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A Moraically-Based Model of the Syllable in Bechar Arabic

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Abstract: Unlike the phonological analyses that characterize syllables in terms of onsets and rhymes, a moraically-oriented approach counts the number of beats or timing units (moras) present within the syllable. This counting ability makes this model superior to previous ones as it has the power to scan and relate the elements immediately dominated by the moras [1], [2], [3]. Taking into account extra prosodic syllables, a monomoraic syllable is light whereas a bimoraic syllable is heavy. In other words, open, short-vowelled syllables are monomoraic (σμ) or light, whereas closed and long-vowelled syllables are bimoraic (σμμ) or heavy. The current study shows the importance of adopting a moraic model of the syllable to describe and explain morpho-phonological processes. More specifically, it demonstrates that the incorporation of the mora as an essential constituent of the syllable can account for phonological phenomena in Bechar Arabic (BA), namely 'the Lengthening and Shortening of vowels in a specific morphological context.' We argue that the inclusion of the mora as a syllabic component simplifies the description and the explanation of prosodic phenomena of Bechar Arabic.

Keywords: The Mora, The Syllable, Vowel Lengthening, Vowel Shortening, Bechar Arabic

1. Introduction

Classical Arabic (CA), from which Algerian Arabic (AA) originates, is a Semitic Language. The word structure in Semitic languages is characterized by the complex set of non concatenative (or nonlinear) alternations. That is to say, words in Semitic languages can be described in terms of roots, typically consisting of three consonants, which lend the basic meaning (e. g. *k-t-b* "write", *q-b-r* "bury", *ʔ-m-r* "order") and patterns which in some way modify the basic meaning, frequently situating the root in a particular grammatical context. The Semitic verbal system is an important key to understanding the genesis of the *root-and-pattern* morphology in the Semitic language [4]. As other Semitic languages, Bechar Arabic (BA) is built on the basic consonantal skeleton, the root. It occurs in patterns with different vowels to occupy specific meanings. For example, the root /dχl/, which has the meaning of 'entering', includes the following patterns, among others:

Patterns	Gloss
[dχəl]	he entered
[dχul]	enter, imp.
[dχu: l]	Entering
[dəχlɑ]	entrance
[dəχχəl]	cause to enter

Bechar Arabic (BA) is a variety of Algerian Arabic (AA) spoken in the southwestern part of Algeria. It is characterized by certain particularities attributed to rural dialects. Despite the heterogeneity of the inhabitants of the city of Bechar, we can nonetheless, speak of a somewhat homogeneous variety where regional variations have been neutralized to yield the variety referred to as BA.

The most interesting fact about this dialect is that it inhibits initial consonant clusters and initial geminates; yet, it allows both medial and final geminates; it also allows consonant clusters in the coda as long as they are moraic. Thus, the overall aim of this paper is to investigate the phenomena of vowel lengthening and shortening by implementing a moraic approach to the syllable. Specifically, we argue that the inclusion of the mora as a syllabic constituent can easily explain these lengthening and shortening phenomena.

2. Geographical and Historical Situation

Bechar, formerly, known as Colomb-Bechar, is the capital

city of the province of Bechar, southern Algeria. It is situated in the southwest, about one thousand kilometers from Algiers, the capital, and some seven hundred kilometers from Oran. It shares borders with Morocco. It is 161,400 square kilometers and has a population of about 300,000 inhabitants (see maps below). The greater part of the province is uninhabitable sand-dune field (Erg), in particular the Great Western Erg and the Erg Er Raoui or dry plains (Hamadas) suitable for grazing but with insufficient surface water to support agriculture. Most settlement is, therefore, concentrated in oases along the Saoura Valley and its tributaries. Natural resources include coal deposits in the north around Bechar and Kenadsa and copper in the south in Djebel Ben Tagine. The oases' traditional economic basis was agriculture, notably growing date-palms and grain. Many of the oases had significant populations of Haratin and Shurfa. There are notable Zawias, traditional religious schools at Kenadsa and Kerzaz. The region also supported a substantial, mainly, Arab pastoralist nomadic population, particularly the Doui-Menia, Ouled-Djerir, Ghenanma, Chaamba, and Reguibat. Some of these still remain nomadic, but most have settled in the oases.

Before coal was found in 1907, Bechar was a small populated town. It thrived on the activity of the coal mines until petroleum production seized the market. The city is noted for its leatherwork and jewelry. Dates, vegetables, figs, cereals, and almonds are produced near Bechar. Bituminous coal reserves in the region are not exploited to their greatest potential because of high transportation costs. The city was once the site of a French Foreign Legion post.

