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The Templatic Syllable Patterns of Reduplication and Stem-affixing Inflections in the Classical Arabic Based on Prosodic Morphology Theory

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***Abstract*—A morpheme, is a set of feature matrices dominated by a single node. Reduplication or gemination is one of the productive morphological processes which have been studied inclusively in different languages and in the frame of different linguistic theories like Generative Grammar, Optimality Theory and Minimalist Program. McCarthy's prosodic theory is justified by an analysis of the formal properties of the system of verbal processes like reduplication are the primary or sole morphological operations. This theory of nonconcatenative morphology recognizing the root as a discontinuous constituent. Under the prosodic model, a morphological category which characteristically reduplicates simply stipulates an output template composed of vowel and consonant. Consonantal roots and vocalic melodies in Arabic, although they contain bundles of the same distinctive features, can nevertheless be represented on separate autosegmental tiers. This ensures that the association conventions for melodies can operate independently on these two tiers. Association of autosegments from different tiers to the same segments will be subject to the natural restriction that no segment receives multiple associations for the same nontonal feature.**

***Index Terms*—automatic spreading, verbal reduplication, hierarchic structure, syllable weight, vowel pattern, phonetic reduction**

I. Introduction

Lexical phonology (LP) analyzes all phonological resemblances between related forms with a serial derivation. It is committed to identifying the base by its derivational priority, it cannot explain sound pattern of English with its phonological system. The nominal morphology of Arabic supplies a clue. The template system says that verb stems must end in CVC.

A. Background to the Prosodic Morphology

The goal of the theory of prosodic morphology is to explain the character of morphology/ phonology dependencies (templatic morphology), calling on universal and language-particular principles. (McCarthy and Prince 1994b: A1). Over the years, there has been gradual progress toward this goal. Work started with the CV template, which was applied to root-and-pattern morphology (McCarthy 1981) and to reduplication (Marantz, 1982). This was later generalized to incorporate syllabic information (Levin, 1983) and prosodic structure generally (McCarthy and Prince 1986/1996), leading to the hypotheses in Premises of the Theory of Prosodic Pattern. Now with the emergence and growth of corpus linguistics and corpus based studies, morphological processes of this kind could be studied and conducted more accurately. Most of the morphological studies and morphologists have referred to reduplication process in their studies and it is considered as one of the universals of world's languages which represent different semantic or syntactic properties in most of the languages (Stolz, 2008).

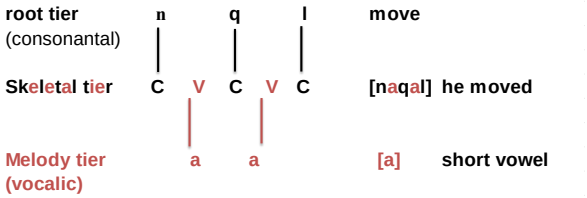
In McCarthyand Prince's (1994a) prosodic theory, morphological, noncanonical word forms and constraint interaction are presented as following:

a. The Prosodic Morphology Hypothesis

Templates, and canonical word-forms are defined in terms of the fundamental units of prosody: moras, syllables, feet, and prosodic words.

b. Template Satisfaction Condition

Satisfaction of templates is obligatory and determined by universal and language-particular requirements on the units they refer to. Constraint interaction, which is the central element of OT, ensures that templates are satisfied within .the universal and language-particular requirements on the units they refer to. Templates themselves are also seen as consequences of interaction, with no special independent status.



B. Formalists' Perspectives on the Representation of Morphemes

It is well known that a number of idiosyncratic morphological and phonological properties cluster around words like permit, subsume, and submit, with Latinate prefixes and stems. In the verb form, stress invariably falls on the final syllable in spite of the possibility of further retraction. Certain special assimilation and deletion rules apply at the boundary between the prefix and stem; compare admit, assume, attempt, appear, accept. Finally, as Aronoff (1976) notes, the types of nominalizations of these forms are determined entirely by the stem morphemes: submission, permission with mit versus assumption, consumption with sume. This clustering of properties means that the grammar must be able to recognize words of this type as a class composed of Latinate prefix and stem morphemes.

One theory, essentially the one followed by Chomsky and Halle (1968), would analyze permit as a sequence of two morphemes separated by a boundary but without internal hierarchic or cyclic structure: per+ mit. (It is irrelevant here whether this class has a special boundary like "=" or not.) The boundary allows us to recognize permit words as a class-they contain an internal boundary but have no other structure.

Zellig Harris (1951) studied long component of the English language. While the boundary solution basically says that morphemes are delimited by symbols in the segmental string, the long component theory claims that the string of segments is uninterrupted, but the morphological analysis is given by another, simultaneous level of representation. Harris's long components were designed to handle discontinuous phenomena-in particular.

The formal basis of this interpretation is essentially the notation of autosegmental phonology (Goldsmith, 1976).

