Reduplication: A New Distributed Morphology Approach

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Abstract

The current paper aims to capture the properties of reduplication within the distributed morphology model (Halle and Marantz 1993, 1994; Embick and Noyer 2006; Siddiqi 2009; Embick 2010). Taking Standard Arabic (SA) as a representative, the article shows that SA, like many other languages, has both full and partial reduplication. Full reduplication repeats entire words or stems whereas partial reduplication doubles part of the stem. Rather than the available two analyses, i.e. the readjustment approach (Raimy 2000; Frampton 2009) and the affixation approach (Haugen 2008; Haugen and Harley 2010; Haugen 2011), the current paper provides a novel approach to the phenomenon of reduplication in the world languages. It argues that root consonants and vowels should be decomposed into non-phonetic distinctive features that undergo late insertion at PF. These non-phonetic distinctive features are supplied with sound items at PF in the same fashion that the terminal nodes with morphosyntactic features are fed with vocabulary items. This approach serves three purposes. It accounts for speech errors, captures the non-concatenative morphology in Semitic languages, and allows the reduplicant form to copy all the distinctive features of the roots, yielding instances of full reduplication. Instances of partial reduplication can be

generated by root-sensitive impoverishment rules which target and delete some of the features of the stem or the reduplicant form.

Keywords: reduplication, standard Arabic, distributed morphology, sound items, impoverishment rule.

1. Introduction

Reduplication is a morphological process in which a stem, segment, or syllable or even full words are repeated (Raimy 2000; Inkelas & Zoll 2005; Haugen 2008 among others)[1]. Reduplication can be full or partial. Full reduplication repeats full stems as in (1) from Halkomelem (cf. Shaw 2004), whereas partial reduplication doubles only a part (a sound, two sounds, or a syllable, etc) of the stem as in (2) from Agta (cf. Healey 1960).

1.	a.	[qʷél]	‘to speak’ →	[qʷél-qʷél]	‘talkative’
	b.	[kʼʷə́ɬ]	‘to capsize’ →	[kʼʷə́ɬ-kʼʷə́ɬ]	‘likely to capsize’
2.	a.	[ɸurab]	‘afternoon’ →	[ɸu-ɸurab]	‘late afternoon’
	b.	[ŋaŋaj]	‘a long time’ →	[ŋa-ŋaŋaj]	‘a long time (in years)’

There are many grammatical or rhetorical purposes for reduplication (Haspelmath, 2013). The primary use of reduplication is pluralization as in Agta in (3) (cf. Raimy, 2000) and Dakota in (4) (cf. Shaw, 1980).

3.	a.	pusa	‘cat’	pu-pusa	‘cats’
	b.	kaldin	‘goat’	kal-kaldin	‘goats’
	c.	takki	‘leg’	taktakki	‘legs’
	d.	uffu	‘thigh’	uf-uffu	‘thighs'
4.	a.	hãska	‘tall’	hãska-ska	‘tall (plural)’
	b.	waʃte	‘good’	waʃte-ʃte	‘good (plural’

[1] Abbreviations used in this article are as follows: DM=Distributed Morphology; MS=Morphological Structure; SA=Standard Arabic; SI(s)=Sound Item(s); VI(s)=Vocabulary Item(s).

Reduplication can also be used for intensifying events, as in Gunu in (5a) (cf. Rekanga 1989), Mbukushu in (5b) (cf. Fisch 1998) or Yao in (5c) (cf. Ngunga 2002).

5.	a.	bela	'lie'	bela-bela	'lie continually'
	b.	kwata	'touch'	kwata-kwata	'touch everything'
	c.	lima	'cultivate'	lima-lima	'cultivate frequently'

Sometimes, full words are reduplicated for contrastive focus constructions as in (6) from English (cf. Ghomeshi et al. 2004).

6. a. I'll make the tuna salad and you make the *salad salad*.
   b. And you think you know me? The *me me*?
   c. I'm up, I'm just not *up up*.
   d. He wasn't *famous famous* before that.

In contrast to the above uses of reduplication, i.e. multiplication, intensity, or focus, reduplication can also express the opposite function, namely diminution or attenuation, as in Mainland Comox in (7) (Watanabe 1994), or as in Ndyuka and Sranan in (8) (cf. Kouwenberg & LaCharité, 2005).

7.	a.	supaju	'ax'	suspaju	'little ax'
	b.	ʔaltx^{w}	'room'	ʔaʔltx^{w}	'little room'
	c.	tala	'money'	tatla	'a little bit of money'

8.	a.	lon	'to run'	lon-lon 'to be kind of running'	[Ndyuka]
	b.	ferfi	'to paint'	ferfi-ferfi 'to paint a bit'	[Sranan]

As far as Standard Arabic (SA) is concerned, reduplication is mostly employed for intensity and emphasis (Procházka 1993; Abu-Mansour 2015). Full words or stems can be reduplicated in SA as in (9) and (10) respectively.

9. Full Word Reduplication

a. sˁah sˁah	'silence, silence'
b. ʔanta ʔanta	'you, you'
c. ʔallah ʔallah	'wow, wow'

d. marħa marħa ‘an expression of excitement’
e. bayna bayna ‘so and so’

10. Full Stem Reduplication

a.	xarxar	(cf. xar+xar)	‘bubble’
b.	tamtam	(cf. tam+tam)	‘mumble’
c.	ɣamɣam	(cf. ɣam+ɣam)	‘babble’
d.	zaqzaq	(cf. zaq+zaq)	‘chirp’
e.	tˁaʔtˁaʔ	(cf. tˁaʔ+tˁaʔ)	‘lower one’s head’
f.	kamkam	(cf. kam+kam)	‘cover’
g.	sˁarsˁar	(cf. sˁar+sˁar)	‘scream’
h.	ħasˁħasˁ	(cf. ħasˁ+ħasˁ)	‘manifest’
i.	fadˁfadˁ	(cf. fadˁ+fadˁ)	‘disclose’
j.	waswas	(cf. was+was)	‘suspect’

The examples in (9) and (10) are instances of full reduplication. Partial reduplication also exists in SA where part of the stem is doubled while the rest thereof is deleted. In (11), the first CV of the stem is deleted, whereas, in (12), the final VVC of the reduplicant form is the one being erased[2].

11. Partial Stem Reduplication (the 1st CV of the stem → ∅)

a.	ʕaram+ram	(cf. ʕaram+[ʕa]ram)	‘very numerous’
b.	ɣaʃam+ʃam	(cf. ɣaʃam+[ɣa]ʃam)	‘very unjust’
c.	ʕarak+rak	(cf. ʕarak+[ʕa]rak])	‘very experienced’
d.	kaðab+ðab	(cf. kaðab+[ka]ðab)	‘big liar’
e.	ʕa sˁab+sˁab	(cf. ʕasˁab+[ʕa]sˁab)	‘very hard’
f.	damak+mak	(cf. damak+[da]mak)	‘very sweeping’
g.	ʃalaʕ+laʕ	(cf. ʃalaʕ+[ʃa]laʕ)	‘very tall’
h.	ħarak+rak	(cf. ħarak+[ħa]rak)	‘very quick’
i.	hawal+wal	(cf. hawal+[ha]wal)	‘very scared’
j.	ɣatˁam+tˁam	(cf. ɣatˁam+[ɣa]tˁam)	‘very deep’

12. Partial Stem Reduplication (2nd VVC of the reduplicant form → ∅)

a.	mar+mari:s	(cf. mar[i:s]+mari:s)	‘a very hard land’
b.	mar+mari:r	(cf. mar[i:r]+mari:r)	‘a very empty land’
c.	mar+mari:t	(cf. mar[i:t]+mari:t)	‘a very empty land’
d.	qar+qari:r	(cf. qar[i:r]+qari:r)	‘a stomach sound’

[2] Note that we follow Clements & Keyser’s (1982) linear model of CV phonology in treating long vowels as VV.

