Positional Syllable Maximality: Syllabification in Hejazi

Faisal Al-Mohanna
King Saud University, Riyadh
mohannaf@ksu.edu.sa

Abstract

This paper examines the process of evaluating syllabic parsing in Hejazi. The constraint-based analysis presents the universally unmarked CV as the syllable template required to optimise actual syllabification. Instances of final reduction, final vowel shortening and final consonant extrasyllabicity, support the proposed analysis, offering justification for the lack of final mono-syllable moraic trochees, and hence lack of word final head syllable and stress. The account decomposes the requirement on maximum syllabic moraicity. The constraint SYL-MAXIMALITY(μ) confines moraic content to the minimum while SYL-MAXIMALITY(μμ) maximally allows the parsing of bi-moraic syllables. Ranked undominated, SYL-MAXIMALITY(μμ) allows parsing (non-final) heavy syllables and restricts superheavies to the right periphery of the prosodic word. SYL-MAXIMALITY(μ), that preserves the hypothetically maximum and minimum syllable throughout the syllabification domain, is ranked lower to guarantee unmarked syllabification elsewhere, i.e. whenever allowed by higher constraints on faithfulness and markedness formalised to uphold other principles of prosodification, in non-final positions.

1.0. Introduction:

Hejazi, amongst other dialects of Arabic, portrays instances of final reduction, demonstrated empirically in final vowel shortening and representationally in final consonant extrasyllabicity. These processes, where underlyingly long vowels shorten finally, and final consonants associate directly to the prosodic word, support the persistent CV parsing hypothesis. They, though violating constraints on weight identity and prosodic licensing (WT-IDENT and EXHAUS respectively), are considered as the most plausible option maintaining the distributionally unmarked CV syllable, for Hejazi.

These two processes facilitate final footing; they allow pairing final strings of syllables into disyllabic moraic trochees. Shortening a final long vowel or marking a final consonant extrasyllabic, to satisfy CV parsing, contributes to metrification as the final syllable is rendered monomoraic and consequently eligible to share a foot with a preceding light syllable.

Failing to enforce CV syllabic parsing throughout the prosodic word should not be interpreted as an argument for listing heavy syllables (CVC, CVV) or

superheavy syllables (CVCC, CVVC) as canonical syllable types in Hejazi. Their existence, and hence sacrifice of the cross linguistically least marked syllable structure, is a mere realisation of higher requirements of faithfulness and markedness. Heavy syllables are only parsed under duress, to avoid breaching input/output correspondence, segment and constituent contiguity, and/or headedness and exhaustivity as governing principles of the Prosodic Hierarchy relations.

The paper is organised in the following way. Section two summarises basic OT constraints interpreting primary syllabification principles. In section three, the proposed account is presented in detail, starting with default syllabification. Then, the two examples of final reduction are demonstrated as processes satisfying a universal requirement. The section extends the argument to the distribution of superheavy syllables, and explains the definite effect of sonority sequencing on vowel epenthesis in Hejazi. The conclusion is given in section four.

2.0. Syllabification in OT:

This section presents a formalisation of the primary constraints implementing basic syllabification principles in OT. To this end, Prince and Smolensky (2002) interpreted Jakobson's syllabic typology into a set of universal constraints. In particular, optimising the universal core syllable CV is considered top priority.

According to Clements and Keyser (1983), the primary set of core syllable types, cross-linguistically, contains the following sequences:

(1) a. CV
  b. V
  c. CVC
  d. VC

So, languages neither forbid onsets nor require codas (Jakobson 1962). This means that languages may have optional consonant-initial syllables, but never ban them, and optional consonant-final ones, but never require them. Thus, CV and VC occupy the two extremes of markedness; the former is the least marked, and the latter is the most highly marked syllable type.

According to Clements are Keyser (1983), there are two operations involved in deriving the three marked core syllables (V, CVC, VC) from the least marked (CV), deleting the initial consonant and/or adding a final consonant. Consequently, the basic structural (markedness) constraints conspiring to optimise the CV syllable type are as follows (Prince and Smolensky 2002):

(2) a. NUC
  Syllables must have nuclei

  b. * COMPLEX
  No more than one C or V may associate to any syllable position node.

  c. * M/V
  V may not associate to margin nodes (onsets and codas)

d. * P/C
C may not associate to peak nodes (nuclei)

e. ONS
Syllables must have onsets

f. -CODA
Syllables must not have codas

Obviously, this set of structural constraints interprets two essential principles of syllabification. Firstly, the constraints NUC, ONS, and -CODA enforce CV parsing. Secondly, *M/V and *P/C maintain the sonority requirement governing the syllable's internal structure.

In addition to this family of constraints, there is the Faithfulness (correspondence) pair MAX-IO and DEP-IO. These constraints aim at restricting surface structures to those that exhibit a one-to-one correspondence with input segments (McCarthy and Prince 1995). This means that processes of deletion or insertion, ruled out by MAX-IO and DEP-IO respectively, are not preferred.

Ranking the basic syllable structure constraints involves two major steps, decided differently to suit different languages. We first need to decide whether or not onsets are required and/or codas are forbidden. This allows for ranking structural constraints with respect to their Faithfulness counterparts. Then, we will have to decide the way in which this onset requirement and/or coda banning is enforced. This helps determine the relative ranking of MAX-IO and DEP-IO.

3.0. CV-syllabification in Hejazi:

3.1. Default Syllabification:

In general, there seems to be a consensus amongst researchers who investigated the syllable in Arabic (Brame 1970, Bakala 1973, Broselow 1979, McCarthy 1979 *et seq*, Selkirk 1981, among others) that the inventory comprises two types (light and heavy). The light syllable is composed of a simple peak vowel obligatorily preceded by a simple consonant onset (CV). The heavy counterpart, on the other hand, has a branching rime incorporating an additional coda consonant or an additional timing slot rendering a nucleus with a long vowel (CVC, CVV). In addition, there are two rather highly marked manifestations of a third syllable type whose distribution is confined to the word-final position. These syllables, traditionally termed superheavy, are composed of a heavy syllable plus a consonant (CVVC, CVCC).