Goldsmith's (1976) Absolute Slicing Hypothesis

In traditional phonology, a phonological representation is a complete order of segments:

Sound1 may precede/follow Sound2,

Sound1 and sound2 may precede Sound3.

It means that they cannot be unordered.

Formally, McCarthy's view (1981), the root node t identifies this string as a particular morpheme. Moreover, *u* bears all nonphonological information associated with the morpheme, such as rule diacritics, whether it is a root or an affix, and in fact its identity as a morpheme. Note that this is not intended as a substitute for hierarchic structure where that structure is motivated. It does, however, replace all delimitation of morphemes by boundary symbols like " + ". A similar proposal, though not cast in autosegmental terms, was made by Pyle (1972).

II. Classical Arabic Root-and Pattern Morphology

In the theory of word formation, the program of Prosodic Morphology (McCarthy and Prince 1986) has established that grammatical categories, usually in the domain of root-and-pattern and reduplicative morphology, are often expressed by invariant prosodic shapes or *templates.* The central claim of the program, known as the Prosodic Morphology Hypothesis, is that these "[t]emplates are defined in terms of the authentic units of prosody: mora (m), syllable (s), foot (F), prosodic word (PrWd)" (McCarthy and Prince 1995b:318). There are two well-documented species of templatic specification: templatic specification of the affix and templatic specification of the base. Templatic specification of the affix is found in ordinary reduplication, where the morphology imposes an invariant shape on the reduplicative affix (Marantz 1982, as sited in Gafos, 1998, p.515).

Another species of templatic specification, base templaticism, is illustrated below. In forming the plural and diminutive forms of Arabic nouns, the morphology imposes a light-heavy bisyllabic template, an iambic foot, on the (left side of the) singular noun base, as shown by the boldface portions of the forms (McCarthy 1979, 1993, McCarthy and Prince 1990).

Singular Plural Diminutive

Éukm **Éakaa**m **Éukay**m 'judgment'

¿nab **¿anaa**b **¿unay**b 'grape'

s Ïaagil **s Ïawaa**gil **s Ïuway**gil 'engrossing'

jundub **janaa**dib **junay**dib 'locust'

Note, however, that the Prosodic Morphology Hypothesis does not state that *every* morphological category has a templatic target. Rather, the claim is that *if* there is a templatic target, *then* that target should be expressible in terms of the units of prosody. As expected, then, there are also cases where the morphology specifies no template at all(as sited in Gafos, 1998, p.516).

Prosody has a significant effect on lexical, discoursal, and pragmatic meanings of syllable of a word. A syllable is a compound phonological unit which is formed by a string of sounds. Its initial sound is heard very well. It has a final sound which separates it from other sounds. In other words, it is a chain of speech sounds in which an element is heard better than other segments (Akaasheh, 1332, P.42). Syllables play a key role in creating specific tone. They cause meaning change, tone shift, and placement of stress. Tone functions within words. Pitch range pattern affects meaning distinctions in tone languages. Considering stress which exist within the internal structure of words whether on the first, middle or last letter of a word and specifies the meaning of that word to some extent, it can be noted that syllables have functional properties. Syllabic feature belongs to vowels but in some languages some consonants may be as the peak of the syllable. In English, the consonants /m,n,l,r / are syllabic. In the model of Levelt et al. (1999), segments are associated to unitary syllable nodes without internal structure. In other models, syllables are frames with slots corresponding to subsyllabic units (onset and rime, or onset, nucleus, and coda; see Dell, 1986) or consonantal and vocalic positions (Dell, 1988; O'Seaghdha & Marin,2000).Word formation (Stem-affixing Inflections; Prefixing Inflection and the Left Edge of the Template, Suffixing Inflection and the Right Edge of the Template) in Arabic and other Semitic languages is the premiere example of prosodic morphology: words come in certain fixed shapes that mark various morphological distinctions, such as Classical Arabic *kataba/kattaba.* he wrote. /.he caused to write or *kita+bun/kutubun* .

III. Gemination

In geminate/doubling verbs, the identical consonants are fused into an actual geminate unless a C-initial suffix.

In Yawelmani's view, /C1V+C2C3V/ sequences could be resolved by epenthesizing a vowel or deleting a consonant.

In concatenative morphology, morphemes are discrete elements linearly concatenated at the right or the left end of the base of the application of morphological rules. Morphology of this type is subject to analysis by a relatively simple discovery procedure. Given an adequate phonological representation, concatenative morphemes can be recovered by a left-to-right (or right-to-left) parse of words searching for invariant recurrent partial strings, possibly with constant meaning or function (Hockett, 1947).