3. Consonantal and Vocalic Inventories

The consonantal system of (BA) has perhaps received little treatment. But nevertheless, we postulate that the number of consonants the dialect of Bechar has is only 28. The consonantal inventory of BA is displayed in the following chart:

Table 1. *Bechar Arabic Consonantal Inventory Place of Articulation.*

Manner of Articulation		Bilabial	Labiodental	Alveolar	Alveo-palatal	Velar	Uvular	Pharyngeal	Glottal
Stops	V-			t ţ		k	q		ʔ
	V+	b		d ḍ		g			
Fricatives	V-		f	s ṣ	ʃ		χ	ħ	h
	V+			z ẓ			ɣ	ʕ	
Affricate					ʒ				
Nasals		m		N					
Lateral				L					
Trill				r ɾ					
Glide		w			j				

Four remarks can be made about the chart above. First, the interdentals have been lost in Bechar Arabic (BA). Accordingly, /θ/ has shifted to /t/ in the city dialect but to /f/ in rural areas. Thus, Classical Arabic (CA) /θɑmmɑ/ 'over there' commonly becomes /təmmɑ/ and/or /təm/ and /fəmmɑ/ and/or /fəm/ in neighboring areas; /ð/ becomes /d/, example CA /hɑðɑ/ 'this' is /hɑdɑ/, CA /kɑðɑbɑ/ 'he lied' becomes /kdəb/, …etc. Second the glottal stop /ʔ/ does not form part of the phonemic inventory of BA; it is only prothesized before vowel-initial words for onset purposes. Third, /q/ is preserved in many words of BA, e. g. /qbəl/ 'before/accept', /ʕɑqəl/ 'smart', /səqsı/ 'ask', etc., by contrast, it generally becomes /g/, e. g. /gu:l/ 'say', /ʕɑ gɾəb/ 'scorpio', /gəmlɑ/ 'louse', /gənţrɑ/ 'bridge', etc. However, some words have /g/, for instance, /mnɑgəʃ/ 'earrings', /dəgdəg/ 'chop up', /drəg/ 'disappear/hide', /gurʃɑ: l/ 'dirt', /gəlfɑ/ 'a large piece/loaf', /gu: b/ 'a kind of spots on the face', … etc. Fourth, the phonemes /r/ and /ţ/ are distinct as shown by the minimal pairs such as /dərb/ 'ghetto' and /ḍɑţb/ 'hitting', /dɑr/ 'he did' and /ḍɑ:ţ/ 'a house', /rbəħ/ 'win' and /ţbɑʕ/ 'a quarter', … etc.

In the present work, we postulate that the vocalic inventory of BA consists of three underlying pairs of vowels and an epenthetic schwa. As can be seen in Table2, the first set of pairs is realized as [+high] [-back] [-tense] [ɪ] and [+high] [-back] [+tense] [ɪ:]. The second set is realized as [+high] [+back] [tense] [+round] [u]and[+high] [+back] [+tense] [+round] [u:]. The third set of pairs is realized as [+low] [-back] [-tense] [ɑ] and [+low] [-back] [+tense] [ɑ:]. While the central vowel is realized as [+mid] [-back] [-tense] [ə].

The short vowels have in many cases been reduced to a schwa with various realizations depending on context: hence, [nsɑr] → [nsər] 'eagle', [mɑrgɑ] → [mərgɑ] 'stew'; [ʕurs] → [ʕərs]'wedding', [ɣurbɑ: l] → [ɣərbɑ: l] 'a sieve'; [ʒɪn] → [ʒən] 'ghost', [wɑħɪd] → [wɑħəd] 'one' …etc. However, in some cases, almost always next to a velar or uvular, but occasionally near a bilabial, /u/ is retained; thus, [ħugrɑ] 'bullying', [fumm] 'mouth',[burʒ] 'tower', [gult] 'I said'. This alternation between the schwa and the short vowels can be viewed either as a process of schwa strengthening, i. e., a process whereby the schwa becomes a full vowel; or a process of vowel reduction. Whichever the case is, the alternation exists and reflects an intra-dialectal variation within the variety of BA. One last point to mention about vowels is that in BA, there are some vocalic alternations between long vowels and diphthongs which are mainly used by old people, e. g., /mʃɪ:ʃ/ → /mʃɑjʃ/ 'kitten', /klɪ:t/ → /klɑjt/ 'I ate' …etc. The different diphthongs of BA are /ɑj/ → /mʃɑjʃ/ 'a kitten', /bɑjḍ/ 'eggs'; /ɑw/ → /ʕɑwd/ 'a horse', /ɪj/ → /twɪjqɑ/ 'a small window', /dɪj/ 'much talk' and /əw/ → /nəw/ 'rain',. etc.