Hejazi is not an exception to these distribution generalisations; such syllable types are attested in the language:

(3)	Light	CV	ʃa.dʒa.ri	'my trees'
	Heavy	CVC	mak.tuub	'a letter'
		CVV	kaa.saat	'glasses'

Superheavy	CVCC	<u>bint</u>	‘a girl’
		ʔa.<u>kalt</u>	‘I ate’
	CVVC	<u>tiin</u>	‘figs’
		faa.**nuus**	‘a lantern’

Analysing the process of parsing underlying strings into these syllable types, distributing them as they are attested in the language, is the central issue discussed in this section. In OT terms, we want to determine the set of constraints and constraint rankings that conspire to optimise true syllabification in Hejazi.

All these forms show that the onset position is obligatorily filled with a single consonant, which means that Ons is ranked undominated. Another undominated constraint is *Complex as Hejazi does not allow more than one C or V to associate to any syllable position node. However, -Coda is ranked low to tolerate licensing consonants in the coda position. Thus, the ranking below holds for default syllabification in Hejazi:

(4) Undominated: Nuc, * Complex, * M/V, * P/C, Ons

Dominated: -Coda

The surface manifestation of the attested syllable types in Hejazi, however, is not the immediate result of uniformly applying the most primitive syllable template the language truly necessitates for optimal parsing across the prosodic word. The hypothesis, to be pursued, represents the mono-moraic CV as the syllable template for Hejazi and sets the proper OT constraints to implement it. Evaluating the syllabic harmony of candidate analyses will then be a matter of comparing them to that template, which emerges whenever possible, i.e. whenever allowed by more predominant principles of correspondence and licensing. Consequently, CV parsing does not force epenthesis or deletion nor does it promote under-parsing or consonant extrasyllabicity throughout the prosodic word.

All through the forms in (3) above, the maximal syllable contains two elements in the rime, with superheavies analysed differently later in the section. Such rimes are composed of either a short vowel and a consonant or a long vowel. This may suggest that the core syllable template for Hejazi, where these two language-specific properties are captured, is CVX, where X is either a consonant or another timing slot producing a long vowel (Al-Mohanna 1998). Assuming this view, however, requires parsing all underlying strings of segments into that particular syllable template, which is not the case in Hejazi.

As mentioned above, and analysed in detail later, the two processes of final reduction do not seem to follow from this generalisation. A final underlying sequence with a potential of fully satisfying a CVX template, and subsequently creating a bi-moraic syllable, is rendered one mora shorter. This may be analysed as a consequence of imposing a simple CV syllabic parsing. In particular, we find that underlying long vowels (mainly subject pronouns) shorten finally: /simiʕ**tuu**/ → [si.miʕ.**tu**] ‘you *pl.* heard’ (cf. [si.miʕ.**tuu**.na] ‘you *pl.* heard us’), /liħign**aa**/ → [li.ħig.**na**] ‘we followed’

(cf. [li.ħig.naa.hum] ‘we followed them’), etc. Also, and to allow the pairing of final strings of syllables into disyllabic moraic trochees, the phonology optimises final consonant extrasyllabicity. This will eventually deny word-final foot headedness and generate the required footing configuration in Hejazi. These processes offer the justification for the lack of final mono-syllable moraic trochees, and hence lack of word final head syllable and stress. In other words, shortening a final long vowel or marking a final consonant extrasyllabic, to satisfy CV rather than CVX parsing, contributes to metrification as the final syllable is rendered monomoraic and consequently eligible to share a foot with a preceding light syllable: /…CVCVV/ → [….(CV.CV)$_{\Sigma}$]$_{\omega}$ and /…CVCVC/ → […(CV.CV)$_{\Sigma}$C]$_{\omega}$. Therefore, the claim is that the outputs of the two processes of final vowel shortening and final consonant extrasyllabicity are considered as the most plausible options that satisfy CV parsing.

In an attempt to interpret the default CV parsing, but at the same time accommodate bimoraic syllables, I propose a scaled decomposition of the requirements on syllable moraic maximality, to be implemented in the following pair of constraints:

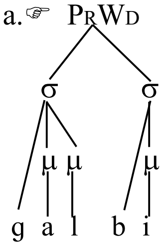
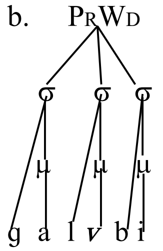
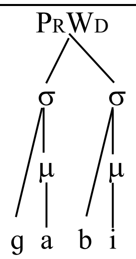
(5) (I) SYL-MAXIMALITY(μ):
Syllables are maximally *mono*-moraic.

(II) SYL-MAXIMALITY(μμ):
Syllables are maximally *bi*-moraic.

The constraint SYL-MAXIMALITY(μ) maintains the universally unmarked syllabification by limiting moraicity to a maximum of one mora per syllable. The constraint SYL-MAXIMALITY(μμ) is independently motivated, especially in languages with moraic trochee footing. Such a constraint has been proposed more than once in OT literature: *σμμμ (Sherer 1994 and Walker 1994), *Tri-moraic Syllables (Hewitt 1994), BIMORA Baković (1996), SYLLBIN Broselow (1997 *et al*), etc. The universal constraint FT-BIN (Prince & Smolensky 2002, McCarthy & Prince 1993, and *et seq.*) and the SYLLABLE INTEGRITY condition (Prince 1980, Halle 1990, Halle and Kenstowicz 1991, Idsardi 1992, Kager 1993, Hayes 1995) both say that feet must be binary (syllabically or moraically) and that a syllable must not be divided between two feet. Therefore, unless syllables are maximally bimoraic, a moraic trochee foot parsing will inevitably disturb their integrity.