Nonconcatenative morphology, has morphological operations that cannot be analyzed by the method of recurrent partials. These include reduplication, infixation, morphologically governed ablaut, and suprafixation. All of these terms are in common use except the last, which refers to, for example, the variation in tonal pattern of the stem as a mark of verbal aspect inflection in Tiv (McCawley (1970), Goldsmith (1976)). Although nonconcatenative morphology as a whole has received less attention than concatenative, this is not for lack of exemplification. Any basically concatenative morphological system, like ordinary English morphology, has a very simple translation into this notation. For any 1 x n feature matrix dominated by [L, n equals the cardinality of the set of all phonological features, and the daughters of any p. form a continuous segmental string. So, for example, permit will be represented as in (2):

[per mit] N,v

This sort of representation achieves the desired end.

In a nonconcatenative system, + -boundary is clearly unavailable, so such rules could not be formulated.

The t-infix is characterized as a reflexive morpheme:

- cons

(3) - syll t / t

+ high]

[reflexive]

In Arabic, phonological features of co-articulators transfer part of meaning. In Persian, every sound can represent several letters orthographically but in Arabic, each sound represents a specific letter. All sounds are produced by different places of articulation or by the same places of articulation but different manners of articulation. Therefore, functional meaning of phones in Arabic is more effective than Persian language. The duration of time for producing a vowel is called the length. In contrast to Persian language, in English and Arabic languages vowel length is a distinctive feature; For example, in Arabic the verbs «zaaraba »and «zaraba » have different meanings. Forms with initial clusters, if not preceded by a vowel in the same phonological phrase, receive epenthetic. Intervocalic glottal stop and a following vowel are deleted in some forms.

It includes inflectional alternations like kutiba 'it was written' and makaatibu 'offices (nom.)'.

There are roots of three or four consonants which cluster around a single semantic field, like ktb 'write'. Certain changes in these roots, like gemination of the middle radical in (lb), yield derivatives such as causative or agentive. Moreover, some vowel patterns seem to bear consistent meaning, like the difference in stem vocalism between active kataba and passive kuitiba.

Similarly, the vocalism-is called the vowel melody-is not freely distributed among the vowels. For example, it is a fact that no Classical Arabic word (with the possible exception of some loans) has the vocalism i-u, nor does any verb have a melody that begins with i.

IV. Obligatory Contour Principle

Leben's (1973) Obligatory principle says that no tonal melody can contain adjacent identical elements. Thus, a melody HHL is automatically simplified to HL, but HLH remains unchanged. The revisions of this principle involve two points.

1. In Arabic roots of two, three and four consonants are subject to the Obligatory Contour Principle.
2. The geminate roots in Arabic don't provide a satisfactory explanation for an empty slot.
3. This OCP states that identical H and L tones can't be adjacent to each other.

Note also that the Obligatory Contour Principle excludes quadriliteral roots with adjacent identical autosegments, like hypothetical* ddrjo r *drrj. In fact, this is the right result; there are no QI verbs of the type *dadraj. This theory also predicts the occurrence of doubly reduplicated root consonants. The only limitation on such reduplication is the difference between the number of root consonants and the number of empty consonantal slots in the template. Arabic routinely shows double reduplication in the second and fifth binyanim with roots like sm: sammam, tasammam.

Consider two representative roots with identical radicals in the permitted positions, like qlq and smm. The first, qlq, is unremarkable in the autosegmental treatment. But the second, smm, as well as all other geminate roots, must be represented formally as a biliteral root sm according to the revised Obligatory Contour Principle. If there were a (traditional) root of the nonoccurring type designated as ssm, this root would be formally identical to smm because of the operation of the Obligatory Contour Principle. Given this apparatus, the convention of left-to-right association can explain the absence of verbs or nouns like sasam versus the existence of samam. Now consider the mapping of the biliteral root onto the prosodic template of the first binyan perfective:

CVCVC

The verb system of the triliteral root is based on fifteen derivational categories and that of the quadriliteral root on four-these are the binyanim mentioned above. In fact, each binyan is inflected in almost the same way as all the other. What binyanim differ in is the arrangement of root consonantism with respect to characteristic affixes and vowel positions.

Edmondson (1986) believes that the first binyan is a possible category for nearly all roots that can appear as verbs. It is relatively unmarked morphologically, at least in the finite forms, and it has no special semantic properties. But the others, the derived binyanim, generally involve some special modification of the meaning of a related noun or verb or of the basic meaning of the root. So, for instance, the third triliteral binyan is usually reciprocal, while the sixth is usually the reflexive or effective of the reciprocal.