Table 2. *Bechar Arabic Vocalic Inventory.*

Features	[ɪ]	[ɪː]	[ɑ]	[ɑː]	[u]	[uː]	[ə]
[high]	+	+	-	-	+	+	-
[mid]	-	-	-	-	-	-	+
[low]	-	-	+	+	-	-	-
[back]	-	-	-	-	+	+	-
[round]	-	-	-	-	+	+	-
[tense]	-	+	-	+	-	+	-

4. The Moraic Model

In X-theory, weight is defined by the number of skeletal positions in the rhyme of the syllable. In a light syllable, CV, the vocalic segment is associated with one skeletal position in the rhyme, whereas in heavy syllables, CVV or CVC, it is associated with two positions as schematized in figure1 below:

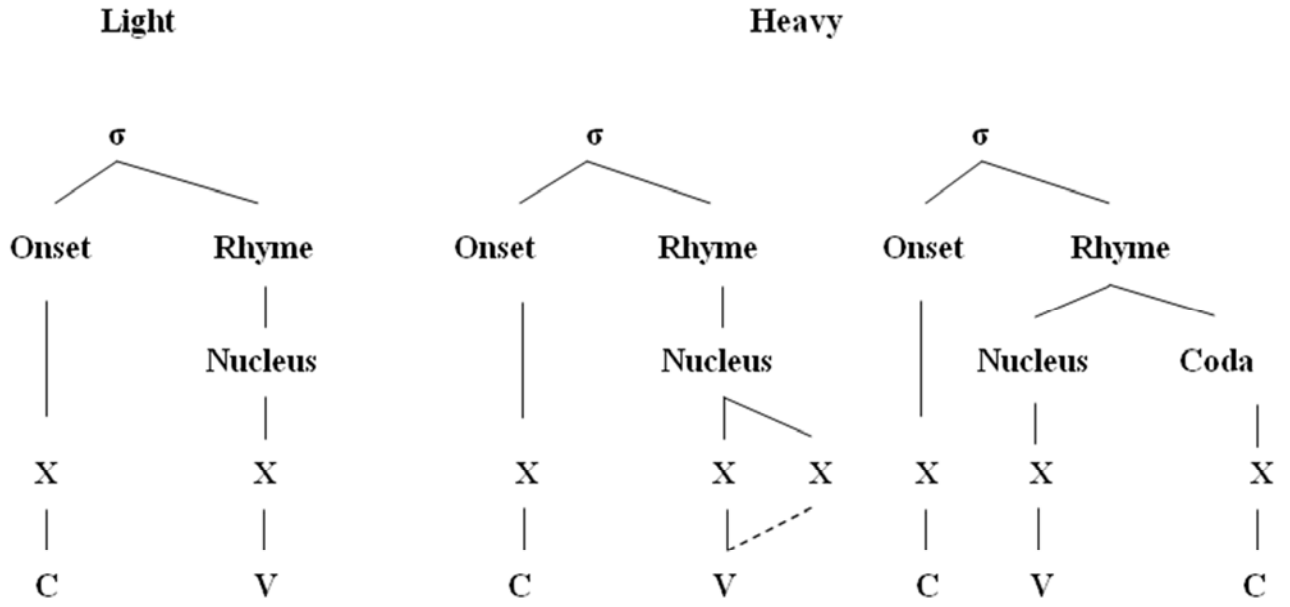

Figure 1. *Skeletal Positions.*

These representations show that each segment is linked directly to a timing slot, while long segments are linked to two timing slots in the skeletal tier. Linking segments to timing slots establishes the distinction between light and heavy syllables. However, under this model and since all segments are associated with X-slots, it is not possible to distinguish between CVC as a light syllable and CVC as a heavy syllable. This paves the way to a new prosodic conception in which the syllable does not consist of an onset and rhyme, but of two morae (from the Latin word meaning 'a short period of time' or 'delay').

While the traditional model allows a number of phonological facts to be stated easily, it is far more complex than the moraic model. It is only mentioned as it is an essential part of one theory of syllable weight [5]. The moraic model is the most important and influential syllable theory [3], [1], [6], [7]. The mora, also called a beat or weight unit, is an old concept that has been recognized in almost every school of linguistics. The notion mora, in the moraic theory as proposed by [3] and [1], has a dual role. First, it is a unit of phonological weight that measures syllables' heaviness or lightness, a bimoraic syllable is heavy whereas a monomoraic syllable is light. The second role the mora plays is as a skeletal position which indicates the position of segments in the syllabic structure [8].