Given that “all syllables in Arabic require an onset” (Watson, 2002:65), we assume that the obliterated parts in (11) are syllables but those in (12) are not. The first rhotic sound [r] in the words in parenthesis in (12) should function as the onset of the following deleted parts, not as the coda of the preceding /ma/ or /qa/. Because this [r] is preserved in (12), the deletion process must have applied only to part of the syllable, namely VVC.

In this paper, we will develop a distributed morphology approach to account for full and partial reduplication in the world languages, using SA as a representative. Because the reduplicant form borrows all (or a number of) sounds from roots, stems, and roots as original sources, we will begin our analysis with a discussion of the formation of roots, stems, and words in SA. We assume that understanding the root/stem/word formation helps in capturing all reduplication facts given above.

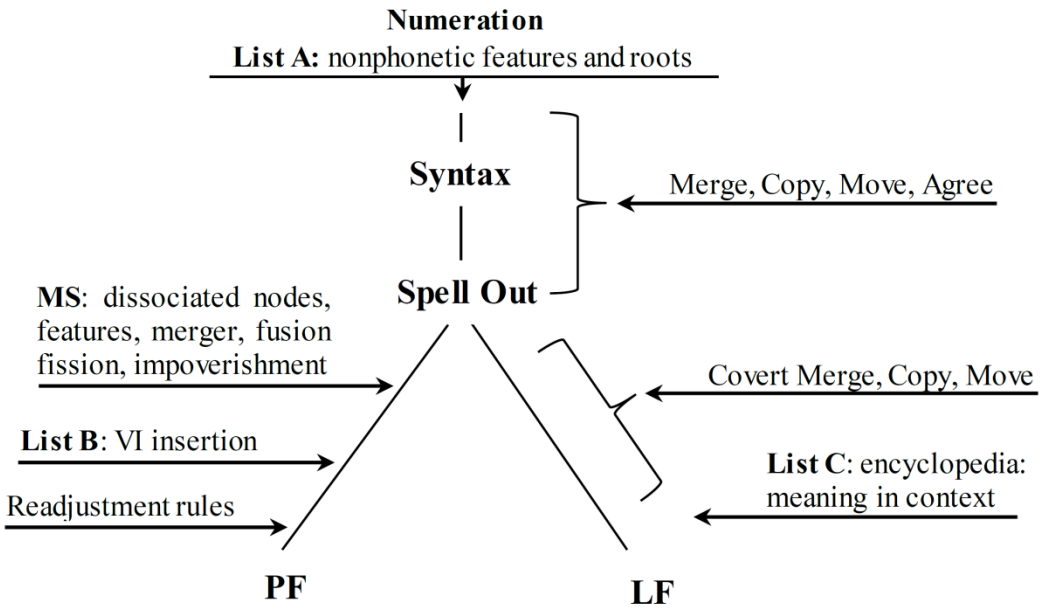
The organization of the paper will be as follows. We will lay out the framework of DM in section (2) focusing on the tools that can be of use in developing our approach. We will move from there to present our approach in section (3) showing that it can account for word formation as well as reduplication in SA. Concluding remarks will be given in section (4).

2. DM Framework

Based on earlier realizational theories of morphology (Kiparsky 1973, Anderson, 1992), Distributed Morphology (DM) is developed as a unified piece-based framework that modulates both morphosyntactic and moprhophonological phenomena via the Chomskyan generative Y-model as shown in (13). Rather than listing sound/meaning correspondences of words

in the lexicon, DM, as its name suggests, distributes the lexical properties among three grammatical components (Halle and Marantz 1993, 1994; Embick and Noyer 2006; Embick and Marantz 2008; Siddiqi 2009; Embick 2010). The first component, known as List A, provides the syntax with the basic formatives which include roots and morphosyntactic features, which in turn undergo the common syntactic operations such as Merge, Move, Copy and Agree, in the sense of the Minimalist Program (Chomsky, 1995, 2000, 2001, 2004 et seq, hereafter MP). Given that DM is a late insertion approach, the second component, namely List B, contains phonological material that realizes terminal nodes at PF. The third component, List C, interprets the terminal nodes at LF. These interpretations proceed convergently and yield the intended meaning of the final structure.

13. Grammar Architecture of Distributed Morphology



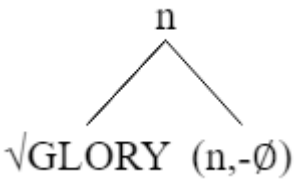
As represented in (13), every derivation sets out with a selection of language-particular roots as well as feature bundles from Universal Grammar

(Embick and Marantz 2008:5). This selection is known as the numeration or the lexical array in the Chomskyan terms. In DM, however, roots are not categorially labelled; they are only notated with the symbol √ (Pesetsky, 1995). They are later categorized according to the Categorization Assumption in (14) (cf. Marantz 1997, 2007).

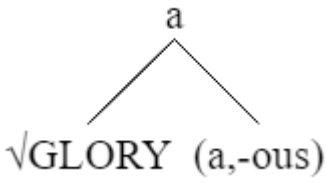
14. **Categorization Assumption**: Roots cannot appear (i.e. be pronounced or realized) without being categorized; roots are categorized by combining with category-defining functional heads.

The Categorization Assumption in (14) ensures that a root never appears in a bare form but as a member of the well-known lexical categories such as nouns, verbs, adjectives etc. Thus, the derivation of the noun *glory* and the adjective *glorious* will be formed from the same category-neutral root √GLORY. The only difference follows from the merging of the former with the nominal functional head *n* and the merging of the latter with the adjectival functional head *a* as shown in (15) below (cf. Embick and Marantz 2008:22).

15. a. The noun *glory*



b. The adjective *glorious*



In (15), the root √GLORY is a noun or an adjective based on its relationship with the category-defining head with which it is combined, either *n* or *a*. The nominal head *n* in (15a) is spelled out as [–∅] (i.e. null) whereas the adjectival head *a* in (15b) is realized as [-ous].

After the syntax builds a well-formed structure out of List A, the structure is handed off from Spell-Out to both PF and LF. On the morphological branch (PF), language-specific operations may apply in a stage called Morphological Structure (MS). These operations include lowering, merging, raising for structure; but impoverishment (i.e. feature deletion), fusion (i.e. grouping the features of two nodes into one node), and fission (i.e. splitting the feature bundle on one node into two nodes) for features. These operations eventually alter the structure and the feature content in deference to the language's morphophonological constraints.

After MS, Vocabulary Items (VIs) from List B are accessed and given to the terminal nodes (aka positions of exponence) in the structure. These VI are phonological strings and they fill the terminal nodes in a competition-based manner. The competition between the VIs is regulated via Subset Principle (Halle 1997), which is a reformulation of Kiparsky 1973's Elsewhere Condition. According to the Subset Principle, the most highly specified VI is more eligible to insert into a terminal node than less specified candidates. To illustrate, the most specified VI /-t/ is inserted in the context of [+past] feature for the verb *learn* yielding *learnt* before the less specified or the elsewhere case /-ɪd/ is chosen. On the interpretative side (LF), the same

correspondence between the VI and the features is held in a model-theoretic fashion yielding a compositional interpretation for the whole derivation.

3. Word Formation and Reduplication in SA

In this section, we will provide a unified account to both word formation and reduplication in SA. The issue of word formation will be explored in section (3.1.) whereas that of reduplication will be addressed in section (3.2).

3.1. Word Formation in SA

Before we move to reduplication, it is important to discuss how roots, stem and words are formed in SA. The understanding of the dynamics of Arabic word formation will make the phenomenon of reduplication easy to capture. For word formation, SA, like other Semitic languages, has a non-concatenative morphology, sometimes known as discontinuous morphology, introflection (Waston, 2000:126; Haspelmath, 2002:22) or root-pattern morphology (Ryding, 2005:45). In other words, SA draws on the three or four consonants in each root and incorporates them within fixed vocalic templates. This morphological mechanism is productive in SA and it does not only derive new lexical categories but it also conveys grammatical functions. As shown in (16), the consonants of the triconsonantal root *k-t-b* are always maintained, but they interlock with different vocalic templates to derive lexical categories such as nouns, verbs, adjectives and adverbs.