Besides moraic content, the other variable that we must specifically determine for Hejazi is the overall ranking of these two constraints. SYL-MAXIMALITY(μμ) should be ranked undominated to establish the fact that syllables, throughout the word, may not accommodate more than two moras. On the other hand, SYL-MAXIMALITY(μ) must be ranked lower than Faithfulness constraints, MAX-IO and DEP-IO in particular, to block unnecessary underparsing or overparsing performed to diminish (by deletion/shortening or epenthesis) those potentially supra-maximal sequences, as interpreted by this constraint. Consider the following tableau for a simple input like /galbi/ → [gal.bi] ‘my heart’.

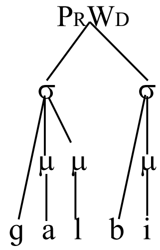
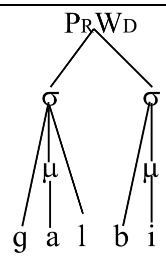
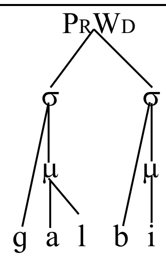
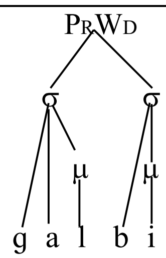
(6) /galbi/ → [gal.bi] ‘my heart’

/galbi/	Ons	Syl-Maximality($\mu\mu$)	Max-IO	Dep-IO	Syl-Maximality(μ)	-Coda
a.☞ 					*	*
b. 				*!		
c. 			*!			

This tableau demonstrates how the grammar, through constraint ranking, blocks persistent CV syllabification. Candidate analyses that violate constrains on Faithfulness (5b and c), only to satisfy Syl-Maximality(μ), are ruled out.

In addition to violators of constraints on input-output segment correspondence, *Gen* presents for evaluation a category of candidate analyses that maintain default mono-moraic maximality by modifying mora prosodic representation. In particular, the process of licensing (underlying and derived) moras considers a number of association configurations with varying degrees of preserving the principles of Prosodic Hierarchy.

(7)

μ μ /g a l b - i/	NUC, *P/C, *M/V, *COMPLEX, ONS, SYL-MAXIMALITY(μμ)	MAX-IO	DEP-IO	SYL-MAXIMALITY(μ)	-CODA
a.? 				*!	*
b. 					*
c. 					*
d. 					*

Obviously, the proposed constraint hierarchy does not block representationally false outputs like (7b, c, or d). These candidate analyses avoid violating SYL-MAXIMALITY(μ) by immediately associating a post-peak medial consonant to a preceding syllable node, a preceding mora, or a distinct mora (licensing a non-moraic vowel). Hejazi grammar, and indeed UG, must have the capacity to prohibit this type of SYL-MAXIMALITY(μ) satisfiers.

The mora theory we adopt determines the set of OT constraints proposed to control moraic representation. Precisely, the issue of whether or not moras are underlyingly present in the input or supplied by *Gen* will characterise the domain of any intended solution. Following Hayes (1989), I shall assume that moras are of two types: underlying and derived. Only vowels and geminate consonants are underlyingly moraic; long vowels are bi-moraic and short ones are mono-moraic. Other consonants are assigned moras derivationally through Weight-by-Position. Hence, the constraints below (Al-Mohanna 1998):

(8) a. MORAICITY-IO
Input moraicity has some correspondent in the Output.

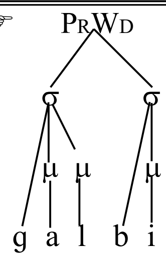
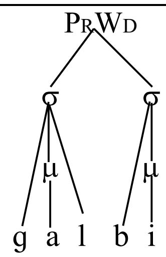
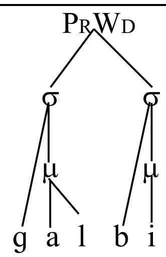
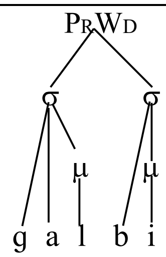
b. Rime Exhaustivity (RIME-EXHAUS)
Within syllable boundaries, post-peak elements are exhaustively parsed into moras.

c. *COMPLEX-μ
A mora may not associate to more than one segment.

The first constraint maintains input-output moraic correspondence. This means that each vocalic timing slot is at least associated to one mora in the output. There have been suggestions in OT literature for incorporating constraints to which one may attribute vocalic moraicity. Rosenthal (1994) introduced V-MORA, and Hewitt (1994) came up with Link VN. Both of these constraints are violated by candidates containing non-moraic vowels. I want to categorically indicate that I am not assuming constraining the input, restricting "richness of the base". What I want to maintain is underlying moraicity (cf. *DELINK Itô, Mester and Padgett (1993) (cited in Spaelti (1994)) for a more general enforcement of maintaining the input's association lines). RIME-EXHAUS carries out the role of Hayes' Weight-by-Position (cf. WxP Zec (1992), WEIGHT-BY-POSITION Kager (1997), and MORAICCODA Broselow et al (1997)). Finally, *COMPLEX-μ discriminates against multiple association linking moras to melodies (cf. *BRANCH-mora Rosenthall (1994) and Walker (1994) and NOSHAREDMORA Broselow et al (1997)).

Consider the tableau below, where the proposed constraints are ranked undominated:

(9)

μ μ | | /g a l b - i/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ	Max-IO	Dep-IO	Syl-Maximality(μ)	-Coda
a. ☞ 				*	*
b. 	*! Rime-Exhaus				*
c. 	*! *Complex-μ				*
d. 	*! Moraicity-IO				*

Clearly, introducing the moraification constraints suggested above attains a true candidate optimisation. Other candidates are ruled out because they present a non-moraic element in the rime (9 b), associate more than one melody to a given mora (9 c), or delete an underlying one (9 d).