Under moraic theory [3], [6], [9]; [7], the X-slots in the nucleus are replaced by moras. X-slots in the coda are dispensed with moras in languages that recognise CVC as a heavy syllable otherwise the coda consonant is linked directly to the syllable node in languages where CVC is considered light. Cross-linguistically, CV syllables are treated as light or monomoraic (represented with one mora) and CVV syllables as heavy or bimoraic (represented with two moras). CVC syllables are treated as heavy in Arabic and English, while other languages treat it as light [10]. A language-specific rule should state how a certain language treats different types of syllables. A rule called 'weight-by-position' proposed by [7] overcomes this problem. As shown below, this rule allows the language to assign a mora to consonants in the coda. Accordingly, the rhyme in CVC may be assigned with one or two moras depending on the language rules:

a. In a language in which closed syllables and syllables with a long vowel are heavy, whereas other syllables are light [9]. This is shown in figure 2 below:

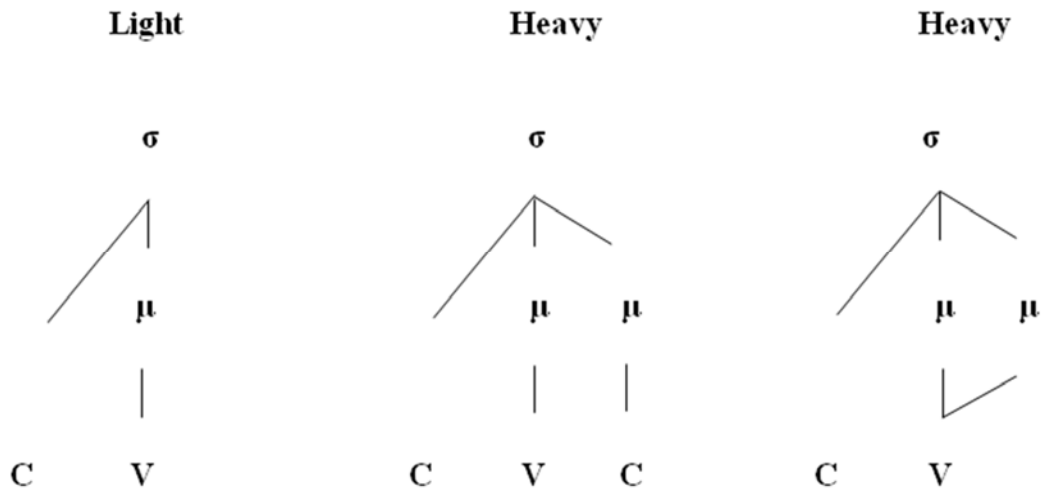

Figure 2. *Heavy Closed and Long-Vowelled Syllables.*

b. In a language in which only long vowels count as heavy [9]. This is indicated in figure 3 below:

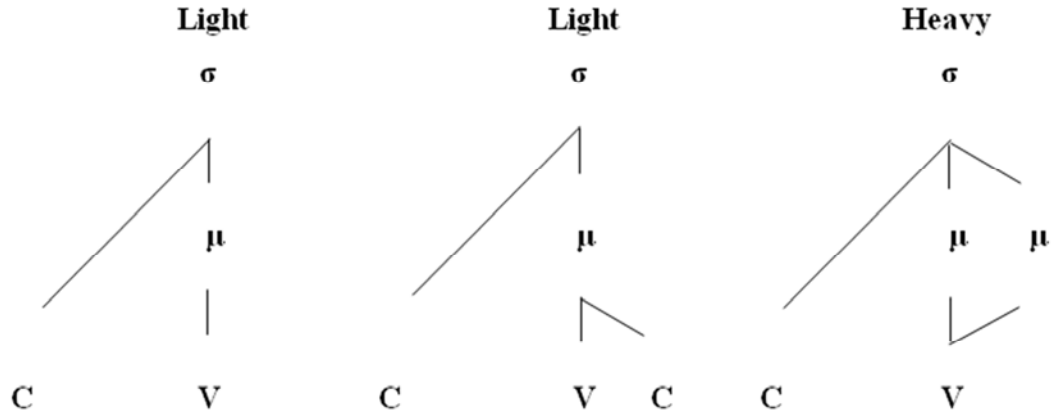

Figure 3. *Heavy Long-Vowelled Syllables.*

As the above trees depict, consonants in the onset are not assigned moras in moraic theory because they have no effect on syllable weight. They are linked directly to the syllable node. The length of the segment can be represented in two ways: long vowels are assigned two moras, whereas geminate (long) consonants are attached to the coda of one syllable and the onset of the next one. To put it differently, they are linked to a mora and to the syllable node of the following syllable because geminate consonants serve as a coda for one syllable and an onset for the next one as shown in figure 4 below:

