initial two moras [te] and [ŋ] constitute a single heavy syllable by Maximality. Unless Maximality dictates [ŋ] as coda of the preceding syllable, [l] and [n] cannot be parsed as tautosyllabic segments.

It has been illustrated that due to Maximality, quadriconsonantal clusters are uniformly parsed on the moraic unit regardless of directionality. Recall the derivation in (13), where the skeletal epenthesis rule yields the wrong form *[teŋulungo], either by postponing the application of resyllabification until the end of the cycle, or syllabifying in the opposite direction. Within the skeletal approach the wrong result *[teŋulungo] can be correctly modified by the Syllable Number Minimization Principle, which globally minimizes the overall number of syllabic constituents in a given string. This principle, however, merely restates the observed fact that epenthesis applies minimally. By contrast, in the prosodic analysis maximal assignment of moras to syllables by the Maximality principle is processed purely in terms of local operations. In addition, the indeterminacy issue is not raised concerning whether to parse as heavy or light the syllable in which the vocalic nucleus is missing, since syllabification is maximal and theory-internally simultaneous with epenthesis of a nucleus.

Taking syllable parsing to be based on the moraic unit, in conjunction with Maximality and Prosodic Licensing, then it is predictable that in a sequence made up of an odd number of consonants the site of the epenthetic nuclei varies according to the choice of the Directionality parameter, as schematized in (21):
(21) a. Right-to-Left Scansion

\[ [C \ V \ ]_\sigma \quad [C \ C \ ]_\sigma \quad [C \ C \ ]_\sigma \quad [C \ V \ ]_\sigma \]

b. Left-to-Right Scansion

\[ [C \ V \ C \ ]_\sigma \quad [C \ C \ ]_\sigma \quad [C \ C \ C \ ]_\sigma \quad [C \ V \ ]_\sigma \]

Right-to-left scansion forms two heavy syllables in the middle of the clusters as shown in (21a), while scansion in the opposite direction yields two heavy syllables word-initially, as shown in (21b).

The prediction schematized in (21a) is borne out by the Tangale intensified forms given in (22), where /de/ is the intensifier:

(22) teŋulungo (/teŋle + de + no + go/) 'really misled me'
soguddungo (/sogde + de + no + go/) 'really lost me'

Morphological elision results in the clustering of five consonants; under right-to-left parsing two heavy syllables are formed in the middle by Maximality:

(23)

\[
\begin{array}{cccc}
\sigma & \sigma & \sigma & \sigma \\
\mu & \mu & \mu & \mu \\
\sigma & \sigma & \sigma & \sigma \\
\mu & \mu & \mu & \mu \\
\sigma & \sigma & \sigma & \sigma \\
\mu & \mu & \mu & \mu \\
so & go & d & d & ng & o
\end{array}
\]

Starting from the right edge, the first mora is parsed as a syllable. The preceding two moras [d] and [n] are mapped onto a single heavy syllable, and then another two moras [g] and [d] also form a heavy syllable. The
remaining mora [so] is parsed as a syllable. The epenthetic nuclei are inserted into these degenerate syllables, yielding the correct result [soguddungo].

It has been shown that a prosodic analysis in which syllables are parsed on the basis of the moraic unit is preferred over the skeletal approach in which syllabification is based on CV skeletons. Under the prosodic approach, syllabification is guided by the independently motivated principles of Maximality and Directionality. The former determines the size of a syllable by locally examining the neighboring moras, hence obviating the stipulative principle of Syllable Number Minimization requiring global reference. Coupled with Maximality, Directionality gives a more restrictive account of the site of the epenthetic nucleus without raising the indeterminacy issue. Finally, as pointed out as a representational issue by Ito (1989), the "diacritic uses of strayness" indicated by prime notation in the skeletal epenthesis rules is ruled out entirely by the moraic hypothesis.

3. Degemination

Within the prosodic analysis epenthesis functions as supplying a nucleus for the degenerate syllable on the basis of the moraic unit. Under the skeletal approach, epenthesis applies to incorporate stray consonants into syllables. We now turn to truncation of some consonant clusters as a syllabification process. In (24) we see deletion of the second half of the homorganic clusters /nd/ and /mb/:
The underlying representation /landa+no/ undergoes morphological elision, resulting in a triconsonantal sequence. Right-to-left scansion forms a heavy syllable in the middle, as illustrated below:

The heavy degenerate syllable in the middle onto which two moras are mapped fails to undergo epenthesis of a vocalic nucleus. Rather, the correct form [lanno] is obtained by deleting the second half of the homorganic cluster in the stem.