16.	Word	Template	Translation	Lexical Category
a.	**ki**t**b**	CiCa:C	‘book’	Noun
b.	**k**a**t**a**b**a	CaCaCa	‘wrote’	Verb
c.	ma**kt**u:**b**	maCCu:C	‘written’	Adjective
d.	**ki**t**b**at-an	CiCa:Cat-an	‘in a written form’	Adverb

The same root *k-t-b* can also be integrated within other templates as in (17) for word inflection, i.e. to express number (plural vs. singular) as in (17a,b), aspect (perfective vs. imperfective) as in (17c,d) or voice (active vs. passive) as in (17e,f).

17.

Word	Template	Translation	Function
a. **k**i**t**a:**b**	CiCa:C	'book'	singular
b. **k**u**t**u**b**	CuCuC	'books'	plural
c. **k**a**t**a**b**a	CaCaCa	'wrote'	perfective
d. ya**kt**u**b**u	CaCCuCu	'write'	imperfective
e. **k**a**t**a**b**a	CaCaCa	'wrote'	active
f. **k**u**t**i**b**a	CuCiCa	'be written'	passive

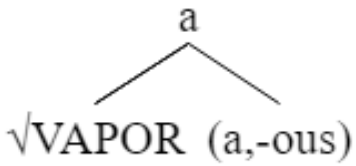
Until now, the practitioners of DM remain silent regarding the derivation of root-pattern morphology in Semitic languages (see e.g. Arad, 2003; Tucker, 2011). There exists no consensus as to how the roots are merged within templates and realized as such. In contrast, in languages that have concatenative morphology such as English, the categorization of words is simply conducted via prefixes or suffixes as in (18) and (19) respectively.

18.
a. blaze (noun) → **a**blaze (adjective)
b. witch (noun) → **be**witch (verb)
c. slave (noun) → **en**slave (verb)

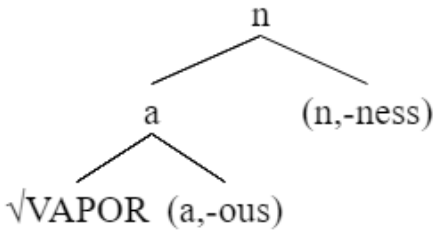
19.
a. vapor (noun) → vapor**ous** (adjective)
b. vaporous (adjective) → vaporous**ness** (noun)

The adjective *vaporous* in (19a) is categorized as an adjective by merging the root VAPOR with the adjectival head *a* as shown in (20a). The new adjective *vaporous* can be further nominalized as *vaporousness* in combination with the nominal head *n* as in (20b) (cf. Embick and Marantz, 2008:11).

20. a. The adjective *vaporous*

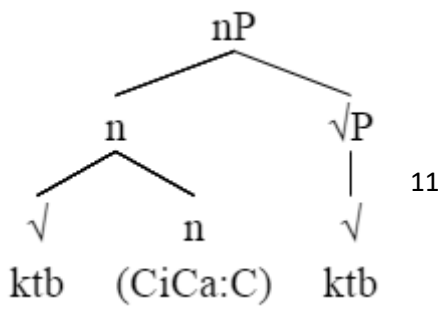


b. The noun *vaporousness*

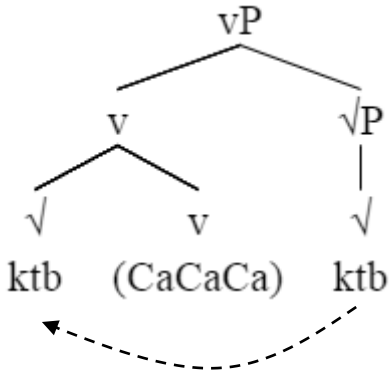


However, this is not the case in SA non-concatenative morphology, where prefixation or suffixation do not suffice for word derivation. Rather, vowels must interlock with the consonants of the root in an intricate way, i.e. the root *ktb* becomes *kataba* ‘wrote’, *kita:b* ‘book’, *maktu:b* ‘written’ or *kitabatan* ‘in a written form’ as in (16). So how are these different vowels inserted between the fixed root consonants? The literature presents some attempts to deal with this issue. For instance, Alqarni (2015: 96) proposes that the category-defining head bears the vocalic template in which the root consonants can incorporate. Thus, the root *ktb* can be *kita:b* ‘book’ (a noun) by merging with the template CiCa:C on the head *n* as in (21a), or it can be *kataba* ‘wrote’ (a verb) by being combined with the template CaCaCa on the verbal head *v* as in (21b).

21. a. The noun *kita:b* ‘book’



b. The verb *kataba* ‘book’



By merging the root with the template under the category-defining head, either (CiCa:C) or (CaCaCa), words in SA are formed. Alqarni (2015), however, did not go further to explain exactly how the root consonants replace these Cs in each template, and what mechanism in the DM approach can do so. The picture becomes more complicated if we know that the templates (CiCa:C) and (CaCaCa) in (21a,b) are not the only templates that make Arabic roots nouns or verbs. There are many different templates for nouns as in (22) and many others for verbs as in (23). Some of these templates have different vowels as well as fixed consonants such as *mu-* for nouns in (22d) and such as *ʔa-* or *ʔin-* for verbs in (23c,d).

22.	roots	template	examples (nouns)
a.	ktb ʕql	CiCa:C	kitab ‘a book’, ʕiqa:l ‘a headband’
b.	qtl xtm	Ca:CiC	qa:til ‘a killer’ xa:tim ‘a ring’
c.	rsl ðll	CaCu:C	rasu:l ‘a messanger’, ðalu:l ‘a camel’

d.	ħrb fʕl etc.	muCa:CiC	muħa:rib ‘a fighter’, mufaʕil ‘a reactor’

23.

	roots	template	examples (verbs)
a.	ktb qrʔ	CaCaCa	kataba ‘wrote’, qaraʔa ‘read’
b.	qnʕ xlsˁ	CaCuCa	qanuʕa ‘got satisfied’, xalusˁa ‘concluded’
c.	xrdʒ ʕln	ʔaCCaCa	ʔaxradʒa ‘drove out’, ʔaʕlana ‘announcd’
d.	ɣlq dmdʒ etc.	ʔinCaCaCa	ʔinɣalaqa ‘become closed’ ʔindamadʒa ‘got combined’

Although more than one template can be applied to one root, see (16) and (17) above, the data in (22) and (23) shows that, generally speaking, every root is associated with a specific template. Consider the following examples where the root *ʕln* can appear only in the verbal template *ʔaCCaCa* but not in the other verbal templates in (24).

24.

roots	template	examples (verbs)
ʕln	ʔaCCaCa	ʔaʕlana ‘announced’,
	*CaCaCa	*ʕalana
	*CaCuCa	*ʕaluna
	*ʔinCaCaCa	*ʔinʕalana

For these reasons, Alqarni (2015) argues that every root merges with a category-defining head bearing the appropriate template. He proposes that these templates are VIs that appear under the category-defining head when their relevant roots appear in their domain. Thus, all the templates above will be vocabulary items for nouns as in (25) or for verbs as in (26) below.

25. Template Vocabulary Items for Nouns

CiCa:C ⟷ n __ {√ktb, √ʕql etc}

Ca:CiC ←→ n __ {√qtl, √xtm etc}
CaCu:C ←→ n __ {√rsl, √ðll etc}
muCa:CiC ←→ n __ {√ħrb, √fʕl etc}
The list goes on.

26. Template Vocabulary Items for Verbs

CaCaCa ←→ v __ {√ktb, √qrʔ etc}
CaCuCa ←→ v __ {√qnʕ, √xlsʿ etc}
ʔaCCaCa ←→ v __ {√xrdʒ, √ʕln etc}
ʔinCaCaCa ←→ v __ {√ɣlq, √dmdʒ etc}
The list goes on.

Although every root is now associated with its template, the question remain unanswered regarding how these root consonants appear in a discontinuous format and how the vowels can be interspersed between them. Our objective in this paper is to develop a theory-driven approach to lead such derivations within the DM framework.