In this section, the default CV template, potentially qualified for mono-moraic parsing, is proposed for syllabification in Hejazi and presented as the justification for the two word-final processes of vowel shortening and consonant extrasyllabicity. This claim is then formally interpreted into a pair of constraints regulating syllable moraic maximality. The two constraints portray a scaled decomposition positionally delimiting syllable moraicity to a maximum of two moras non-finally and one mora finally. The mono-moraic level of this requirement imposed on syllable moraic content is ranked lower than input-output segment correspondence and the main

principles of Prosodic Hierarchy relations. The following subsections present detailed analyses, where additional OT constraints are formalised and rankings proposed to optimise final consonant extrasyllabicity and final vowel shortening, as most harmonic satisfiers of CV parsing.

3.2. Final Consonant Extrasyllabicity:

An example of final reduction, demonstrated representationally in Hejazi, is final consonant extrasyllabicity. Compelled by the restrictions Syl-Maximality(μ) imposes, the analysis optimises a candidate which associates a final extrasyllabic consonant (Liberman and Prince 1977, Itô 1986, Kiparsky 2003, and others) (cf. Harris and Gussmann 1998 for 'word-final onsets'). Such prosodification will violate a lower ranked constraint like Exhaustivity (Selkirk 1996): /…VC/ → $[\ldots(\ldots V)_{\Sigma}C]_{\omega}$. This process offers the justification for the lack of final mono-syllable moraic trochees, and hence lack of word final head syllable and stress.

The need for Ft-Bin in Hejazi is quite evident. The empirical facts of the language's stress pattern demand a strict binary moraic footing (trochaic in particular). Stress is assigned to the right-most non-final heavy syllable, otherwise to the penult or antepenult, whichever is separated from the first preceding heavy syllable or (if there is none) from the beginning of the word by an even number of syllables (Al-Mohanna 1998, 2004). This means that stress is never final, with the exception of final superheavy syllables. Consequently, final head syllables should be avoided, which means denying any environment for creating final mono-syllabic moraic trochees, that may only be erected on final heavy syllables. However, optimising the true output of a form that terminates in a heavy /-CVC/ sequence preceded by an odd number of light syllables can be rather problematic for the so far suggested set of constraints and/or constraint ranking. In such forms, stress is placed on the penult, i.e. the syllable separated form the left edge of the word by an even number of light syllables. This means that this syllable must be prominent in its foot structure. To achieve such a configuration, the penultimate syllable must be footed with the final CVC sequence. Obviously, this will violate Ft-Bin. Consider the following tableau:

(10) /ʃad͡ʒaratak/ → [ʃa.d͡ʒa.rá.tak] 'your *sg. ms.* tree'

/ʃad͡ʒaratak/	Ft-Bin	WSP	Parse-Syl	Align-Head (R)
a. ? (ʃa.d͡ʒa)(rá.tak)	*!	*		
b. ☞ *ʃa(d͡ʒá.ra)(tak)			*	*

As configured, the head foot in the true output (10 a) violates the undominated Ft-Bin, as the final foot will necessarily license three moras, one associated to the first syllable [- (ra -)] and two to the second [- (- tak)]. On the other hand, the light penultimate syllable, in the falsely optimised candidate (10 b), is denied foot headedness because of the existence of a heavy ultima. However, another candidate analysis which erects a foot over a final pair of light syllables will be evaluated as most harmonious.

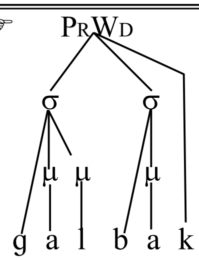
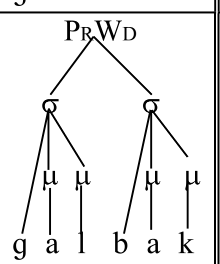
Implementing CV parsing word-finally, reducing Syl-Maximality(μ) violations by one, will help create the environment for the proposed candidate. This is the most plausible justification for parsing the first two elements of final /-CVC/

sequences into light syllables, which eventually facilitates assigning penultimate stress in words like /ʃad͡ʒaratak/. The remainder of this subsection demonstrates how the grammar optimises final consonant extrasyllabicity, performed to maintain CV parsing word-finally, over exhaustive syllabification.

Along these lines, more than one analysis has been suggested in the OT literature (Hung (1994), Spaelti (1994), Eisner (1997)). Hung (1994), for example introduces the constraint Rhythm. By virtue of demanding a weak *n* level grid mark after each stronger *n+1*, this constraint forces final consonant "weak parsing", in Cairene for example. Also, in an article that takes on the challenge of adhering to extreme simplicity and locality in constraint formalisation, Eisner (1997) interprets Non-Fin as a constraint that militates against final syllable footing. More radically, though, Spaelti (1994) introduced WeakEdge as a constraint preferring structural emptiness in the right periphery of prosodic categories. Collectively, all these proposals will, directly or indirectly, exclude a final consonant from the structure of the final foot.

Nevertheless, we are not actually obliged to adopt an approach that is merely asserted in an ad hoc fashion rather than following logically from general principles. Arguing for final consonant extrasyllabicity, which rules out candidate analyses with perfectly syllabified final consonants, ought to follow from a universally established principle, such as CV parsing. The tableau below demonstrates the prominent role Syl-Maximality(μ) plays:

(11) /galb-ak/ → [gal.bak] 'your *sg. ms.* heart'

/galb-ak/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ	Max-IO	Dep-IO	Syl-Maximality(μ)	-Coda
a. ☞ 				*	*
b. 				**!	**

On the surface, the final consonant /-k/ is phonetically realised, as it is prosodically licensed in both candidates (11 a, b). Nonetheless, (11 a) is a better satisfier of Syl-Maximality(μ), as the final consonant does not trigger weight-by-position and

consequently associates to no mora. The outcome of such prosodification rules out word-final footing. This is certainly a more definite effect, especially with forms such as the one analysed in (10) above. Consider the tableau below where SYL-MAXIMALITY(μ) is included in the constraint hierarchy to preserve the universally unmarked CV parsing, which will ultimately achieve the desired footing effect:

(12)

/ʃad͡ʒaratak/	FT-BIN	WSP	SYL-MAXIMALITY(μ)	PARSE-SYL	ALIGN-HEAD (R)
a. ☞ [(ʃa.d͡ʒa)$_{Foot}$(rá.ta)$_{Foot}$ k]$_{PrWd}$					
b. [ʃa(d͡ʒá.ra)$_{Foot}$ (tak)$_{Foot}$]$_{PrWd}$			*!	*	σ

Although tableaux (11 and 12) demonstrate evaluations optimising true outputs, there remains one important detail. Generally, any candidate containing unsyllabified elements should be inferior to one that is perfectly syllabified. In terms of OT constraints, the analysis developed thus far does not ascertain such principle. In particular, we should determine the constraint violated in the optimal candidate analyses in (11 and 12); the one evaluating the final consonant's prosodification status.