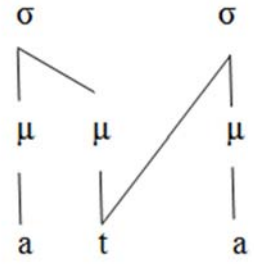

Figure 4. *VCCV representation [9].*

Most languages allow for only monomoraic or bimoraic syllables; syllables with only one or two moras. This means that long vowels could not be followed by geminates. A moraically-oriented approach counts for the number of beats or timing units or moras present within the syllable. This counting ability makes this model superior to previous ones as it has the power to scan and relate the elements immediately dominated by the moras. The advantages of the moraic model over the other syllable models are summarized below:

a) The model expresses the weight-irrelevance of the onset;
b) it offers a way of expressing light, heavy and super heavy syllables;
c) it offers an account of short vs. long vowels;
d) it offers an account of singletons vs. geminates;
e) it expresses the variable nature of coda-weight;
f) finally, moras are better integrated into the prosodic hierarchy.

Many other distinctions like Margin, Nucleus and Coda were introduced by other scholars [11], etc. Among these

perhaps the most useful element for this study is the mora or syllable weight.

5. Pre-Suffix Vowel Lengthening

An argument advanced in support of the mora is the pre-suffix vowel lengthening that can be seen as resulting from a constraint on the weight of pre-suffixal bases. This is formalized as a negative constraint on morphemes ending in a monomoraic vowel pre-suffixally as illustrated in figure 5 below:

Figure 5. *Monomoraic Pre-suffix Vowel.*

Vowel lengthening is a very common phenomenon before certain suffixes and it involves the vowels of roots. Yet, suffixes do not affix directly to a morpheme with a final short vowel. When a morpheme ending in a short vowel occurs in pre-suffixal position, violation of constraint above is repaired by lengthening the pre-suffix vowel, e. g. [mʃɑ]→ [mʃɑ:t], [mʃɑ:w]. Pre-suffix vowel lengthening is formalized as mora reduplication schematized in figure 6 as follows:

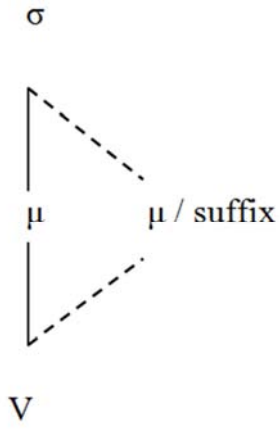

Figure 6. *Pre-suffix Lengthening.*

Undoubtedly, this finding could not be attained without a direct reference to the mora. We see that treating BA vowels as bimoraic simplifies the analysis. Here again, adopting a moraic approach to the syllable simplifies the description and the explanation of this phonological phenomenon, i. e. Vowel Lengthening.

6. Compensatory Lengthening

Deletion of postvocalic glottal stops is known to cause Compensatory Lengthening (CL) of preceding vowels in most, if not all Arabic dialects, including the variety under study. It is puzzling that deletion of glottal stops can correlate with CL. Since glottal stops have a shortening effect on the preceding vowel, it is unclear why their loss should result in Vowel Lengthening. With the inclusion of the mora, it becomes easy to explain this lengthening process. It is particularly interesting from a theoretical perspective since the standard explanation of Compensatory Lengthening after consonant loss is that the mora that originally dominated a coda consonant which is deleted associates with the preceding vowel [7].

As the illustrative examples presented below depict, many forms of classical Arabic where the coda is occupied by a glottal stop have witnessed a deletion of this latter in BA. This means that the mora will remain empty; however, the process of Compensatory Lengthening takes place to lengthen the vowel:

Classical Arabic	**Bechar Arabic**
/fɑʔr/ 'mouse'	/fɑ: r/
/ʃɑʔn/ 'importance'	/ʃ ɑ: n/
/ ðɪʔb/ 'wolf	/dɪ:b/
/muʔmɪn/'faithful'	/mu: mn/

According to McCarthy and Prince [1], under moraic analysis, long vowels should be considered as consisting of two units and short vowels of one unit (or mora). The elision of the glottal stop for simplification reasons has left one mora stranded. The latter should be either dropped or filled up by a default segment. However, what happens is that the short vowel preceding the glottal stop lengthens to fill this vacant slot. To put it differently, to license the mora prosodically, the language has recourse to vocalic expansion to fill the space left empty by the /ʔ/ elision to keep the mora in its place in total conformity with 'prosodic licensing' [12].