To do so, we will make use of the phonological feature theory and incorporate it into the DM framework. Phonological feature theory is an approach in cognitive science that represents mental sounds with formal features (Hayes, 2009: 70). According to this theory, a sound can be mentally represented using a bundle of features. For example, the sound /f/ can be represented with distinctive features that can collectively definite it, such as [+consonantal +continuant +labiodental –voice]. For the vowel /u/, it can be represented with other relevant features that contribute to its realization, such as [-consonantal +voice +high –low +back –front +round].

We will take advantage of the phonological feature theory and propose that the root consonants and the templatic vowels in SA, and other languages, enter the syntactic component decomposed into distinctive features such as [±consonantal], [±continuant], [±sonorant], [±voice], [±labial] etc. Thus, for the

noun *kita:b* ‘book’ to be formed in SA, the root sounds *ktb* will appear as bundles of features under the root node as demonstrated in (27a) whereas the vowels will appear under the nominal head *n* as in (27b).

27. a. the root [k t b]

√

+consonantal	+consonantal	+consonantal
-continuant	-continuant	-continuant
-sonorant	-sonorant	-sonorant
+dorsal	+coronal	+labial
-voice	-voice	-voice
etc	etc	etc

b. the templatic vowels [i a:]

n

-consonantal	-consonantal
+high	-high
-low	+low
+front	+front
-back	-back
-round	-round
-long	+long

The representations in the columns in (27) are sets of features that can collectively define each sound in the word *kataba*. For our purposes, it is not a matter of concern that some of the features in each set in (27) are redundant and non-essential for the pronunciation of the given sound. We assume that each sound must enter the syntax with as many features as required to be pronounced at PF.

Note that this is not contra the basic principles of the syntactic theory that the syntax cannot deal with phonological information. The featural representations in (27) are not phonological in the first place, neither are they pronounced. They are simply formal representations of information, similar to the representations of the morphosyntactic features [+pl], [+def], etc. Given that the latter representations can enter the syntactic computations and can be manipulated, we assume that the formal representation in (27) can be operated on by the syntax. These distinctive features in (27) will be pronounced only after they are shipped off to PF.

Before discussing how these features are pronounced at PF, it is important to address the controversy of the DM community over the realization of roots in comparison to morphosyntactic features. This will help us find a foothold for our approach. Recall from section (2) that List A consists of morphosyntactic features and roots. Morphosyntactic features are part of universal grammar, and they include [+pl], [+f], [+past], [+def] etc. That is, Arabic and English has the same set of morphosytantic featurs such as [+pl], [+f], [+past], [+def]. As far as roots are concerned, they language-particular; i.e. the roots in SA must be different from those of English and other languages.

There is a consensus between the DM theorists that the morphosyntactic features are realized via VI completion as discussed in section (2). However, there are three proposals on how and when the roots are phonologically realized. The first proposal argues that roots enter the syntax phonologically realized (Embick 2000; Embick and Halle 2005; Embick and Noyer 2006; Borer 2014). That is, an English word such as *map* is

already phonologically realized as [mæp] in List A. Thus, the syntax takes [+pl] (with no phonological information) and [mæp] (with its phonological information) and apply to them its operations such as Move, Merge, and Copy. In other words, there is no late insertion for roots. Late insertion applies only to morphosyntactic features[3].

The second position argues that all the elements of List A that enter the syntax, be they morphosyntactic features or roots, must be subject to late insertion, i.e. they must receive their phonological content at PF. As argued by Marantz (1995, 16).

> There are two basic reasons to treat "cat" and all so-called lexical roots as we treat inflectional affixes, and insert them late. . . . First, it's extremely difficult to argue that roots behave any differently from affixes with respect to the computational system. No phonological properties of roots interact with the principles or computations of syntax, nor do idiosyncratic Encyclopedic facts about roots show any such interactions.

Put differently, all the elements of List A must enter th syntax devoid of any information, be it phonological or semantics. The phonological and semantic information that can distinguish *cat* from *dog* is irrelevant to syntax and should not be present on the terminal nodes of the roots. Thus, roots should appear as the abstract symbol √ in the syntactic structure. However, according to Marantz (1995), the only available features that can enter the

[3] An early version of this proposal comes from Halle (1990, 1997). Halle argues that there should be two types of morphemes in DM: concrete and abstract. Concrete morphemes are those that have a fixed underlying phonological representation such as *dog, red, car* etc and any bound morphemes such as *–ness* and *un-* etc. Abstract morphemes are those that have surface representations different from the underlying ones, such as the verb *be* (*is*, *am*, *are*, *was*, *were*, *be*, and *been*) and all the variants of suffixes for plural (such as *-s*, *-z*, and *-ɪz*) or for past (such as *-d*, *-t*, and *-ɪd*). According to Halle, concrete morphemes should enter the syntax fully realized and cannot be subject to late insertion. Abstract morphemes should be subject to competition in the light of the Subset Principle (Halle, 1997).

syntax and can be placed on root nodes are semantic, e.g. [±count], [±animate]. These features can help resolve the competition of which root is more suitable to enter into a given node at PF. As shown in (28), if there is a configuration where the head D has the article 'a', which requires a single count noun, and the root has [+count] and [+animate], the root at PF can be realized by *cat* as in (28b), but not *rice* as in (28c) because the latter is [-count] and [-animate].

28. a. $[_{DP}\,[_{D}$ a $[_{nP}\,[_{n}\,[_{\sqrt{}}$ [+count] [+animate]]]]]]]

b. $[_{DP}\,[_{D}$ a $[_{nP}\,[_{n}\,[_{\sqrt{}}$ cat]]]]]]

c. *$[_{DP}\,[_{D}$ a $[_{nP}\,[_{n}\,[_{\sqrt{}}$ rice]]]]]]

Given that there are many English roots that can have the features [+count], [+animate] such as *dog, lion, man,* etc, and they can compete with the word *cat* to enter in the same root node in (28b), Marantz (1995) submits that at PF, any root with the enough information is eligible for insertion into the root node based on the speaker's intention. Thus, at PF, *cat, dog, lion, man* etc are all eligible for insertion. Many scholars regard this as the weakest point in Marantz's proposal (e.g. Pfau 2000, 2009; Acquaviva 2008; Harley 2014). If all the roots that have the features [+count] and [+animate] can insert in the node in (16a), one might inquire about their semantic interpretation at LF. In the syntactic theory, PF cannot access LF and they are impenetrable to each other (Chomsky, 1995). In light of Marantz's proposal, the word *cat* could be inserted into the root node at PF, and the semantic interpretation of *dog* could be given to the root at LF, given the inaccessibility between the two

branches (Harley, 2014). To avoid this problem, Marantz (1995, 17) requires that LF must know what is going on at PF. He said:

> Late insertion involves making a specific claim about the connection between LF and semantic interpretation. LF can't by itself be the input to semantic interpretation. If "cat" is inserted in the phonology at a node at which "dog" could just as well have been inserted – and if, as we assume, the difference between "cat" and "dog" makes a difference in semantic interpretation – then the phonological representation, specifically the choice of Vocabulary items, must also be input to semantic interpretation.

A group of scholars defies Marantz's proposal on this theoretical problem. They argue that the root node must not be an abstract symbol √ which makes a long list of roots eligible for insertion. Rather, roots must be more specified in the syntax so that only one root can win the competition (e.g. Pfau 2000, 2009; Acquaviva 2008; Siddiqi, 2009; De Belder 2011; Harley 2014).

These scholars deprive the root from both semantic and phonological information, but they make roots specific by adding index notations to them when they enter the syntax. Thus, roots can enter the syntax with a hypothetical numerical address such as $\sqrt{}_{250}$, $\sqrt{}_{147}$ or $\sqrt{}_{19}$. At PF, only roots with the same address can insert into their relevant nodes. For instance, if the root *cat* is associated with the number 157, it would be the only competitive root that can insert into $\sqrt{}_{147}$ at PF. These numerical indexes help in resolving the issues arising from Marantz's proposal because both PF and LF can now relate $\sqrt{}_{n}$ to its relevant phonology and semantics.