Phonologists have argued for a Prosodic Hierarchy in which all phonological units belong to higher prosodic structures (Selkirk 1978, 1981, 1982, 1984, Nespor and Vogel 1986, Itô 1986, McCarthy and Prince 1986, 1990 a, b). This means that segments belong to syllables, syllables to feet, feet to prosodic words, and so on. The dominance relations holding between the different prosodic domains are regulated by the Strict Layer Hypothesis (Selkirk 1981):

(13) Strict Layer Hypothesis:
Pn → Pn-1* (where X* = 'one or more Xs')

The formality of Strict Layer Hypothesis follows from one of the basic principles of Prosodic Phonology, namely Prosodic Licensing.

Selkirk (1996) provided an OT revision of the Prosodic Hierarchy. She introduced a constraint-based formalisation of the various dominance relations imposed on the hierarchy by the Strict Layer Hypothesis. These constraints are as follows:

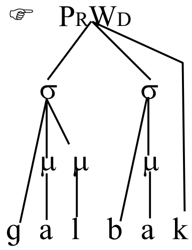
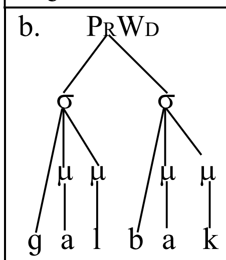
(14) Constraints on Prosodic Domination:

a. Layeredness — No C_i dominates C_j, $j > i$
b. Headedness — Any C_i must dominate a C_{i-1}
c. Exhaustivity — No C_i immediately dominates a constituent C_j, $j < i-1$
d. Nonrecursivity — No C_i dominates C_j, $j = i$

Selkirk asserts that Layeredness and Headedness are cross-linguistically undominated and consequently inviolable. The other two constrains are subject to language-particular ranking. What is of interest to us is the constraint Exhaustivity (EXHAUS). This constraint is violated when a prosodic constituent immediately dominates

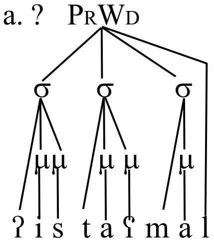
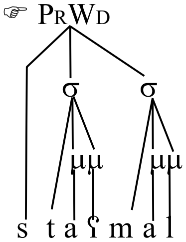
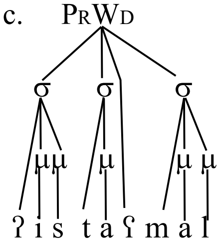
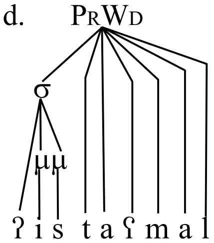
another that is more than one level lower in the Prosodic Hierarchy. Thus, a prosodic word should not immediately dominate a terminal segment. For Hejazi grammar, Exhaus must be ranked at least lower than Syl-Maximality(μ), as it is always violated by forms with final / - CVC/ sequences. The following tableau incorporates this constraint.

(15)

/galb-ak/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ	Max-IO	Dep-IO	Syl-Maximality(μ)	Exhaus	-Coda
a. ☞ 				*	*	*
b. 				**!		**

Restricting degenerate prosodification to the final consonant is a central issue, however. The constraint hierarchy should disfavour any candidate analysis with non-final unsyllabified segments. As it stands, the low ranking of Exhaus optimises false outputs with: initial or medial degenerate association, more than one final syllabically unprosodified segment, or a final unsyllabified vowel. The following tableau, evaluating candidate analyses of the input /staʕmal/ → [ʔis.taʕ.mal], demonstrates some consequences of the proposed account:

(16) /staʕmal/ → [ʔis.taʕ.mal] ‘he used/ employed’

/staʕmal/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ	Max-IO	Dep-IO	Syl-Maximality(μ)	Exhaus	-Coda
a. ? PrWd 			*!*	**	*	**
b. ☞ PrWd 				**	*	**
c. PrWd 			*!*	**	*	**
d. PrWd 			*!*	*	******	*

The proposed constraint hierarchy will not exclude false outputs as (16 b, c, and d), evaluated more harmoniously than the true output (16 a). Interpreting a number of simple and basic principles of syllabification into OT constraints will assist a given grammar, in this particular matter. Such constraints, however, should be independently motivated in cross-linguistically confirmed statements of prosodic licensing.

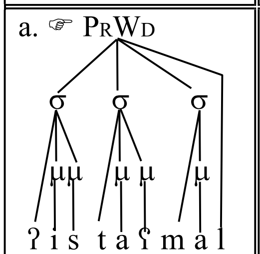
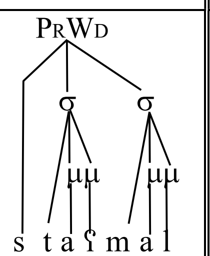
Universal Grammar may employ Alignment (McCarthy & Prince 1993b) to discriminate against forms whose initial segments or clusters of segments are

immediately dominated by the prosodic word node. In particular, a constraint, such as the one formalised in (17) below, requires the alignment of the left edge of the prosodic word with that of some syllable (cf. Clements 1997).

(17) Align-Left:
Align (PrWd, L, Syll, L)
(The left edge of every prosodic word must be aligned with the left edge of some syllable).