Following the theory of Feature Geometry (Clements 1985, Sagey 1986), I assume that the clustering of homorganic consonants /nd/ and /mb/ is structurally represented as sharing the same place of articulation,7) as illustrated in (26). Each segment is represented by a Root node, which

7) It is assumed that two identical place features of the adjacent nasals and stops are percolated into a single Place node by Feature Percolation (Steriade 1982). Also refer to the Obligatory Contour Principle (OCP: McCarthy 1986) and others.
bifurcates into Laryngeal and Supralaryngeal nodes. The Place node is dominated by the Supralaryngeal node, which, however, is left out in (26) for the sake of representational simplicity.

(26) a. /nd/
   \[\text{Rt} \quad \text{Rt}\]
   \[\text{[+nas]} \quad \text{Pl} \quad \text{[-nas]}\]
   \[\text{[+ant]} \quad \text{[+cor]}\]

   b. /mb/
   \[\text{Rt} \quad \text{Rt}\]
   \[\text{[+nas]} \quad \text{Pl} \quad \text{[-nas]}\]
   \[\text{[+ant]} \quad \text{[-cor]}\]

Now that we have the representation of the Place node branching into two Root nodes, we see that epenthesis of a vowel between the two moras [n] and [d] in (25) crosses association lines, violating the integrity of geminate structure (Kenstowicz 1970, 1982; Steriade and Schein 1986; Hayes 1986), as illustrated in (27):

(27) \[\text{C (V) C}\]
    \[\text{u} \quad \text{d} \quad \text{u}\]

In order not to violate the No-crossing constraint, the representation in (25) instead truncates the second half of the geminate structure, deriving [lanno]. Degemination, not epenthesis, is the device to syllabify triconsonantal sequences containing an /mb/ cluster when the two moras [m] and [b] form a heavy degenerate syllable, yielding the correct form [kamno], not

---

8) Refer to McCarthy (1988) and Iverson (1989), where superfluity of the Supralaryngeal node is extensively argued. The representational issue of this node, however, does not directly bear on the present analysis.
*[kamubno].

Before we see further examples of truncation of a segment, a note is reserved for geminate integrity. With the emphasis on the simplicity of feature representation as well as the phonological rule component, Under-specification theory (Kiparsky 1982; Archangeli 1984; Borowsky 1985; Sohn 1987) holds that the least marked segment in a language is totally unspecified in underlying representation, hence most likely to be epenthesized or deleted in the grammar. Following this claim, epenthesis of a nucleus vowel is equivalent to insertion of an empty skeletal position without any accompanying segmental information on the melody tier, and the surface melody is automatically spelled out by default rules. Thus, insertion of a vowel inbetween geminates would not violate geminate integrity. However, since this line of argument still remains a controversial issue (Kenstowicz 1994a) and is a topic beyond the scope of the present study, we leave it as a further research topic.9)

Degemination also applies to reduplicative verbal morphology indicating repeated action:

(28) monomonde (/monde + monde/) 'to forget repeatedly'
    simzimbe (/simbe + simbe/) 'to meet repeatedly'

Morphological elision results in triconsonantal clusters, and syllable parsing from the right edge forms a degenerate syllable with two homorganic moras [n] and [d], as illustrated below:

---

9) An alternative approach would be to postulate epenthesis of a skeletal position automatically accompanied by the Root node, as opposed to the one with neither the Root node nor feature matrix, as invoked in Sohn (1988). Under this notational distinction, the prediction is made that the epenthetic nucleus inserted between the two homorganic segments invariably violates the No-crossing constraint: the unmarked segment is the one totally unspecified in underlying representation, while the epenthetic segment is represented with the Root node, which does not have any subnodes.
As the two moras [n] and [d] in the middle constitute partial gemination in underlying representation, epenthesis of a nucleus in the degenerate syllable is blocked by the No-crossing constraint. Thus, the [nd] cluster does not split up, disallowing epenthesis of a nucleus; instead, it undergoes degemination, yielding the result [monmonde], not *[monudmonde].