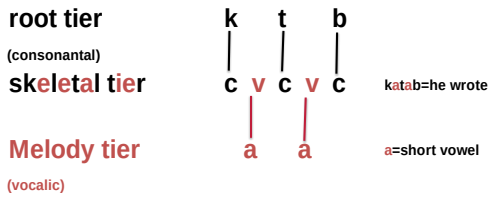
Subject to these lexical idiosyncrasies, the binyanim cross-classify the roots morphologically and semantically, where the root supplies the basic meaning and the banyan (except for the first binyan) supplies some modification of this meaning or of the verbal diathesis. The meaning of any verb is not a composition of the meaning of root and binyan, but there is a reasonable amount of predictability. For instance, the root ktb expresses a notion like 'write'. This root occurs in eight binyanim reflected by the following uninflected forms of the perfective active:

Binyan
I katab 'write'
II kattab 'cause to write'
III kaatab 'correspond'
IV ?aktab 'cause to write'
VI takaatab 'write to each other'
VII nkatab 'subscribe'
VIII ktatab 'write, be registered'
X staktab 'write, make write' (Spencer, 1984, p.10)

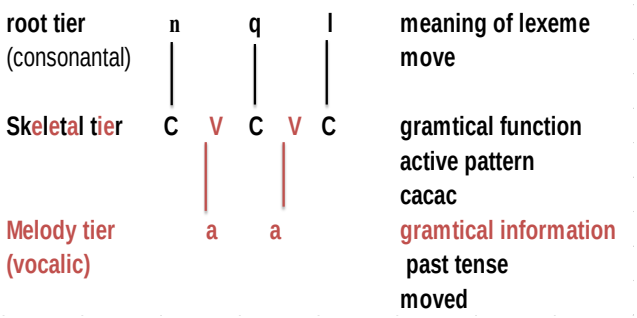
In the Arabic language, many derivations and semantic variations of the same root can be occurred by adding vowels, suffixes, and prefixes to the root.

ktb= write
Adding vowels to the root
Katab he wrote
Kattaba he caused to write
Kutiba It was written
Ka:taba he corresponed
Ktataba he copied
Adding prefixes to the root
maktab an office
nkatab we write
maktu:b a letter
maka:tib offices
adding suffixes to the root
Kitabun a book
Kita:batun act of writing
Kutta:bun Quraan school

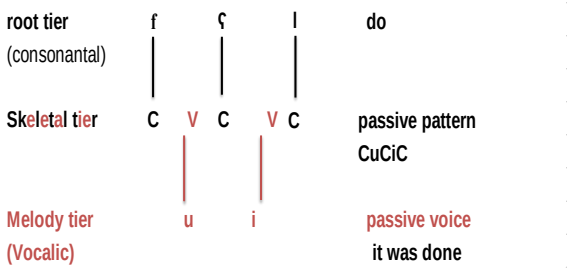
'katab' (He wrote)



'naqal'(he moved)



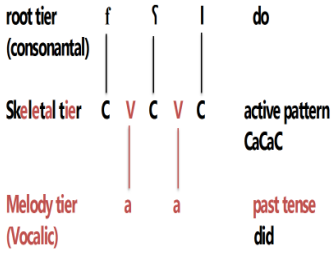
'fu….iI'(It was done)

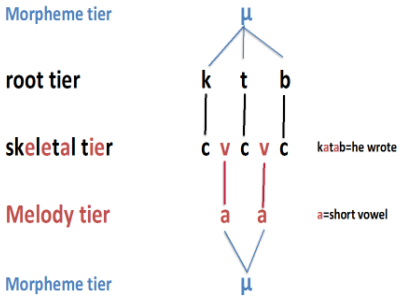


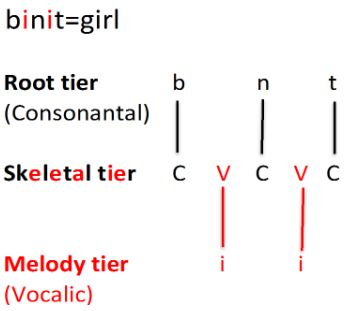
Arabic Patterns and roots

In Arabic autosegmental representation, vowels and consonants are connected to C and V nodes on different tiers

A root tier consists of consonantal segments and the Skeletal tier is, a prosodic template associated with a particular meaning or grammatical function.





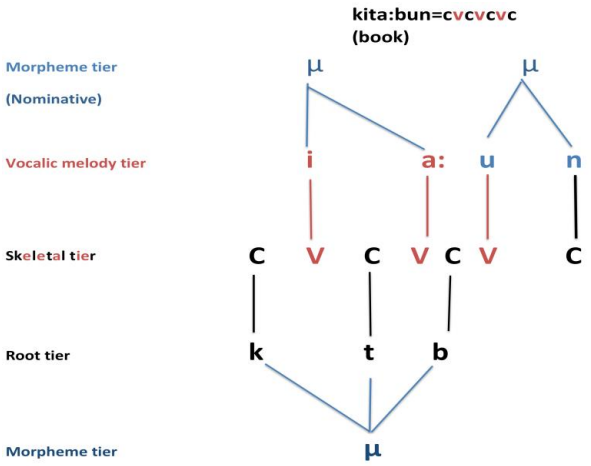


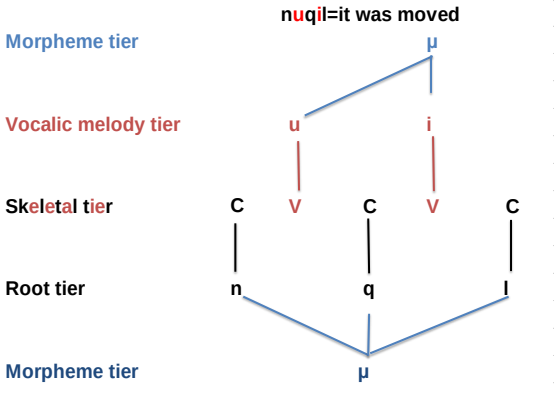
Morpheme tier:

McCarthy introduced an additional morpheme layer = μ node.