Our approach seeks a compromise between these three approaches: the first approach which argues that roots must enter the syntax phonologically realized, and the second two approaches which argue that

roots should be stripped of any phonological and semantics information until PF and LF. Our approach states that every root enters the syntax with the formal representations of the sounds it contains, as shown in (27a) for the root [ktb] and (27b) for the vocalic template [ia:]. As stressed earlier, these features are not phonological, but they are like morphosyntactic features, in that the syntax can manipulate both of them as non-phonological atoms.

This proposal is appealing as it serves many purposes. First, it renders all the information in List A into features: morphosyntactic (e.g. [+pl], [+f], [+past]) and phonological (e.g. [+nasal], [+consonantal], [+labial] etc). Recall that Embick and Marantz (2008:5) claim that morphosytnactic feature bundles in DM are derived from Universal Grammar. Similarly, these distinctive features come from Universal Grammar. The feature [+nasal] is universal in that it appears in all nasal sounds in the world languages. The same applies to vowels which are [-consonantal] cross-linguistically. As put by Mielke (2008: 31), the universality of distinctive features follows from the fact that

> features in two languages which refer to the same acoustic feature are fundamentally the same. Thus, the feature [high] in Turkish is fundamentally the same as the feature [high] in Russian … the universality of the distinctive features (in spoken languages) is a direct consequence of the universality of the human vocal tract.

In other words, our approach gains importance because all the features in List A are now from Universal Grammar.

The second advantage of our approach follows from the fact that all these features in List A will be supplied with their phonological content in a unified fashion. That is, we propose that, at PF, the distinctive features of the root consonants and vowels in (27) are supplied with Sound Items (SIs) via the same pairing between VIs and morphosyntactic features [+sg], [+pl] etc. To

illustrate, if /ɪd/ and /s/ are VIs that are associated with [+past] and [+present] respectively as in (29), we propose that the phonemes /k/, /t/, /b/ are SIs linked to their respective features as in (30).

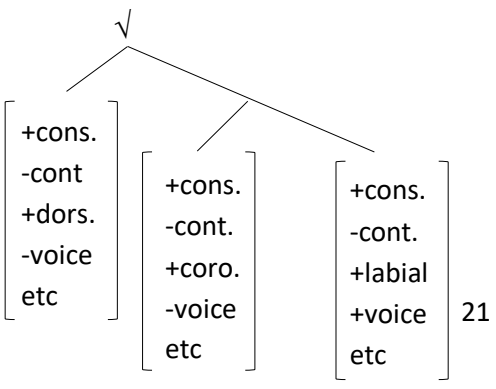
29. VI list
    /ɪd/ ←→ [+past]
    /-s/ ←→ [+present]

30. SI List
    /k/ ←→ [-continuant +dorsal, -voice]
    /t/ ←→ [-continuant +coronal -voice]
    /b/ ←→ [-continuant +labial +voice]

Under this account, we will have a unified and governed theory of insertion in DM. Sound insertion (akin to vocabulary insertion) undergoes the same competition principles such as the Subset Principle (Halle, 1997). Like VIs, SIs compete with each other for insertion, and the strongest candidate is the one that matches the maximum number of the available distinctive features.

The third advantage of our approach follows from the fact that it can derive all words in the world languages: the word formation in non-concatenative root-pattern languages such as SA as well as that in concatenative languages such as English. To derive the noun *kita:b* 'book', we propose that the root √*ktb* enters the syntax as demonstrated in (31). Note that these features in (31) are only representative, i.e. we do not bring all the required features for these sounds for space limitations.

31. Root /ktb/

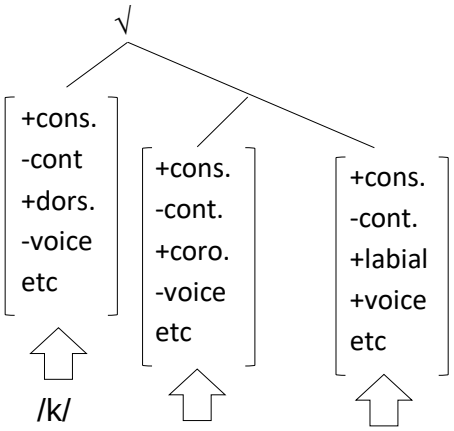


Given that grammatical features such as [+past], [+pl] etc are borne by terminal nodes, we assume that these distinctive features appear as bundles under sub-terminal nodes within the root node. These sub-terminal nodes can be a result of Copy, where the node of the root copies itself two or three times to accommodate the feature bundle of each consonant and vowel, or as an alternative, the root node undergoes a fission operation twice (if the root consonants are three) or thrice (if they are four). Both proposals yield similar results. At PF, different phonemes (or sound items) as in (32) will compete for insertion into the root sub-terminal nodes in (31) above, yielding the root √*ktb* 'write' in (33).

32. Sound List

/k/ ⟷ [+dorsal –voice]
/t/ ⟷ [+coronal –continuant –voice]
/b/ ⟷ [+labial +voice]
/n/ ⟷ [+nasal +coronal, +voice]
/m/ ⟷ [+laibal +nasal +voice]
/i/ ⟷ [-consonantal +high +front]
/a:/ ⟷ [-consonantal +front +low +long]
Etc

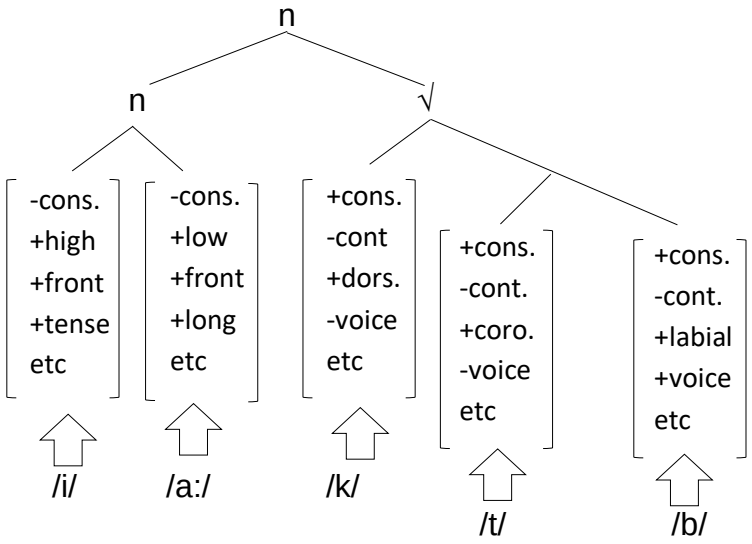
33.



/t/ /b/

As the structure is built from bottom up, the root √ktb will be categorized as a noun by merging with a nominal head *n.* Given that the main assumption in the literature that the head *n* bears templatic vowels (Alqarni, 2015), we assume that the head *n* (bearing [_i_a:_]) will also be endowed with distinctive features for these vowels as shown in (34). These vocalic features represent the nominal template within which the consonants /ktb/ will be incorporated. All these distinctive features will undergo sound insertion at PF, yielding the [i-a:-k-t-b].

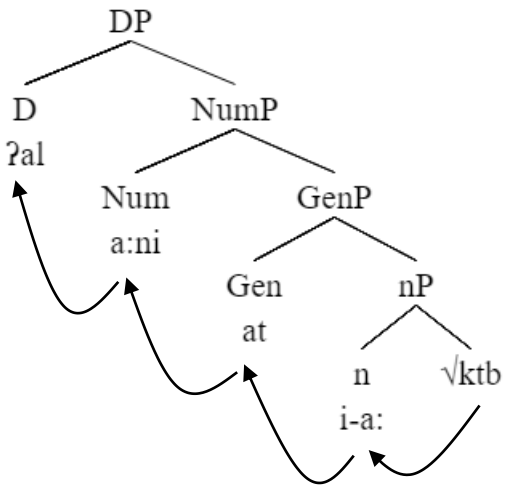
34.