Consider now the derivation of intensified verbal forms. As shown in the data (22), the intensifier /de/ is suffixed immediately following the stem:

\[(30)\] Plain Form Intensified Form
\[a. \ t\text{nndungo} \quad t\text{nndudungo} \quad 'chose me'\]
\[b. \ m\text{ondungo} \quad m\text{ondudungo} \quad 'forgot me'\]
\[c. \ y\text{imbungo} \quad y\text{imdungo} \sim y\text{imbudungo} \quad 'remembered me'\]
\[d. \ s\text{umbungo} \quad s\text{umdungo} \sim s\text{umbudungo} \quad 'kissed me'\]

The plain form in (30a), for example, is derived from the underlying representation /tɛnde + no + go/, to which morphological elision applies, resulting in quadriconsonantal clusters. Since an account of the epenthetic vowel in quadriconsonantal clusters is already provided in (19), we will not go over the steps in which the correct form [tendungo] is yielded. Note here that the seemingly homorganic cluster of [d] followed by [n] resulting from the elision of [e] does not constitute a geminate, and hence correctly undergoes epenthesis of a vocalic nucleus since they are heteromorphic.

Of interest in relation to the present discussion is the sequence of five
consonants arising from the concatenation of the intensifier morpheme /de/. Consider the intensified form in (30c), where clustering of five consonants results from /yimbe + de + no + go/ via morphological elision. Right-to-left scansion yields the following representation:

\[
\begin{array}{cccccc}
\sigma & \sigma & \sigma & \sigma & \sigma \\
\mu & \mu & \mu & \mu & \mu \\
y & i & m & b & d & n & g & o & \rightarrow *[yimbdungo]
\end{array}
\]

The initial mora from the right edge forms a single syllable without incorporating the preceding mora [n] due to the Sonority principle. Proceeding to the middle, the two moras [d] and [n], and then another two moras [m] and [b] are mapped onto a single heavy syllable respectively, requiring an epenthetic nucleus. Finally the remaining word-initial mora is parsed as a syllable. However, the right-to-left scansion results in the wrong form *[yimbdungo], where the epenthetic nucleus breaks up the homorganic consonants in the stem, violating the geminate integrity. Note again that the two moras [d] and [n] do not constitute partial gemination since they come from different suffixes, and hence they can be split up by epenthesis.

An epenthetic nucleus in the second syllable is disallowed in (31), but the language adopts degemination as an alternative strategy of syllabification. As shown in reduplicative phonology in relation to the examples in (28), the second half of the homorganic cluster is truncated, hence automatically disallowing epenthesis of a nucleus, and the correct result [yimdungo] is obtained:
As listed in (30), the resulting output [yimdungo] alternates with [yimbudungo], in which epenthesis of a nucleus is adjusted to the position immediately following the geminate. This is handled within the prosodic approach by parsing only a light syllable as illustrated in (33):

Starting from the right edge, there is nothing special in parsing the first two syllables. Now proceeding to the mora [b] and its preceding mora [m], though these two homorganic moras are available on the moraic level, they cannot be mapped onto a single heavy syllable as in (31) since insertion of a nucleus vowel in the degenerate syllable violates the No-crossing constraint. At this point a general practice would be truncating the second half of the geminates; instead, as an alternative to degemination dictated by Prosodic Licensing, the mora [b] alone is parsed as a light syllable, which, being a degenerate syllable, requires epenthesis of a nucleus.
Finally, the remaining two moras [yi] and [m] are mapped onto a single syllable and the desired result [yimbudungo] is obtained\(^{10}\). Note that Maximality is violated in parsing the homorganic cluster in (33) in favor of its competing No-crossing constraint. However, no other stipulation needs to be made. Directionality and the site of the nucleus in relation to the stray consonant as determined by moraification and syllabification rules (15a, b) remain constant throughout Tangale syllable parsing.

A similar process of applying either degemination or epenthesis to homorganic geminate structure is also observed in the examples where the stem contains a cluster of a liquid followed by coronal stop.

\[
\begin{array}{lll}
(34) & \text{'insect'} & \text{'book'} \\
\text{indefinite} & dilda & takarda \\
\text{my} & dilno \sim diludno & takarno \sim takarudno \\
\text{your (f)} & dil3i \sim dilud3i & takar3i \sim takarud3i \\
\text{your (m)} & dilgo \sim diludgo & takargo \sim takarudgo \\
\text{her} & dildo \sim diluddo & takardo \sim takaruddo \\
\text{his} & diini \sim diludni & takarni \sim takaruudni \\
\end{array}
\]

Application of morphological elision to the underlying representation /takarda + no/ results in triconsonantal cluster, which is syllabified as follows:

---

\(^{10}\) Epenthesis of a vowel after geminates seems to reflect the preference not to break up homorganic clusters presumably to "optimize a syllable contact in which the coda and following onset share the same articulator" (Kenstowicz 1994b, 171).
Right-to-left syllabification forms a heavy degenerate syllable in the middle and a nuclear vowel is inserted, yielding the correct form [takardno].