Dropping one mora in such a context is not permitted in BA because the resulting forms like *[fɑr] 'a mouse' which contains one monomoraic (light) syllable followed by an extraprosodic syllable, are not accepted because they violate one of the most powerful universal constraints, namely Foot Binarity [13]; [14].

Forms like *[fɑs] 'a pickaxe' violate this universal constraint since they do not consist of a binary foot. They are neither bimoraic nor disyllabic. The only option available is to lengthen the vowel in order to meet the bimoraic requirement of foot binarity. This claim is reinforced by the fact that nearly all BA words satisfy the minimality condition that forces lexical words to have a bimoraic syllable followed by an extraprosodic syllable, e. g. /ʈəbb/ 'to steal', /gɑ: l/ 'to say'…etc. The following illustrative examples in figure 7 exhibit the phonological shift of the [fɑʔs] of CA to [fɑ:s] ' a pickaxe ' of BA:

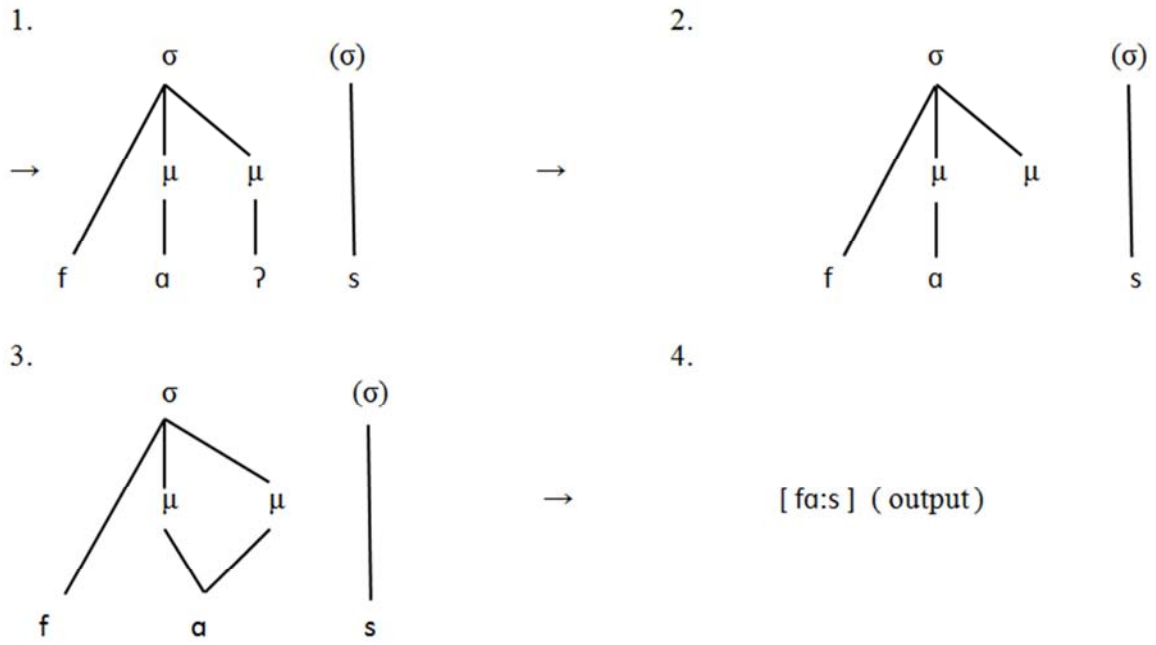

Figure 7. *Phonological Shift from [faʔs] → [fa:s].*

Stage 3 is made clear by the following spreading rule in figure 8:

Figure 8. *Spreading Rule.*

Compensatory Lengthening, then, is a repair process that regulates the prosodic make-up of lexical items. A short survey of this mechanism has shown that a model incorporating moras can account for the process of elision/expansion in a very simple way.