The main concern at this point is how to conglomerate the roots within the vocalic template on the head *n*. Otherwise, the resulting structure in (34) will yield *[ia:ktb], as opposed to the desirable output [kita:b] ‘book’. We take it for granted that the root moves from its original position to the head *n* and adjoins to it. In SA, words are derived by head-to-head affixal movements. For example, the derivation of the dual noun phrase [ʔal-kita:b-at-a:ni] ‘the two

styles of writing' is derived via successive head-to-head movements as shown in (35) below.

35.



In (35), the root √ktb first moves to the head *n* and forms [kita:b] in a way that will be discussed momentarily. The noun [kita:b] will continue raising to Gen to combine with the feminine marker [-at] generating [kita:b-at] 'a style of writing'. From Gen, the complex heads proceed towards Num and attach to the dual suffix [-a:ni] yielding [kita:b-at-a:ni] 'two styles of writing'. Finally, the adjoined heads land on D for the definite article [ʔal] 'the'. Note that if every head moves from bottom up and adjoins to the left of the higher heads, the final output will be *[kita:b-at-ani-ʔal] where the definite article [ʔal] 'the' is

unfavorably suffixed to the whole word. The wanted form is [ʔal-kita:b-at-a:ni] where the definite article has a prefixal nature.

To subvert this problem, we resort to a DM-based tool proposed by Embick and Noyer (2006:319), namely Local Dislocation Rules. These rules manipulate the linear order of affixes. We propose local dislocation rule (36) to switch the order between the complex heads [kita:bata:ni] 'two styles of writing' and the definite article [ʔal] 'the'.

36. Local Dislocation Rule
√+n+Gen+Num^D → D^√+n+Gen+Num

Thus, the ill-formed word *[kita:b-at-ani-ʔal] in (37a) will undergo an affixal reordering via rule (36), resulting in the correct form in (37b).

37. a. *[kita:b^at^a:ni^**ʔal**] before local dislocation rule
b. [**ʔal**^kita:b^at^a:ni] after applying rule (18).

However, it should be known that Embick and Noyer (2001) take issue with rules such as (36). Local Dislocation Rules should switch only the positions of string-adjacent elements, i.e. [ʔal] 'the' and the closest affix to it in (37a), namely the dual suffix [a:ni]. To achieve the objective of rule (36), Embick and Noyer (2001, ft 9) draws on Sproat's (1985) proposal that rebracketing may apply to these affixes before the dislocation rule takes place. In other words, affixes undergo a rebracketing operation and appear in different units. Thus, (37) should be revised as in (38).

38. a. [kita:b^at^a:ni^**ʔal**] rebracketing
b. [[kita:b^at^a:ni]^[**ʔal**]] applying rule (18).
c. [[**ʔal**]^[kita:b^at^a:ni]] final result

The single unit [kita:b^at^a:ni^**ʔal**] in (38a) should first undergo rebracketing and become two units [[kita:b^at^a:ni]^[**ʔal**]] as in (38b). These two units can therefore be reordered, yielding the wanted form [[**ʔal**]^[kita:b^at^a:ni]] in (38c) where the definite article appears word-initially.

Taking these operations into account, we propose that the root-pattern derivation in SA (or any Semitic languages) proceed similarly. After the root adjoins to the left of the nominal head *n*, the result will be as shown in (39) where the vowels follow the root consonants.

39. k^t^b^i^a:

At this stage, we induce rebracketing and local dislocation rules to order the consonants and vowels at hand. These rules will re-apply multiple times so as to produce the well formed word *kita:b* 'book'. This can be accomplished in the step-by-step illustration in (40), where the rules re-apply until the final result is derived.

40. a. [k^t^b^i^a:] rebracketing (ill-formed word)

↓↓

b. [k^t^[**b^i**]^a:] dislocation rule

↓↓

c. [k^t^[**i^b**]^a:] rebracketing

↓↓

d. [k^[**t^i**]^b^a:] dislocation rule

↓↓

e. [k^[**i^t**]^b^a:] rebracketing

↓↓

f. [k^i^t^[**b^a:**]] dislocation rule

↓↓

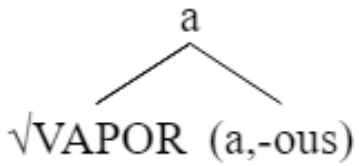
g. [k^i^t^a:^b] final output (well-formed word)

In summary, all the root-pattern formation can be accomplished via the steps above. Unlike earlier works that do not discuss the derivation of root-

pattern morphology at great length, our proposal is now theoretically formalized via three operations from DM: root sound features, rebracketing and dislocation rules. The latter two operations are independently motivated in DM and can be carried over to our approach.

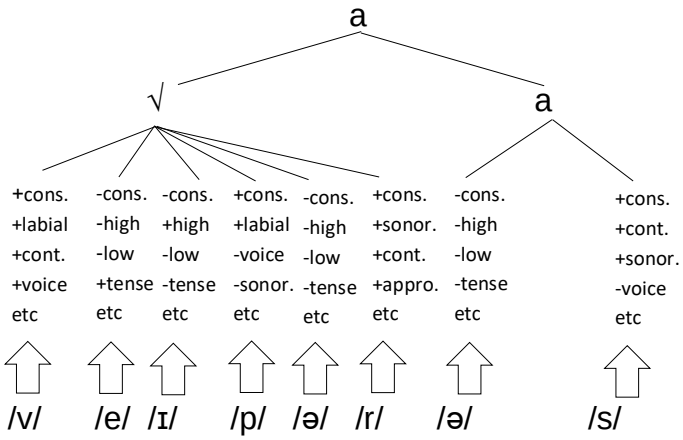
Extending our proposal to other languages as a unified theory for root realization, it can also derive concatenative morphology more straightforwardly. For the English example in (20), repeated below as (41a), the root and the category defining heads will be endowed with distinctive features as in (41b) and will eventually receive appropriate SIs at PF.

41. a. The adjective *vaporous*



(cf. Embick and Marantz, 2008:11).

42.



In other words, we can simply replace these consonants and vowels in (41a) with representative features that are spelled out by sound items at PF. In sum, this is the fourth advantage of our approach, i.e. it can account for both concatenative and non-concatenative morphologies.

The fifth advantage of our approach follows from its ability to account for metathesis cases that occur at the sentence level as in (43) (cf. Rudy, 1988: 7).

43. a. May I **s**ew you to another **sh**eet? (cf. May I **sh**ow you to another **s**eat).
    b. B**r**aid of g**l**ass (cf. B**l**ade of g**r**ass).
    c. **B**y **M**erest **D**ozen (cf. **M**y **D**earest **C**ousin).

Note that these sounds are distributed beyond the boundaries of words, unlike the metathesis cases within word boundaries such as *ask-aks* or *prescribe-perscribe.* Unless there are distinctive features in the syntax, other approaches would not be able to generate examples (43) where sounds are wrongly distributed across the clause. For (43a), we can simply argue that the numeration collects all the distinctive features required to pronounce all the relevant roots in the clause. Thus, the features of /ʃ/ (i.e. [+consonantal +continuant -anterior, +distributed]) and those of /s/ (i.e. [+consonantal +continuant +anterior, +distributed]) all enter the syntax. For a reason or another, the syntax distributes the two bundles of features (for the two sounds) mistakenly beyond the word boundaries into different roots. That is, the sound /ʃ/ is wrongly put along the feature bundles of the root *seat* whereas the sound /s/, under that of the root *show*, hence the metathesis cases in (43). Thus, unlike other approaches, our approach therefore makes perfect predictions regarding metathesis cases at the sentential levels.

It can also account for other speech errors within the word boundaries. Consider the speech error in (44) made by English-speaking children and that in (44) made by African American speakers.