This constraint should rank undominated in our proposed hierarchy. If so, any candidate analysis failing to align the left edges of the prosodic domains (PrWd and σ) like (16 b) will never be optimised. Consider the following tableau:

(18) /staʕmal/ → [ʔis.taʕ.mal] 'he used/ employed'

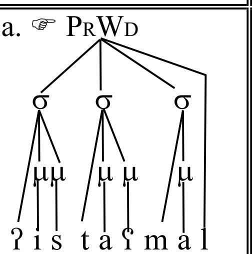
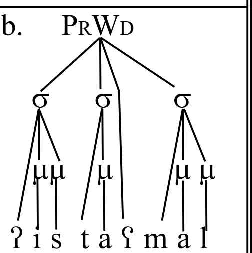
/staʕmal/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ, Align-Left	Max-IO	Dep-IO	Syl-Maximality(μ)	Exhaus	-Coda
a. ☞ 			**	**	*	**
b. 	*! Align-Left			**	*	**

To rule out Exhaus violations incurred by having the prosodic word immediately dominating a medial segment, the proposed account considers a constraint presented to attain a similar effect required for Classical Arabic. McCarthy and Prince (1990) suggested a (pre-OT) constraint whereby the linear contiguity of syllables is maintained, a constraint that does not allow interrupting the adjacency of subsyllabic elements.

(19) Syllabic Contiguity (Syl-Contig):
Syllabic well-formedness is enforced over contiguous strings of subsyllabic elements.

Ranked undominated, all non-peripheral segments must be properly syllabified. The following tableau demonstrates how Hejazi grammar blocks forms like (16 c):

(20)

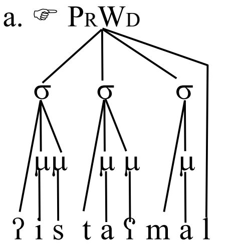
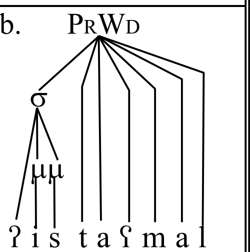
/staʕmal/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ, Align-Left, Syl-Contig	Max-IO	Dep-IO	Syl-Maximality(μ)	Exhaus	-Coda
a. ☞ 			**	**	*	**
b. 	*! Syl-Contig		**	**	*	**

The third type of Exhaus violations, the proposed account should control, is multiple-final degenerate association. The grammar must prevent optimising candidates that have more than one final segment (consonant) violating the requirements of Strict Layer Hypothesis. To account of this undesired overgeneralisation, the grammar slightly augments the scope *Complex evaluates, to include any prosodic node. This can be stated as follows:

(21) *Complex:
No more than one segment may associate to any prosodic node.

As a result, final associations to the prosodic word are minimised to only one segment. Consider the following tableau:

(22)

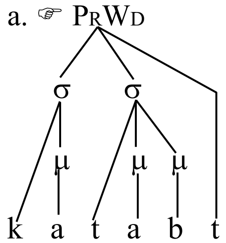
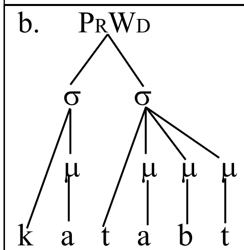
/staʕmal/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ, Align-Left, Syl-Contig	Max-IO	Dep-IO	Syl-Maximality(μ)	Exhaus	-Coda
a. ☞ 			**	**	*	**
b. 	*! *Complex		**	*	******	*

Thus far, the proposed account for prosodifying final /- CVC/ sequences in Hejazi argues for final consonant extrasyllabicity as the only feasible representational analysis to facilitate footing, yet more generally to satisfy the cross-linguistic universal of persistent CV-parsing. The grammar considers this degenerate association as a violation of Exhaus and endeavours to control possible overgeneralisations, representational or otherwise. The same rationale can be extended to the analysis of final superheavy syllables in Hejazi, or other dialects of Arabic. As discussed in the subsection below, final consonants of final /- CVVC or CVCC/ sequences will also be analysed as extrasyllabic.

3.2.1. Superheavy Syllables:

The maximum limit of two moras per syllable is obviously a central issue in the discussion of Hejazi syllabification, hence the undominated ranking of Syl-Maximality(μμ). Nevertheless, there are some underlying sequences potentially capable of licensing more than two moras per syllable. Consequently, the basic assumption of any analysis of superheavy syllables, in Hejazi, must set out to decide the prosodic affiliation of their final consonants. To have these consonants parsed in the coda position of a final syllable implies an account assuming non-uniform syllabic moraicity, achieving no analytical competence what so ever. Nonetheless an account licensing a prosodified extrasyllabic final consonant will guarantee phonetic realisation and maintain the undominated requirement on maximum syllable moraic content. Consider the tableau below:

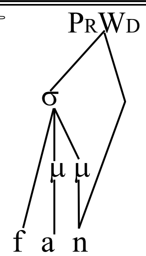
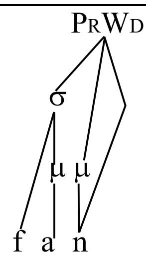
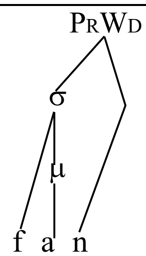
(23) [katabt] ‘I/you *sg. ms.* wrote’

/katab-t/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ, Align-Left, Syl-Contig	Max-IO	Dep-IO	Syl-Maximality(μ)	Exhaus	-Coda
a. ☞ 				*	*	*
b. 	*! Syl-Maximality (μμ)			*		*

The constraint hierarchy evaluates the candidate with a degenerately prosodified final consonant as more harmonious than one licensing a tri-moraic syllable, no matter how Exhaus is satisfied. This analysis, however, does not account for cases with final consonant geminates. Being mono-segmental, associating both members of a final geminate directly to the prosodic word satisfies Syl-Maximality(μ) and incurs no violations of *Complex. Yet, the stress pattern in Hejazi indicates otherwise. A final consonant geminate will always create heavy (stress attracting) syllables, suggesting that at least one member of the geminate is assigned to the coda position of such syllables.