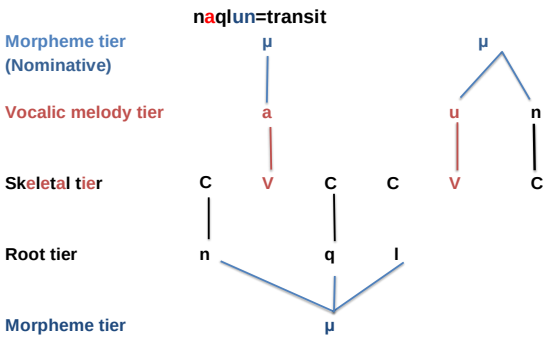
The suffixes and prefixes take also μ nodes. The root tier will provide all the information need to distinguish consonants from one another by place and manner of articulation.

'kita:bun'(book)





'naqlun'(transit)



In 1986, McCarthy extended the OCP to all autosegmental melodies including consonantal and vocalic segments. There is a basic division into two aspects, perfective and imperfective. Voice is active or passive, with slightly different morphology for voice in the two aspects.

Thus, the word; takattab is not a real verb, although V takassab 'to earn' is one. In the first binyan, different roots belonging to different ablaut classes, treated in section 3.4, yield different vocalism from that of ktb in the perfective and imperfective active.

Gaps in the passive inflections indicate binyanim that are regularly intransitive and stative. As a kind of minimal, barely adequate

account of these differences, we would have to answer the following questions:

How are the consonants arranged with respect to the vowels?

The inventory of canonical patterns in the perfective of the trilateral binyanim is listed in (5), where C denotes any [-syll] segment, including consonants and glides:

(5) a. CVCVC
b. CVCCVC
c. CVVCVC
d. CVCVCCVC
e. CVCVVCVC
f. CCVCVC
g. CCVCCVC
h. CCVVCVC

First, the stems of all binyanim invariably end in closed syllables (CVC). Second, there is no binyan with a sequence of two light syllables like CVCVCVC. Third, no banyan contains a light syllable after a heavy syllable like CVCCVCVC. Fourth, no banyan which begins with a consonant cluster is three or more syllables long overall.

The lowest level of linguistic organization

A prosodic template, although the term CV-skeleton adopted by Halle and Vergnaud (1980) may be more evocative. Prosodic templates are composed solely of the features [segmental] and [syllabic], the appropriate values of these features being abbreviated by C and V.

The prosodic template corresponds to the segmental level. Thus, the segmental level will contain only the features [segmental] and [syllabic], and all other features will be autosegmental. This leads to a straightforward analysis of the problem in (B) and (C) of arranging root and affixal consonantism with respect to the C-slots of the prosodic template.

The Arabic triliteral root is represented formally as a melody on a single, morphologically defined autosegmental tier which takes as its melody-bearing elements the [- syllabic] positions of the prosodic template (Alemayehu Haile, 1988, p. 9). This melody contains three melodic elements composed of all features except [segmental] and [syllabic]. In this way, all the information needed to distinguish consonants from one another can be provided by the root tier. The segments k, t, and b in this sense are not ordinary segments but rather archisegments unspecified for [segmental] and [syllabic]. Similarly, affixes like n or t will appear on separate autosegmental tiers. These affixal tiers involve the same distinctive features as the root tier, but they are distinct.

The problem now is to account for the mode of association between the melodybearing [- syllabic] slots of the prosodic template and the autosegments of the various consonantal tiers. We will begin by considering some cases in detail.

A triconsonantal root will, by the first universal convention in section associate from left to right, resulting in a simple one-to-one association with the three C-slots of the template.