The fact that [takarno] is an alternate form, however, suggests that clusters of liquid followed by coronal stop, like the geminates of nasal followed by homorganic stop in (26), optionally form a partial geminate sharing place features, as represented in (36):

\[(36) /rd/\]

\[
\begin{array}{c}
\text{Rt} \\
[-\text{son}] \\
{[+\text{ant}]} \\
{[+\text{cor}]}
\end{array}
\]

The sequence of [l] or [r] followed by [d], though underlyingly posited as having two separate Root nodes, is partially geminated in terms of the Place node in the course of derivation, and shares place features as in (36). Thus at a certain point in the grammar of Tangale, geminate structure optionally arises out of the sequence of sonorants followed by homorganic stops.

Given the structure of partial gemination as in (36), the account of the alternate form [takarno] is straightforward, as illustrated below:
Once the two tautomorphemic moras [r] and [d] are partially geminated in the course of derivation, they cannot be mapped onto a single heavy syllable because epenthesis of a nucleus in the degenerate syllable would violate the No-crossing constraint as shown in the similar syllable parsing in (32). Thus, Prosodic Licensing dictates that the second half of the geminate be truncated, yielding the alternate form [takarno].

It has been shown that degemination is employed in Tangale as a strategy of syllable parsing governed by Prosodic Licensing, eliminating unlicensed material from prosodic structure when the two moras mapped onto a single heavy syllable are true partial geminates: in this environment epenthesis would create a violation of the No-crossing constraint, as illustrated in (32). As an alternative, the mora containing the second half of the geminates can be parsed as a light degenerate syllable by itself, where a nucleus is invariably supplied to the right of the mora that triggers epenthesis. On the other hand, a sequence of liquid followed by homorganic stop optionally forms a partial geminate structure, hence optionally resisting epenthesis as shown in (34). Comparing these two

---

11) Note here that unlike the alternation between [yimdungo] and [yimbudungo] in (32) and (33), [takarno] does not alternate with *[takarduno]. It is because earlier in the derivation before the two moras [r] and [d] are partially geminated, they are mapped into a heavy syllable and an epenthetic nuclear vowel is allowed in the degenerate syllable, yielding an alternate form [takarudno].
sequences of homorganic clusters, we find asymmetry, where a sequence of nasal followed by homorganic stop invariably forms a partial geminate structure, while that of liquid followed by homorganic stop optionally does. This can be accounted for by resorting to the representational distinction, in conjunction with the theory of Underspecification\(^{12}\), in which coronal nasals are specified but liquids are unspecified with respect to the Place node. The representations in (38) illustrate different feature specifications.

\[(38) \text{ a. [nd] cluster}
\]

\[
\begin{array}{c}
0 & 0 \\
\hline
0 & 0 \\
\end{array} \\
\rightarrow \\
\begin{array}{c}
0 \\
\hline
0 \\
\end{array} \\
\text{Root} \\
\text{Place}
\]

\[
\begin{array}{c}
(i) & 0 & 0 \\
\hline
0 \\
\end{array} \
\begin{array}{c}
(ii) & 0 & 0 \\
\hline
0 \\
\end{array} \\
\text{Root} \\
\text{Place}
\]

In the case of the [nd] cluster, the two segments obligatorily turn into a partial gemination by the OCP since both of them require place specification, as illustrated in (38a). In the case of the [ld] cluster, however, liquid is not specified with place features, and hence the sequence is not subject to the OCP. Thus, it remains totally unspecified as in (38b i), or undergoes place

\(^{12}\) Both Radical(Archantegi 1984) and Contrastive(Steriade 1987) Underspecification theories predict coronals to be unspecified with respect to place features. Coronal underspecification (Paradis and Prunet 1991), however, is argued against by McCarthy and Taub (1992), according to whom coronal nasals and stops require the specification of the Place node due to the presence of their non-coronal counterparts, whereas liquids are totally unspecified with place features since they are all coronals. This asymmetry is pointed out to me through personal communication with Gregory Iverson.
assimilation, resulting in a partial geminate structure as in \((38\text{b})\). This explains why clusters of this sequence are susceptible to degemination: once the latter structure is created, mapping the two moras in partial gemination onto a single degenerate syllable and hence inserting a vocalic nucleus is correctly blocked by the No-crossing constraint.