Compared to consonant clusters, geminates are underlyingly moraic (Hayes1989). Thus, an account that requires syllabifying underlying moras will certainly rule out total geminate extrasyllabicity. To that end, the grammar does not need to add any other constraint. Decomposing Exhaus into its very primitive micro constraints reveals more specific domains of Exhaustivity enforcement. The fragment μ-Exhaus, ranked undominated, blocks licensing a mora in any prosodic domain higher than the syllable. The following tableau evaluates key candidate analyses of an input with a final consonant geminate /fann/ ‘art’:

(24)

μ μ | | /f a n/	NUC, *P/C, *M/V, *COMPLEX, ONS, SYL-MAXIMALITY(μμ), MORAICITY-IO, RIME-EXHAUS, *COMPLEX-μ, ALIGN-LEFT, SYL-CONTIG, μ-EXHAUS	MAX-IO	DEP-IO	SYL-MAXIMALITY (μ)	EXHAUS	-CODA
a.☞ 					*	*
b. 	*! μ-EXHAUS			*	**	
c. 	*! MORAICITY-IO				*	

Therefore, extending the final consonant extrasyllabicity account to the analysis of superheavy syllables in Hejazi explains their distributional distinctiveness. Being generally final justifies the proposed configuration of a heavy syllable plus a peripheral extrasyllabic consonant. Such prosodification generates the environment for right-most non-final stress assignment, as the final consonant intervenes between the right edges of the final foot and the prosodic word, creating a non-final heavy syllable on which the non-final foot is erected. These assumptions raise a number of questions on the need for extrametricality in Hejazi, as a device of metrical parsing. Imposing NON-FIN (Non-finality) or any other constraint enforcing extrametricality, on the process of metrification may seem stipulative when the required effect follows from the more general principle of CV parsing (cf. Al-Mohanna 2004).

3.2.2. Sonority Sequencing:

The above discussion maintains the claim that a final consonant of a final superheavy sequence (syllable) is extrasyllabic. Consequently, the sonority profile of the final syllable should not be influenced by the sonority value of that final extrasyllabic consonant, as it is external to that syllable's structure. However, as demonstrated in (25), a final consonant cluster with rising sonority values triggers vowel epenthesis.

(25)	a. /d͡ʒism/	→	[d͡ʒi.si̲m]	'body'
	b. /ʔiðn/	→	[ʔi.ði̲n]	'ear'
	c. /ħukm/	→	[ħu.ku̲m]	'law sentence or ruling'
	d. /gut^{ʕ}n/	→	[gu.t^{ʕ}u̲n]	'cotton'
	e. /faħm/	→	[fa.ħa̲m]	'coal'
	f. /nahr/	→	[na.ha̲r]	'river'
	g. /ʔakl/	→	[ʔa.ki̲l]	'food'
	h. /ħabl/	→	[ħa.bi̲l]	'rope'
	i. /s^{ʕ}abr/	→	[s^{ʕ}a.bu̲r]	'patience'
	j. /fad͡ʒr/	→	[fa.d͡ʒu̲r]	'dawn'

The angle from which OT considers the relation between sonority and syllabification differs from that of any derivational approach. Segment sonority values block syllabification to avoid producing syllable-internal sonority troughs. Sonority, especially a sonority peak, drives syllabification, hence, the restriction on consonants associating to sonority peaks, i.e. the constraint * P/C. Consider the following tableau:

(26) /nahr/ → [nahar] 'a river'

/nahr/	NUC, *P/C, *M/V, *COMPLEX, ONS, SYL-MAXIMALITY (μμ), MORAICITY-IO, RIME-EXHAUS, *COMPLEX-μ, ALIGN-LEFT, SYL-CONTIG, μ-EXHAUS	MAX -IO	DEP -IO	SYL-MAXIMALITY (μ)	EXHAUS	-CODA
a. ☞ [(na)$_σ$(ha̲)$_σ$r]$_{PrWd}$			*		*	
b. [(na)$_σ$(ha̲r)$_σ$]$_{PrWd}$			*	*!		*
c. [(nahr)$_σ$]$_{PrWd}$	*! SYL-MAXIMALITY(μμ)			*		*
d. [(nah)$_σ$]$_{PrWd}$		*!		*		*
e. [(nah)$_σ$r]$_{PrWd}$	*! *P/C			*	*	*

Tableau (26) demonstrates that the epenthesis and extrasyllabicity solution (26 a), the optimal candidate analysis, avoids assigning a (final) consonant to a sonority peak (26

e), with no need to syllabify a final consonant (26 b). However, the analysis will have to assume the undominated ranking of ALIGN-RIGHT, Align (LXWD, R, PRWD, R), to rule out false outputs like $*[\ (nah)_{\sigma}(r\underline{V})_{\sigma}\square\ ]_{PrWd}$.

By this, I conclude discussing superheavy syllables and final consonant extrasyllabicity. The next subsection analyses the process of final vowel shortening in Hejazi, as an empirical piece of evidence supporting the CV parsing hypothesis.

3.3. Final Vowel Shortening:

Hejazi, amongst other dialects of Arabic, portrays another instance of final reduction which supports the proposed hypothesis of maintaining CV syllable parsing. Demonstrated empirically, final vowel shortening is a process where underlyingly long vowels shorten finally. Examples like: /simiʕ**tuu**/ → [si.miʕ.**tu**] 'you *pl.* heard' (cf. [si.miʕ.**tuu**.na] 'you *pl.* heard us'), /liħign**aa**/ → [li.ħig.**na**] 'we followed' (cf. [li.ħig.**naa**.hum] 'we followed them'), etc. show the length contrast in final and non-final positions. Superficially, this shortening may be attributed to a brute force constraint like *LONG-V (cf. Rosenthall (1994), Burzio (1994), Benua (1996) for example). A more plausible analysis, however, considers this process as the most natural option that satisfies SYL-MAXIMALITY(μ), and consequently adheres to the cross linguistically unmarked CV parsing.