This result appears in (6): (6) a. CVCVC b. CVVCVC

\ j / (katab) / (kaatab)

But a problem remains in treating forms like the second and fifth binyanim.), the templates of these two categories have four slots to accommodate just three root consonants. What actually occurs is gemination of the middle root consonant, in effect expanding the triliteral root to fit four consonantal slots. This germination is formally as a one-to-many mapping of the single middle root consonant onto two slots in the prosodic template:

a. CVCCVC (kattab) b. A

\V/ I

ktb t

CVCVCCVC (takattab)

If we suppose that material on an affixal tier is applied to the prosodic template before material on any root tier, then, as an automatic consequence of this ordering and of the conventional left-to-right association, affixes will without further stipulation appear on the leftmost consonantal slots of the prosodic template. The output of left-to-right association on both tiers is shown in the next part:

n s t t

ccVcV cc v cVccVc cVcVVcVc

ktb ktb ktb ktb

(nkatab) (staktab) (?aktab) (takaatab)

First the material on the affixal tier is mapped onto the template, selecting the leftmost slots. The remainings lots receive a left-to-right mapping of the root tier melody, subject, of course, to the condition that there be no many-to-one associations with the segmental level. There is one systematic exception to this pattern of affixation. The reflexive morphemet, which is prefixed in the fifth (takattab) and sixth (takaatab) binyanim, is infixed

in the eighth binyan. That is, it is associated with the second consonant slot of the prosodic template and not the first arise in the ninth and eleventh binyanim. These are formed on the templates (7) and (8).

(7) a. IX b. XI

CCvCvC CCvvCvC

ktb ktb

The unassociated final C-slot is now associated with the melodic element bound to the C-slot on its left, in this case b. This is a consequence of the third universal convention yields the representations in (8):

(8) a. IX b. XI

CCvCvC CCvvCvC

ktb (ktabab) ktb (ktaabab)

Consequently, this sort of is sufficient to generate the germination displayed by these two binyanim without any additional stipulations.

After Erasure, we expect reassociation from the nearest consonant slot on the left-in this case, w. But since the root and the infix are representations on separate autosegmental tiers, it is possible to reassociate either from the infixed w or from the second root consonant t and still produce a well-formed representation. In fact, the twelfth and thirteenth binyanim differ on exactly that point-on whether the infix or the second root consonant is geminated: XII ktawtab, XIII ktawwab.

There is a further result of this analysis of biconsonantal verbal roots. Because of the autosegmental treatment, there is a particular formal characteristics shared by bilateral roots and those trilateral and quadriliteral roots that appear in binyanim with characteristic gemination. In every case, gemination is represented formally as a one-to-many association from the root tier to the prosodic template. This representation does not hold, however, of adjacent identical consonants that come from different morphemes and consequently from different autosegmental tiers, such as root and affix.

Binyanim Melodies

a. u a i

In McCarthy (1979) it is argued that all three melodies are derived from the underlying melody; (u-a-i) by partly morphologically conditioned rules deleting u and i melodic elements.

The First Binyan

We will now turn to the issues presented by the somewhat more varied finite forms of the first triliteral binyan. (Discussion of the participles, which involve further complications, can be found in McCarthy (1979).) The first binyan is unique in that the canonical pattern of the perfective stem [CVCVC] differs other than in prefixation of [CV] from the canonical pattern of the imperfective [CVCCVC]. We can account for this alternation by one repair rule which transforms an underlying [CVCVCVC] prosodic template to a derived [CVCCVC] one. Thus, the first binyan regularly receives the usual [CV] prefix

in the imperfective and is then subject to elision of the middle vowel.

Some of these ablaut patterns are associated with verbs of a particular semantic class, though not strictly. Ordinarily, the first binyan form of a particular root is restricted to just one of these ablaut classes, but some slippage appears. There are also rare cases of anomalous ablaut, exhausting almost all the possibilities. It is only at the level of the autosegmental melody that the Ablaut rule can express the aspectual relationships of the passive. This particular phenomenon, then, lends strong support to the prosodic analysis.

Morphological Rule Constraint (MRC)

All morphological rules are of the form A -* B / X, where A is a single element or zero and B and X are (possibly null) strings of elements.

That is, morphological rules must be context-sensitive rewrite rules affecting no more than one segment at a time.

The phonological rules that must be formulated transformationally involve rules of metathesis. It has been observed both traditionally and in more recent studies (Ultan (1971)) that only a very limited set of possible metathesis rule types exists, depending on phonetic properties of the affected segments. One type is vowel-liquid metathesis, represented, for example, by the Maltese rule of Brame (1972). This apparently reflects a more general type of metathesis between neighboring continuants of unequal sonority.

Moreover, Arabic has some additional evidence that verbs like zaizala constitute a definable class within the lexicon. One bit of evidence is the semantic consistency of this class alluded to earlier: these forms seem to refer to repeated, iterative operations. A much stronger argument lies in the formation of gerunds or infinitives from verbs of this class. Verbs like zalzala often form gerunds of the pattern zalzaal, galgaal, and so on. However, no other triliteral or quadrilateral verb can form a gerund of this pattern. Therefore, the rule responsible for just this type of gerund must be able to refer directly to verbs with reduplicated biconsonantal roots.

The stipulation of an additional rule, the Second, Fifth Binyanim Erasure rule medial reduplication in the forms kattab and takattab, which is apparently quite rare is required.The result is that reduplication is limited to strings that form constituents at some level of representation. Mapping and spreading rules involve the association of constituents at one level (like morphemes, syllables, autosegmental melody) with units at another level (like V, C, a, in the prosodic template).

local process for vowel-vowel alternation.