Before we turn to next discussion, consider the following intensified forms, where adjacency of two homorganic segments does not yield partial gemination:

\[
\text{(39) donudgo} \quad (/\text{done} + \text{de} + \text{go}/) \quad \text{‘completely fixed’}
\]
\[
\text{maludgo} \quad (/	ext{male} + \text{de} + \text{go}/) \quad \text{‘really beat’}
\]

Morphological elision results in a triconsonantal sequence and the two moras \([n]\) and \([d]\) or \([l]\) and \([d]\) are mapped onto a heavy syllable by right-to-left scansion, resulting in the correct forms \([\text{donudgo}]\) and \([\text{maludgo}]\). However, these surface forms do not alternate (\(*[\text{dongo}], *[\text{malgo}]\)) as in \((30)\) or \((34)\). The fact that the seemingly homorganic clusters are not immune to epenthesis is attributed to the heteromorphemic nature of the related segments. Since the coronal sequences \([\text{nd}]\) and \([\text{ld}]\) arise from concatenation of morphemes, gemination does not take place. This follows from the general assumption in the literature that morphemes are displayed on separate tiers and later conflated into a single morphemic tier (McCarthy 1979, 1981, 1986; Younes 1983).

4. Glide Vocalization

In addition to epenthesis and degemination as discussed in the preceding sections, glide vocalization is another process involved in syllable parsing in Tangale. The account of the alternation between glide and vowel thus
is subsumed under syllabification phenomena. Consider the following nouns:

\[(40)\] Indefinite     Definite

\[
sau \quad \text{sawi} \quad \text{‘corn’}
\]
\[
adau \quad \text{adawi} \quad \text{‘sesame seed’}
\]
\[
letau \quad \text{letawi} \quad \text{‘co-wife’}
\]
\[
kelaup \quad \text{kelawi} \quad \text{‘dust’}
\]

As no vowel is deleted by morphological elision in definite forms, the stems in (40) must end with the glide \(/w/\): otherwise, the presence of a glide before the definite morpheme \(/i/\) cannot be accounted for. Following the structural account of the alternation between vowel and glide (Levin 1985; Hayes 1986), I argue here that glides are non-moraic and hence they are not deleted by the morphological elision rule. Non-high vowels are assumed to be moraic but high vowels non-moraic underlyingly. For instance, \([\text{sau}]\) is underlyingly represented as (41a), where the stem-final segment is non-moraic:

\[(41)\]

\[
\begin{align*}
a & \quad b & \quad c \\
\begin{array}{c}
\text{s} \quad \text{a} \quad \text{w} \\
\end{array} & \quad \begin{array}{c}
\text{s} \quad \text{a} \quad \text{w} \\
\end{array} & \quad \begin{array}{c}
\text{s} \quad \text{a} \quad \text{w} \\
\end{array} \\
\rightarrow & \quad \rightarrow & \quad \rightarrow \\
\text{[sau]} & \quad \text{[sau]} & \quad \text{[sau]}
\end{align*}
\]

In (41b) the stem-initial consonant \([s]\) is incorporated into its following mora and the stem-final segment is assigned a mora by the moraification rule (2a). The two moras in (41b), however, cannot be mapped onto a single heavy syllable because Tangale does not allow offglides. This shows that the Coda Constraint (Ito 1989; Borowsky 1989) is at work in Tangale to the effect that glide is prohibited in the coda position:
(42) Coda Constraint

\[
\begin{array}{c}
\ast \\
\wedge \\
\mu \\
\mu \\
\left[ \begin{array}{c}
-\text{cons} \\
+\text{high}
\end{array} \right]
\end{array}
\]

Given the Coda Constraint, the two moras in (41b) cannot be mapped onto a single heavy syllable because the syllable-final glide is prohibited; hence the second mora is parsed as a light degenerate syllable as shown in (41c), showing that the Coda Constraint is ranked higher than Maximality in Tangale syllabification.