Final Vowel Shortening is a phenomenon attested in Hejazi where long vowels, mainly subject pronouns, shorten finally. In the following group of examples, vowels appear in final and non-final position to show the length contrast:

(27)	a.	/katabuu/	→	[ká.ta.bu]	'they wrote'
			(cf.	[ka.ta.búu.ha]	'they wrote her name')
	b.	/gataluu/	→	[gá.ta.lu]	'they killed'
			(cf.	[ga.ta.lúuh]	'they killed him')
	c.	/ʔaχaðtuu/	→	[ʔa.χáð.tu]	'you *pl.* took'
			(cf.	[ʔa.χað.túu.ni]	'you *pl.* took me')
	d.	/simiʕtuu/	→	[si.míʕ.tu]	'you *pl.* heard'
			(cf.	[si.miʕ.túu.na]'you *pl.* heard us')	
	e.	/liħignaa/	→	[li.ħíg.na]	'we followed'
			(cf.	[li.ħig.náa.hum]	'we followed them')
	f.	/misiknaa/	→	[mi.sík.na]	'we caught'
			(cf.	[mi.sik.náa.ha]	'we caught her')
	g.	/saħabtii/	→	[sa.ħáb.ti]	'you *sg. fm.* pulled'
			(cf.	[sa.ħab.tíi.ni]	'you *sg. fm.* pulled me'
	h.	/dˤarabtii/	→	[dˤa.ráb.ti]	'you *sg. fm.* hit'
			(cf.	[dˤa.rab.tíi.hum]	'you *sg. fm.* hit them')
	i.	/gaddamuu/	→	[gád.da.mu]	'they introduced'
			(cf.	[gad.da.múu.na]	'they introduced us')
	j.	/saamaħuu/	→	[sáa.ma.ħu]	'they forgave'
			(cf.	[saa.ma.ħúu.kum]	'they forgave you *pl.*')

k. /ʃaafuu/ → [ʃáa.fu] ‘they saw (something)’
(cf. [ʃaa.fúu.ni] ‘they saw me’)

Unlike the case of final consonant extrasyllabicity, shortening a final long vowel does not prejudice the alignment of the right peripheries of the PrWd and the final syllable. After shortening, the right edge of the final syllable will still be the right edge of the prosodic word, hence no violation of Exhaus. Therefore, in an input like /gaddamuu/, the claim is that the final vowel shortens merely to satisfy Syl-Maximality(μ). This must crucially be coupled with the assumption that Syl-Maximality(μ) dominates a constraint like Wt-Ident (McCarthy 1995):

(28) Wt-Ident(μμ):
If α ∈ Domain (*f*),
if α is bimoraic, then *f* (α) is bimoraic.
(No shortening)

Consequently, the account assumes that input-output weight identity correspondence is sacrificed to maintain a constraint on syllabification. These ideas are summarised in the following tableau:

(29) /gaddamuu/ → [gad.da.mu] ‘they introduced’

/gaddamuu/	Nuc, *P/C, *M/V, *Complex, Ons, Syl-Maximality(μμ), Moraicity-IO, Rime-Exhaus, *Complex-μ, Align-Left, Syl-Contig, μ-Exhaus	Max-IO	Dep-IO	Syl-Maximality (μ)	Wt-Ident	-Coda
a. ☞ gad.da.mu				*	*	*
b. gad.da.muu				**!		*
c. gad.dam		*!		**	**	**
d. gad.da.mu.u	*! Ons			*		*

However, we will have to assume that a constraint like I-Contig (McCarthy and Prince 1995), which militates against skipping any medial material (moras in this case), dominates Syl-Maximality(μ). McCarthy & Prince (1995) provided the formalisation below:

(30) I-Contig (“No Skipping”)
The portion of S_1 standing in correspondence forms a contiguous string.

Also, the account should not allow mora deletion on the left periphery (of the mora tier), a process which does not disturb contiguity of any input mora strings. This may be blocked by a constraint ranked above Syl-Maximality(μ) to discriminate against initial mora deletion (on the mora tier) and ultimately non-final instances of (vowel)

reduction. This constrain will be a formalisation of the assumption that the constituent's right edge is more plausibly nominated for "weakening" processes. The account will capitalise on an interpretation of EDGE-MARKEDNESS, a restriction aimed at constraining the effects of extrametricality (cf. Hayes 1995). It can be formalised as follows:

(31) EDGE-MARKEDNESS
The unmarked edge for vowel shortening is the right edge.

These two constraints will rule out instances of non-final mora deletion to satisfy SYL-MAXIMALITY(μ). The proposed account should not be extended to non-final vowel length contrasts. Consider the following tableau:

(32)

$\mu_1\mu_2$ $\mu_3\mu_4$ /ʃ a f u/	I-CONTIG	EDGE-MARKEDNESS	SYL-MAXIMALITY(μ)	WT-IDENT
a. ☞ σ σ; $\mu_1\mu_2$ μ_3; ʃ a . f u			*	
b. σ σ; μ_1 μ_3; ʃ a . f u	*!			**
c. σ σ; μ_2 μ_3; ʃ a . f u		*!		**

Therefore, we saw how SYL-MAXIMALITY(μ) prompts Final Vowel Shortening across the board, including forms with unfootable final /- CVCVV/ sequences, in the same manner that triggered final consonant extrasyllabicity.

4 Conclusion:

The proposed analysis employs a set of independently motivated constraints on prosodification, justifying final reduction processes in Hejazi and achieving the desired effects for metrification. The account commits itself to universality and abstracts away from any redundancy in the process of syllabification. The universally unmarked CV is presented as the core syllable template for Hejazi. Final vowel shortening and final consonant extrasyllabicity, that help create the desired configuration for CV parsing, offer justification for the lack of final mono-syllable moraic trochees, and hence lack of word final head syllable and stress.

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