Association of a nonconstituent string on one level with a constituent string on another level is excluded formally because it necessarily leads to an ill-formed representation with lines crossing.

CVCCVCVC

Since k and t do not exhaust a constituent on any tier, there is no way to derive *katkatab without crossing association lines.

Reduplication is the universal properties of nonconcatenative morphological process.

A particular result of reduplication by means of a prosodic template arises in Cupeino, as described by Hill (1970). He argues that the habilitative construction is formed from consonant final stems by repeated reduplication until an output target. The template, then, can encode the output target, and automatic spreading effectively reduplicates until the template is filled. Notice the role played by morphologically defined tiers in this representation: since the plural suffix melodies a-e and o-i are represented on a separate tier from the stem.

Halle and Vergnaud suggest that the grammar of Arabic ensures that vowel melodies are associated with V-slots and consonant melodies with C-slots. Since vowel melodies and consonant melodies invariably appear on different morphologically defined tiers in Arabic, it suffices to indicate for each tier what its melody-bearing elements will be, either syllabic or nonsyllabic positions in the prosodic template.

Each melodic element bears an indication of whether it is to be associated with a C or a V in the template. In effect, the melodic elements will be specified as [+ syllabic] or [- syllabic], and the association conventions must match up values of this feature between the melodic and template tiers.

Let us suppose that some prosodic template affixes bear the feature [+reduplication], which induces special behavior. This feature does not belong to a reduplication transformation in standard generative analyses. Rather, it has the effect of causing automatic copying of all the melodic elements in some morpheme-formally in a particular tier. This copied material is then associated in the familiar way with the C/V positions of the prosodic template affix. In the analysis of Arabic, unassociated elements are considered to be deleted.

The first modern insights into Semitic morphology appear in Harris's (1941) long components analysis of Biblical Hebrew. Harris proposes a list of morphemes divided into three types on formal and semantic grounds. The consonantal roots like ktb have the sort of general meaning. Morphemes of the second class, patterns, are composed of vowels plus symbols from the set " ", ":", and affixal consonants. The dash marks "the presence of some phoneme, usually a consonant, in close juncture" (Harris, 1941, p. 152). The colon is the familiar notation for consonant length. The meaning of a pattern is essentially a modification of the meaning of the root. So, for instance, the pattern of kattab would be notated _a :a with the meaning 'intensive, causative'. The third class of morphemes is relatively uninteresting, consisting of those function words and loans. The relationship between morphemes of the root class and those of the pattern class is expressed by a single statement of morpheme order: members of the root class are intercalated in patterns.

Since Chomsky's analysis is one of the earliest and most extensive demonstrations of rule ordering within a modified structural is framework, we can coherently speak of a morphophonemic derivation. At the earliest stage of this derivation, there is a linear concatenation of morphemes from the different classes. So, for instance, the stem of kattab will have the remote representation ktb + a- :a. Several morphophonemic rules substituted formally for medial germination pattern. Although this is adequate for Hebrew, it misses an important property of Arabic verb forms like katab versus kattab. In these words, all vocalism is a as one manifestation of the perfective active. The vocalism can be changed independently of the germination of the medial consonant; compare the corresponding passives kiutib and kuittib.

Clements and Hume's (1995) Geometry of features

Autosegmental phonology deals with the way distinctive features are ordered by phonological rules. In phonological processes like assimilation, the specific features operate as a single constituent. So all features in phonological representations do not behave similarly. Clements (1985) proposed a way in which the features arranged hierarchically. Each feature is put in an independent tier. They shape a final node. Features connect to a higher node to make a separate constituent. These nodes link to each other by lines. The assimilation rule may operate as feature filling or feature changing (pp, 258-259). They suggested three kinds of assimilation; complete assimilation in which the target phonological unit receives all the features of neighboring phonological unit while the root node spreads; incomplete assimilation, when the target phonological unit receives some of the resource features while the lower level class node spreads; single feature assimilation which involves terminal feature spreading.

No feature may appear on more than one tier.

Arabic Root- & Pattern- Morphology (Binyanim)

‘write’- k . . . t . . . b

Perfective
I X _ C V C V C
write-katab (active) kutib (passive)
II cause to X _ CVCCVC
cause to write- kattab, kuttib(passive)
III X each other _ CVVCVC
Write to each other- kaatab (active), kuutib (passive)
Arabic Root- & Pattern- Morphology (Binyanim)
Binyan Form Gloss
I katab 'write'
II kattab 'cause to write'
III kaatab 'correspond'
IV P-aktab 'cause to write'
VI ta-kaatab 'write to each other'
VII n-katab 'subscribe'
VIII ktatab 'write, be registered'
X st-aktab 'write, make write' (Spencer, 1984, p.10)
Getting rid of juncture symbols: Morphemic Affiliation
SPE McCarthy (1981)
per+mit

V. The Spatial Geometry of Different Tiers

In this model, McCarthy proposed the geometry f various tiers as the strings in a three-dimensional space. In that more than two tiers connected to the same tier. This spatial model involves hard and soft constraints with specific characteristics:

Hard Constraints

1. Every tier is parallel to every other tier
2. Association lines connecting different tier pairs never cross or overlap
3. Two different segments on different tiers cannot be linked to skeletal node.
4. Different autosegmental morphemes are always on different tiers even if they specify information of the same type (consonantal /vocal melodies).