Once the glide is parsed as a light degenerate syllable, it is interpreted as a vowel to form a well-formed syllable:

(43) Glide Vocalization

\[
\begin{array}{c}
\sigma \\
\left[ \begin{array}{c}
-\text{cons} \\
\rightarrow \\
+\text{voc} \\
/ \\
\mu \\
\left[ \begin{array}{c}
+\text{high} \\
\end{array} \right]
\end{array} \right]
\end{array}
\]

Restricted to light syllables, Glide Vocalization surfaces the second mora in (41c) as the high vowel [u]. Note that the general strategy of inserting a nucleus vowel is not called into play to support the degenerate syllable, here *[sawu].

In the case of the definite form [sawi], the stem-final segment, being non-moraic, is immune to morphological elision, as shown in (44a):
In (44b) [s] is incorporated into its following mora; the stem-final and the suffixal segments are mapped onto a single mora by (2a). As the two moras are bisegmental, they are each parsed as a light syllable, as illustrated in (44c). In this case, the first segment of the second mora surfaces as the glide [w], whereas the second surfaces as the high vowel [i] by Glide Vocalization\(^\text{13}\)).

The same argument works for the following data, supporting the claim that the alternation between glide and vowel is structure-dependent:

<table>
<thead>
<tr>
<th>(45) Indefinite</th>
<th>Possessive</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>awe</td>
<td>auno</td>
<td>'thorn'</td>
</tr>
<tr>
<td>kayo</td>
<td>kaino</td>
<td>'orphan'</td>
</tr>
<tr>
<td>pai</td>
<td>paino</td>
<td>'dog'</td>
</tr>
<tr>
<td>mai</td>
<td>maino</td>
<td>'chief'</td>
</tr>
</tbody>
</table>

The glide and the high vowel in the indefinite forms [awe] and [pai] are both underlyingly non-moraic. They are either incorporated into the following mora as in (46a) or assigned a mora as in (46b):

---

13) In the application of Glide Vocalization (43), the notion "head of X" needs to be invoked to the effect that the target is the head of a mora, which in turn is the head of a syllable.
The non-moraic segment in (46a) is incorporated into the second mora and the stem-final segment in (46b) is assigned a mora by the moraification rule (2a). Now coming to the syllable level, the two moras cannot be mapped onto a heavy syllable due to the Sonority Principle in case of (46a) and to the Coda Constraint in case of (46b). In the former no syllable is degenerate and underlyingly non-moraic element surfaces as the glide [w], while in the latter the word-final syllable, being degenerate, undergoes Glide Vocalization, yielding the vowel [i]. Thus, [awe] and [pai] are derived respectively.

In the case of the possessive forms [auno] and [paino], the stem-final vowel [e], being moraic, is deleted in the former (/awe + no/), while in the latter the stem-final segment is not deleted since it is non-moraic:

(47) a.

\[
\begin{array}{c}
\mu & \mu & \mu & \rightarrow & \mu & \mu & \rightarrow & \mu & \mu & \rightarrow & \mu & \mu & \mu \\
| & | & | & | & | & | & | & | & | & | & | \\
a & w & e & n & o & a & w & n & o & a & w & n & o & \rightarrow & [auno]
\end{array}
\]
In (47a) morphological elision results in a non-moraic segment stem-finally, which is assigned a mora by (2a) since it cannot be incorporated into either of its flanking moras. Right-to-left scansion parses the rightmost mora as a light syllable. Proceeding to the middle, the mora [w] cannot be parsed tautosyllabic with the mora [no] due to the Sonority Principle; nor can it be syllabified with its preceding mora [a] due to the Coda Constraint (42) disallowing glides in coda position. In (47b) the stem-final segment, being non-moraic, is not deleted and is assigned a mora by (2a). Right-to-left scansion parses the mora in the middle as a light syllable, where syllabification is constrained by the Sonority Principle and the Coda Constraint similarly as in (47a). As previously argued in discussion of (41c) and (46b), this again shows that Maximality is more violable than the Sonority Principle and the Coda Constraint in templatic syllabification of Tangale. The moras [w] and [y] in the light syllables of (47) surface as the vowel [u] and [i] respectively by Glide Vocalization (43), deriving [auno] and [paino].