44. I fount a pek for the pram (cf. I found a peg for the pram).
45. You can aks him. (cf. You can ask him).

The available approaches disallow the occurrences of the natural mistakes in (44) and (44), reducing them to readjustment rules in the phonology part after Vocabulary Insertion (see Haugen 2016 for a severe criticism of readjustment rules). In contrast, our current approach makes straightforward predictions by adopting the tenets in DM such as impoverishment rule and dislocation rules. The cases in (44) and (44) can be a result of (i) competition of ISs yielding *fount* rather than *found* (after [+voice] is deleted from the feature bundle of /d/ by an impoverishment rule, allowing the sound /t/ to win out) or due to the mistaken application of the dislocation rule between the distinctive feature bundles of the root *ask*, yielding *aks*.

As will be demonstrated in the following section, our approach can also explains reduplication facts in SA and many other languages. This is the sixth and final advantage of our approach.

3.2. Reduplication in SA

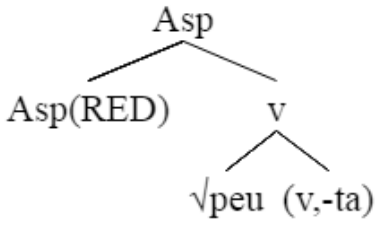
In the DM literature, two approaches are put forward to tackle the issue of reduplication (Haugen, 2011): (i) readjustment approach and (ii) affixation approach. The readjustment approach claims that there is a null affix that represents the reduplicant form (henceforth, shortened to reduplicant). This null affix triggers a readjustment operation to the stem after the vocabulary insertion takes place (Raimy 2000; Frampton 2009). As for the affixation approach, it proposes that a special VI (called reduplicative affix, reduplicant or RED) is added to the syntactic structure so as to discharge certain features

which are fed with phonological content from the stem (Haugen 2008; Haugen and Harley 2010; Haugen 2011).

Consider example (46) from Hiaki (also known as Yaqui, Uto-Aztecan). The reduplicant *peu*, in bold, functions as a habitual aspect, and appears on the left side of the root *peu* 'butcher'. Under the affixation approach, Haugen and Harley (2010) propose that this reduplicant appears under the node Asp(RED) as in the simplified tree in (47). During the vocabulary insertion, this suffix will realize features with phonological content from the stem *peu*, yielding *peu-peu*.

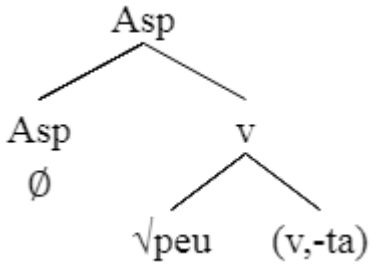
46. aapo maso-m **peu**-peu-ta
3.SG deer-PL RED-√butcher-TR
'S/he is always butchering deer'

47. Affixation Approach (Haugen and Harley, 2010)



As for the readjustment approach, it proposes that the reduplicant *peu* in (46) is realized as a null affix as shown in (48). After vocabulary insertion, this null affix triggers readjustment rules to effect changes to the root *peu* making two copies of it

48. Readjustment Approach (Raimy, 2000; Frampton, 2009)



As is clear from the above structures, both approaches are not clear as to how this reduplicant affix obtains the required part of the stem or the whole thereof. Under the adjustment approach, Raimy (2000), however, proposes a looping mechanism to derive such reduplicant forms. For the example in (46), the looping mechanism will proceed as in (49). In Raimy's terms, the notation # and % mark the beginning and the end of the string respectively.

49. #→p→e→u→%

Linearizes to #→p→e→u→p→e→u→%

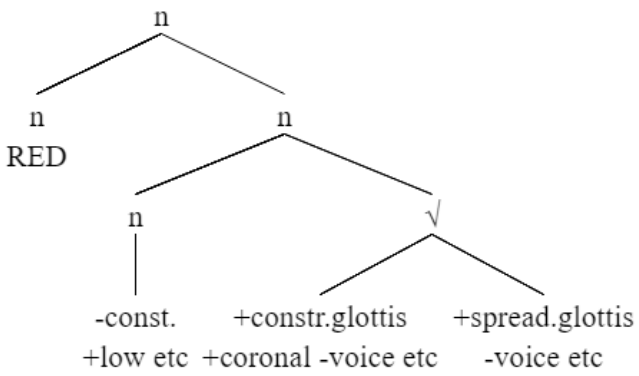
Yet, this kind of derivation suffers from theoretical drawbacks. Although the readjustment rules are still active within the DM theory, some scholars consider them as conceptually problematic because they are process-based mechanisms within a piece-based model (see Haugen 2016). Second, the looping mechanism in (49) needs to be independently motivated to avoid prosodic issues (Frampton, 2009), not to mention that it may lead to an infinite number of loops. It is not clear where this loop stops and where it starts in the phonological word. Haugen (2011), for instance, notes that this looping mechanism makes wrong predictions in deriving other forms of reduplication

in Hiaki. As for the affixation approach, it proposes that reduplicants are VIs which compete to insert into the RED node. However, this approach does not either address how the RED affix becomes a copy of the stem. In other words, both approaches do not provide a clear-cut derivation that ensures that the reduplicant must be phonetically similar to the root in a relative way.

In this paper, we adhere to the earlier two approaches in that the reduplicant is adjoined as an affix in a separate head close to the root. However, we differ in the way the reduplicant is realized. Under our approach, the derivation of full word reduplication in SA in (9) above, some of which are reproduced in (50) below, will be as sketched in (50d) for example (50a).

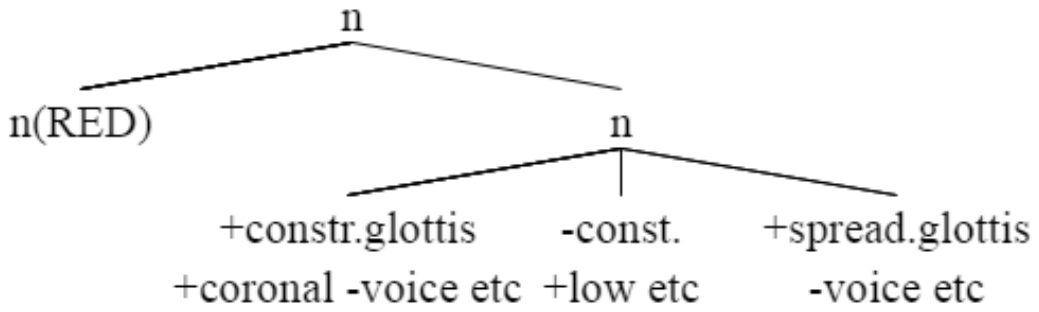
50. a. sʕah sʕah ‘silence silence’
b. ʔanta ʔanta ‘you, you’
c. ʔallah ʔallah ‘wow, wow’

d. Representation of (50a)



In (50d), the sound features of the root are still unmerged with the templatic vowel [a], which is the only vowel in this template. After the root-to-n movement takes place, the features on the root consonants are combined with the vowel of the nominal template, yielding the simplified structure in (51).

51.



In (51), the organization of the root sound features of *sˤah* is accomplished. For the reduplicant to appear, we propose that it copies the exact sound features on the newly derived word. Thus, at PF, the head n (i.e. RED) in (51) will copy the sound features of *sˤah*. This can be accomplished via Feature Copying proposed by Embick and Noyer (2006:309) in (52).

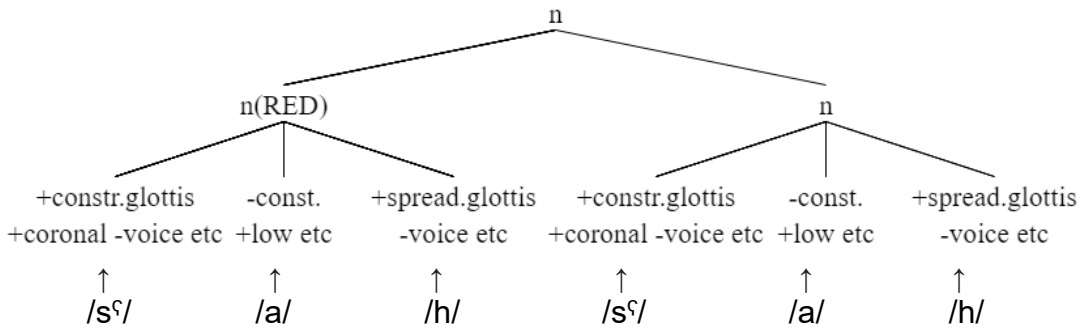
52. **Feature copying**. A feature on node X in the narrow syntax is copied onto node Y at PF.