7. Shortening Long Vowels

As a result of the concatenation of suffixes, people in the region of Bechar tend to shorten the long vowels of concave verbs in the perfective. This shortening is the result of a phonological rule that aims at making the system satisfy the bimoraic (σμμ) requirement of the syllable. Consider the following data for illustration:

The imperfective and the imperative	**The perfective**
[n-fu: t]'I will pass'	[fut-t] 'I passed'
[n-tu: b-u]' we will repent'	[tub-nɑ]'we repented'
[j-d ɪ:r-u]' they will do'	[dər-nɑ] 'we did'
[ʃu: f]' look'	[ʃuf-t] 'I looked'
[gu: l]' say'	[gul-t] 'I said'
[ʒ ɪ:b]' bring'	[ʒəb-nɑ] ' we brought'

As shown above, with the exception of the third persons, the long vowels of concave verbs in the imperfective and the

imperative become short in the perfective. The following shortening rule is responsible for this vowel reduction:

V: → V / ….. CC # (concave verbs) (1st & 2nd perfective)

Although the above rule is descriptively adequate, it does not provide any insight about the reason behind vowel shortening. All what can be deduced is that it operates to readjust the prosodic structure of concave verbs like [zɪ:d] 'come in', [du: g]'taste', [sɪ:r]'go' and so forth when first and second suffixes are added in the perfective. If this rule does not interfere, after suffixes are introduced, forms like *[fu:t-t], *[tu:b-nɑ] will be produced. In order to understand the reason behind this vocalic shift, one needs to introduce a moraic approach to the syllable. Once we include the mora in our view of the syllable, we will quickly realize that forms like these are universally condemned. To put it differently, words that include a long vowel closed by two consonants like [mu: tt], [ʃu: ft] cannot be considered as well-formed structures because they violate one of the most powerful constraints on syllable form, namely the constraint prohibiting superheavy syllables word-internally. Accordingly, long vowels in this context undergo shortening and forms like [futt] instead of *[fu:tt] 'I passed' are generated. Once we characterize the syllable in terms of moras, this sort of vowel shortening is predictable as all instances of heavy syllables closed by another consonant (CV: C) are bound to drop one mora word-internally to satisfy the universal constraint prohibiting trimoraic structures ($\sigma_{\mu\mu\mu}$). To illustrate, we will consider the phonological shift from the form [ru:ħ] 'go' to [ruħt] 'I went' shown in figure 9 below:

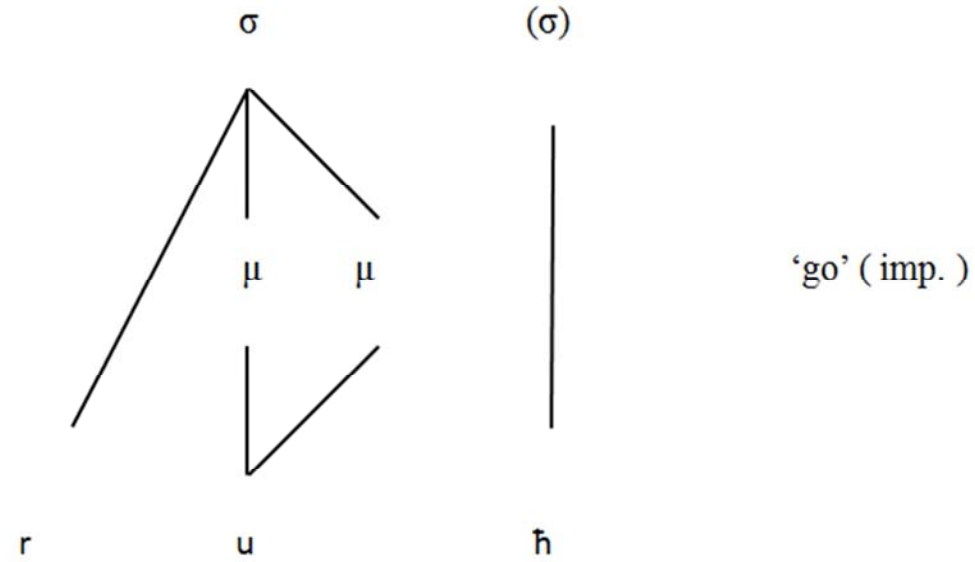

Figure 9. *Phonological Shift from [ru:ħ] → [ruħt].*

After the concatenation of the first person suffix [-t] in the perfective, the following ill-formed configuration emerged. This is shown in figure 10 below:

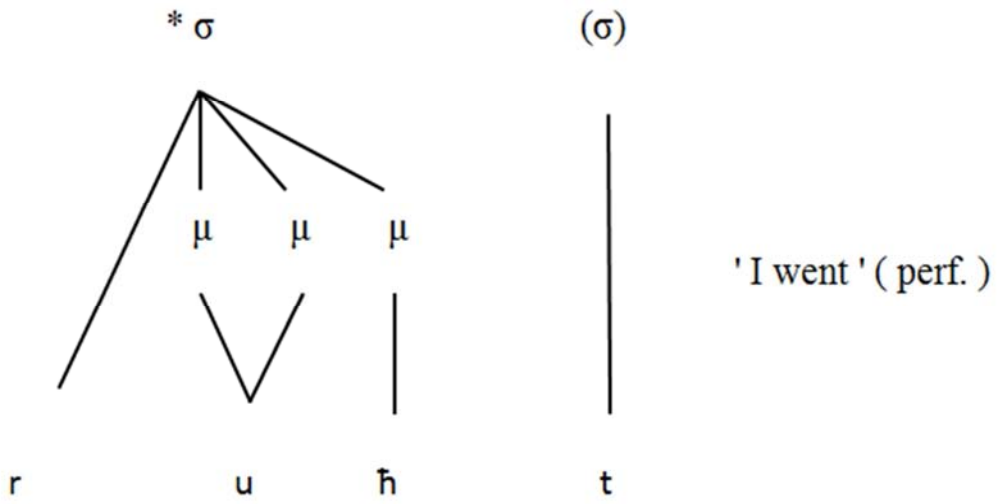

Figure 10. *Ill-formed Configuration.*

As trimoraic structures ($\sigma_{\mu\mu\mu}$) are not allowed word-internally in BA, this configuration cannot make its way to the surface.

As a repair strategy, the constraint (*$\sigma_{\mu\mu\mu} \rightarrow \sigma_{\mu\mu}$) becomes active and shortens the long vowel through one mora elision to yield the following representation in figure 11:

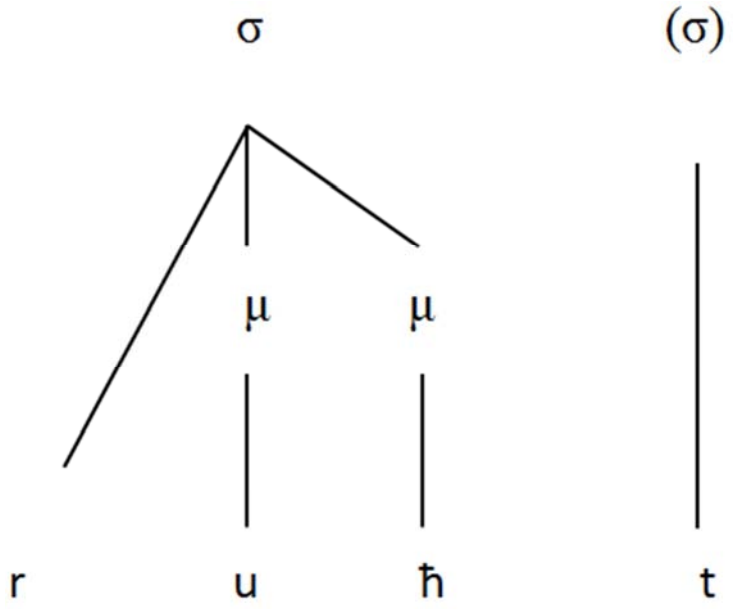

Figure 11. *Long Vowel Shortening/Mora Elision.*

As a result of the constraint (*$\sigma_{\mu\mu\mu} \rightarrow \sigma_{\mu\mu}$), the above attested form makes its way to the surface. This process, which shortens the long vowel through one mora elision, has to operate because it is universally motivated. That is to say, all languages avoid concatenating three moras successively word-internally. The constraint (*$\sigma_{\mu\mu\mu} \rightarrow \sigma_{\mu\mu}$) being active throughout the whole system, would prevent any long vowel from emerging in this special context because any chosen vowel in the underlying representation will be realized as short [15]. Generally, what we have is a matter of moraic concatenation and mora simplification. Models that do not involve moras as necessary ingredients of the syllable can describe the process of vowel shortening, but they cannot give the motive behind its occurrence.

8. Conclusion

We have shown that the adoption of a moraic approach to the syllable has enhanced our understanding of two problematic phonological areas namely, vowel lengthening and vowel shortening. Thus, we have demonstrated that, in order to satisfy Ft-BIN, short vowels lengthen by means of mora spreading/addition, and to satisfy the universal constraint prohibiting trimoraic structures, long vowels of concave verbs shorten by dropping one mora word-internally.

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