Soft Constraints

McCarthy Believes that every melodic node should be associated
to at most one skeletal node.
1. Every skeletal node is linked to a melodic node.
2. Every melodic node is linked to a skeletal node.

VI. Mapping Principle (Universal Linking Conditions)

Association should be as unique as possible
i.e.
1. Every skeletal node should be associated to at most one melodic node
2. Every melodic node should be associated to at most one skeletal node

VII. The Repair Operation Algorithm

Repair Mechanisms involve derivational rules which ensure that the wellformedness constraints for linking between tones and syllables are obeyed. In concatenation affixes, roots and stems are combined in a specific linear order with a change in phonological processes

If two morphemes share elements on the same tier, the order of concatenation determines the phonological order but if they do not share phonological segments in strings on any tier concatenation doesn't impose by a phonological sequencing .This process is done by the phonological repair mechanisms.

1. If there are unassociated S-nodes and M-nodes, S-nodes und M-nodes should be associated with each other from left to right
2. Else: If there are unassociated S-nodes, every unassociated S-node S can be associated to the M-node to which the S-node immediately preceding S is related.
3. Else: If there are unassociated M-nodes, every unassociated M-node M should be corresponded to the S-node to which the M-node immediately preceding M is associated.

The basis of Arabic morphology is a set of prosodic templates that vowel and consonant melodies are mapped onto by certain rules of great generality. Reduplication can be characterized formally as a one-to-many association of a single melodic element with the slots of the prosodic template. That is, reduplication is just an instance of the more

general autosegmental phenomenon of spreading. This is the case, for example, with reduplication of the u portion of the perfect passive melody in sixth binyan tukuutib or of the final root consonant in ninth binyan ktabab. In every instance, the surface reduplication is not a consequence of a transformational rule but rather of the spreading of a particular melodic element to fill up the available slots of the template.

We have seen that, all reduplication is a consequence of one-to-many associations derived by the usual conventions. Just at the level of surface phenomena, Arabic exhibits a wide variety of nonconcatenative morphology: ablaut processes, apparent movements of segments universal and partly language-particular apparatus of autosegmental phonology.

VIII. Conclusion

The foundation of the analysis presented here is the theory of autosegmental phonology as described by Clements and Ford (1979). Goldsmith's view (1976) is in ways relevant to this analysis.

Sometimes, in autosegmental phonology, a biconsonantal root is expanded to fit a prosodic template-the [CVCCVC] template of the causative and [CVCCVCCVC] of the reflexive-with four empty slots. However, in this case the expansion is not effected by reduplicating a single root consonant, but rather by reduplicating the entire root. It is possible to have a mapping between morpheme positions rather than directly between elements of a morpheme and the corresponding template. That is, the root is reduplicated by a one-to-many morpheme-to-morpheme association, and then the elements of these morphemes are mapped onto the prosodic template. Reduplication is accomplished here by mapping one root morpheme onto two root morpheme positions in a separate tier. The units contained in these derivative morphemes are then mapped onto the prosodic template.

It has been assumed that the autosegmentalization of some feature or bundle of features defines a single tier on which all and only those features are represented. I will claim instead that each language has the option of restricting every tier to autosegments which are members of a particular morpheme or morpheme class.

Moreover, different tiers cannot contain the same features unless those tiers represent different morphemes, and then only if a particular grammar stipulates that the tiers are morphologically determined. Each autosegmental tier will designate a natural class on the segmental tier as its set of tone-bearing elements, the units with which it is to be associated. Unassociated melodic elements are associated from left to right with the unassociated melody-bearing elements. If all melodic elements are associated and if there are one or more unassociated melody-bearing elements, all of the latter are assigned the melody associated with the melody-bearing element as the effect of automatic spreading. Arabic language is based on morphological system which specifies rhythm of word (being as a noun or a verb). Segmental and suprasegmental units, syntactic structures, and morphological system of every language guides the addressee to comprehend the speaker's intention. The interpretation of the listener depends on the concepts of words and the content of combinations and compound words. The semantic function of stress as a suprasegmental element in sentences and dual and plural nouns cannot be ignored. In the morphological system of Arabic language, the rhythm of words are measured by verbs. The effect of rhythm on speech can be much or less with regard to ideological and affective issues of the speaker or writer.

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