The sound features of the root will therefore be moved from their subterminals to dissociated nodes under n(RED). These dissociated nodes are also introduced to the DM theory by Embick (1997 1998).

53. **Dissociated Node**: A node is dissociated if and only if it is added to a structure under certain conditions at PF.

After the reduplicant copies the features of the root as shown in (54), all the features will be supplied with their sound items (namely [sˤ], [a], [h]) during sound insertion, yielding the reduplicated form /sˤah sˤah/.

54.



In this paper, we assume that the same derivation of full word reduplication will apply to the full stem in (10) above, where the affix RED will copy the features of the stem and realize them on its own.

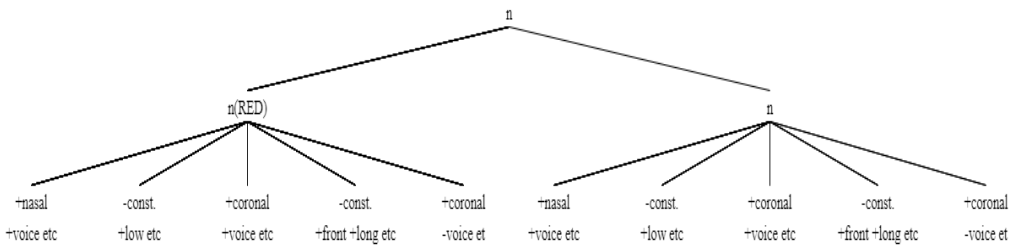
Let us now examine the derivation of the partial reduplication in (11) and (12) recited in (55) and (56) below. In SA, the final VVC of the reduplicant is sometimes deleted as in (55). In other times, the first CV of the stem is removed instead as in (56).

55. *The Removal of the Final VVC from the Reduplicant*
    a. mar+mari:s (cf. mar[i:s]+mari:s) ‘a very hard land’
    b. mar+mari:r (cf. mar[i:r]+mari:r) ‘a very empty land’

56. *The Removal of the First CV from the Stem*
    a. ʕaram+ram (cf. ʕaram+[ʕa]ram) ‘very numerous’
    b. ɣaʃam+ʃam (cf. ɣaʃam+[ɣa]ʃam) ‘very unjust’

Let us tackle the first phenomenon where the final VVC of the reduplicant is removed. The analysis will follow straightforwardly where the reduplicant copy the features from the root as shown in (57).

57.

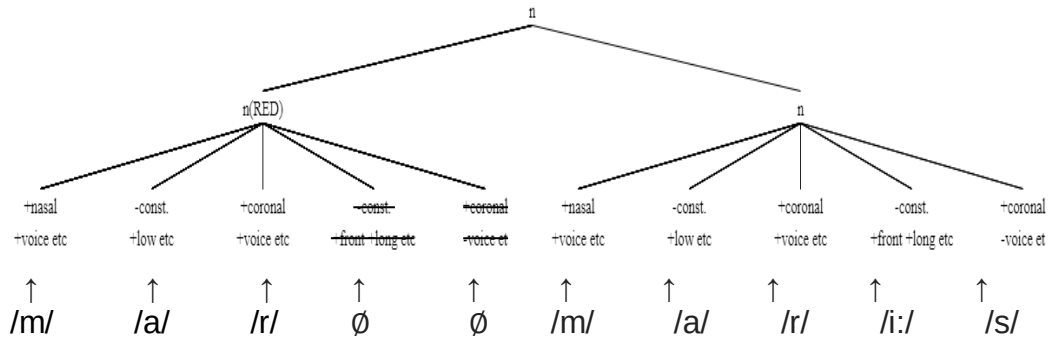


Before the Vocabulary Insertion, we propose that the final VVC of the reduplicant undergoes an impoverishment rule which deletes all the features of [i:] and [s]. We can implement this impoverishment rule as given in (58), where the roots are listed for this rule to be evoked.

58. Features of Final VVC → ∅ [RED___ √mrs √mrr √mrt √qrr etc]

Given that this behavior is only attested in the roots listed in rule (58), and the root √mrs is available in (58), the two final sound features under the n(RED) head will be deleted, hence unpronounced.

59.

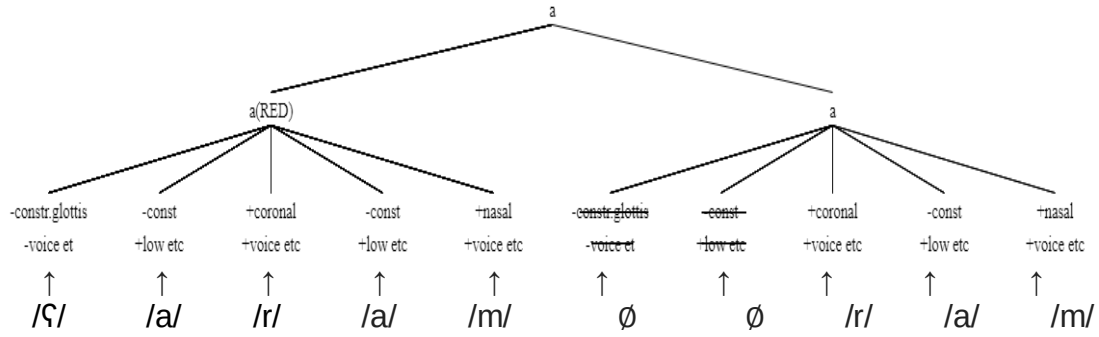


Structure (59) produces /mar-mari:s/ ‘a very hard land’ as given in (55a). We carry the same analysis over to the other phenomenon where the first CV of the stem is deleted. However, we need a different impoverishment rule as in (60) where certain roots are listed for the rule to apply.

60. Features of First CV → ∅ [RED___ √ʕrm √ɣʃm √ʕrk √kðb etc]

Thus, the representation of the adjective *ʕaramram* ‘very numerous’ in (56a) will be as follows. Notice that the features of the first CV are now erased, thus unrealized.

61.



As shown from the above derivation, all the reduplication facts in SA can be captured via our non-lexicalist approach that decompose root consonants and vowels into sound features that are fed with phonological content (i.e. via ISs) at PF. We assume that this approach can simply account for other full or partial reduplication facts in other languages discussed in the introduction. There is nothing special about reduplication facts in all those languages; they will be no different from the Arabic forms. Language-particular impoverishment rule can however intervene and delete sounds or part of the feature bundle to yield variations.

4. Conclusion

The paper contributes to the theory of DM, by proposing an approach to reduplication and both concatenative and nonconcatenative morphology. The approach is not only in harmony with the basic tenets of the DM model, but it also provides new insights to realizational theories of morphology. It argues that root consonants and templatic vowels should be decomposed into abstract distinctive features. These features enter the narrow syntax and they are organized via local dislocation rules to derive both

concatenative morphology in English and non-concatenative root-pattern morphology in SA and other Semitic languages. We provided evidence that this approach can resolve the issues between the DM theorists regarding the realization of roots. This approach provides a unified theory of root realization by rendering the information in List A into features from Universal grammar, and subjecting them to the same principles of competition. It also accounts for speech errors and metathesis cases at the clause levels. For reduplication, this approach proposes that the features of the root are copied from one node to another via Feature Copying. At PF, these features are realized by sound items, akin to the Vocabulary Insertion, yielding two copies of the same root, i.e. full reduplicant forms. For partial reduplication, the sound features will undergo impoverishment rules, thus only part of the stem or the reduplicant is realized. We assume that this approach can be carried over to all languages that include full or partial reduplication, and can make better predictions than other available approaches such as readjustment and affixation approaches.

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