Consider the following forms, where in addition to Glide Vocalization, epenthesis is also motivated to prosodically license moras:

(48) a. paide 'to blame' payudgo 'blamed'
daude 'to abuse' dawudgo 'abused'
b. weg payum 'didn't see a dog'
weg mayum 'didn't see a chief'
There is evidence for positing an underlyingly non-moraic segment: the alternation between glide and vowel in (48a) indicates that high vowels in the stem are non-moraic. In (48b) an epenthetic vowel is inserted between the non-moraic stem-final segment (cf. [pai] and [mai] in (45)) and the negative suffix /m/. Derivations of [paide], [payudgo] and [payum] are given in (49).

(49) a.

\[ \text{payde} \rightarrow [\text{paide}] \]

b.

\[ \text{paydegodg} \rightarrow [\text{payudgo}] \]

c.

\[ \text{payum} \rightarrow [\text{payum}] \]

In the case of syllabification in (49a), the mora [y] in the middle cannot be
incorporated into the rightmost syllable due to Sonority; nor can it be mapped tautosyllabic with the preceding mora due to the Coda Constraint (42). Thus, it is parsed as a light syllable. In (49b) right-to-left scansion parses the rightmost mora [go] as a syllable. Proceeding to the next, the two moras [y] and [d] are mapped onto a single heavy syllable by Maximality. A heavy degenerate syllable is produced in (49c) as well: the initial two moras [y] and [m] from the right edge are parsed tautosyllabic by Maximality.

Given Glide Vocalization (43), the glide in the light degenerate syllable vocalizes and the mora containing a glide is prosodically licensed without resorting to epenthesis of a nuclear vowel, as shown in [paide] in (49a). The two degenerate syllables in the latter two derivations of (49), however, are not subject to Glide Vocalization because the rule is restricted to light syllables. Thus, Glide Vocalization correctly fails to apply to the bimoraic degenerate syllables in (49b,c). Then, Prosodic Licensing dictates pentheses of a nucleus vowel, yielding [payudgo] and [payum], not *[paidgo] or *[paim]. In the sense that the more specific rule Glide Vocalization bleeds the environment for epenthesis of a vocalic nucleus in degenerate syllables as in the case of (49a), the general application of epenthesis functions as a "last resort" in Tangale syllabification, as Stray Erasure does in many other languages (Kenstowicz 1994a, 285).

5. Conclusion

The present analysis has demonstrated templatic syllabification by counting moras as subsyllabic constituents and constraining syllabification by the prosodic principles of Maximality, Directionality and Prosodic Licensing. In this study it is argued that the site of the epenthetic nuclear vowel, as determined by moraification rules and templatic matching based on the
moraic unit, remains constant in relation to stray segments, and that syllable parsing is processed purely in terms of local operations. As epenthesis of a nucleus for the degenerate syllable does not call for a follow-up process of resyllabification, the prosodic analysis dispenses with any stipulation on the otherwise mutually-dependent processes of epenthesis and syllabification. By contrast, in the skeletal approach the output of epenthesis is regulated by the Syllable Number Minimization Principle to globally reduce the overall number of epenthetic vowels inserted with reference to the CV skeletal positions. Considering that every language allowing insertion of a vocalic nucleus minimizes epenthesis, however, a principle like Syllable Number Minimization is suspect because all it does is merely restating the observed fact.

While maintaining that Prosodic Licensing, in addition to the Directionality parameter, is strictly observed for exhaustive syllabification, the present study argues that Maximality is violable when it competes with other prosodic constraints. First, mapping homorganic moras of the geminate structure onto a single heavy syllable is blocked since insertion of a nuclear vowel in the degenerate syllable would violate No-crossing Constraint. As a means of avoiding the clash with this constraint, Prosodic Licensing militates the second half of the geminate to be truncated or to be parsed as a light syllable, hence violating Maximality.

Secondly, syllable-based phonotactics concerning the distribution of glide constitutes another evidence that Maximality is more prone to be violated than the Sonority Principle or the Coda Constraint. The fact that the No-crossing Constraint, the Sonority Principle, or the Coda Constraint is ordered prior to the Maximality principle lends further supporting evidence to the hierarchical organization of constraints and the possible violability of the lower ranking constraints as major theses of Optimality Theory (McCarthy 1993; McCarthy and Prince 1993; Prince and Smolensky 1993; Kenstowicz 1994b). Specifically the parsing of place features (Parse) takes priority over
the other general constraint (Fill) which yields epenthetic vowels. In either approach, however, basic insight into Tangale prosodic structure remains: that is, the directional realization of geminate structure and glide governed by Prosodic Licensing (i.e. specific rule types of degemination and glide vocalization) overrides consistency in epenthesis.

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