Available online at www.jlls.org

JOURNAL OF LANGUAGE AND LINGUISTIC STUDIES

ISSN: 1305-578X

Journal of Language and Linguistic Studies, *16*(4), 2130-2162; 2020

An autosegmental analysis of the derivation of weak active participles from triconsonantal verbs in modern standard Arabic

Eman Ali [a 1], Radwan Salim Mahadin [b]

a University of Jordan, Amman, Jordan
b University of Jordan, Amman, Jordan

APA Citation:
Ali, E. & Mahadin, R. (2020). An autosegmental analysis of the derivation of weak active participles from triconsonantal verbs in modern standard Arabic. *Journal of Language and Linguistic Studies*, 16(4), 2130-2162.
Submission Date: 26/6/2020
Acceptance Date:25/8/2020

Abstract

This study aims to analyze the derivation of weak active participles (APs) from triconsonantal imperfective verbs within the X-slot model of autosegmental phonology. The first stage of the research involves building a corpus of APs from a well-established corpus-based dictionary, namely *muˤdʒam ʔalluɣah ʔalˤarabijjah ʔalmuˤa:sirah* 'Dictionary of Modern Arabic Language'. The corpus contains 620 APs which are categorized, in accordance with the position of the glide in their stems, into initially, medially, finally and doubly weak APs. The analysis reveals that despite having irregular surface representations, the underlying representations of weak APs are parallel to those of their strong counterparts. The surface irregularities of these APs are attributable to the inherent instability of the glides which causes them to be susceptible to diverse phonological rules. These phonological rules are given accurate and simple representations in autosegmental phonology due to the autonomy that elements on different tiers have in this approach.

Keywords: Autosegmental phonology; MSA; corpus-study; weak stems; APs

1. Introduction

Arabic is a Semitic language that has a rich literary heritage dating back to the pre-Islamic period. In addition to Arabic, other major members of the Semitic language family include Aramaic, Ugaritic, Hebrew, Ethiopian, Amharic, Phoenician, Akkadian and Eblaite (Hetzron, 1992). Semitic languages share common phonological, morphological, and syntactic features (Watson, 2002). In terms of phonology, these languages generally employ a limited number of vowels and a wide number of consonants and their consonantal systems incorporate a rich inventory of gutturals, emphatics and geminates. Semitic languages are further marked by their root-and-pattern morphology in which the roots are semantic abstractions embodied by a set of consonants that are inserted into templatic patterns to indicate derivational and inflectional aspects. The distinguishing syntactic features of Semitic

1 Corresponding author.
E-mail address: emanawniali@gmail.com

languages include the common usage of VSO (verb-subject-object) word order and the tendency of qualifiers to follow their qualified terms (e.g. adjectives follow the nouns they qualify).

Modern Standard Arabic (MSA) is argued to be a direct descendant of Classical Arabic (CA), i.e. the language of Quran. The emergence of MSA is attributed to the exposure to Western civilization and to the spread of literacy and education. A distinction between the two variants of Standard Arabic, viz. CA and MSA, is commonly made by linguists. The former is a literary form of Arabic used in the Quran and in the pre and early Islamic eras, whereas the latter is the form utilized in formal language contexts in contemporary Arab world. Even though the lexis and stylistics of MSA are different from those of CA, the two variants are largely similar in terms of phonology, morphology and syntax. In addition to the two standardized variants of Arabic, various regional vernaculars of Arabic are used in informal speech contexts. Examples of Arabic regional vernaculars include Jordanian Arabic, Palestinian Arabic and Iraqi Arabic. Table 1 presents the consonantal inventory of MSA:

Table 1. MSA Consonantal Inventory

b	Voiced bilabial stop	s	Voiceless dental-alveolar fricative	k	Voiceless velar plosive
m	Voiced bilabial nasal	z	Voiced dental-alveolar fricative	x	Voiceless uvular fricative
f	Voiceless labiodental fricative	t̲	Voiceless emphatic dental-alveolar plosive	ɣ	Voiced uvular fricative
j	Voiced palatal glide	d̲	Voiced emphatic dental-alveolar plosive	q	Voiceless uvular stop
w	Voiced labiovelar glide	s̲	Voiceless emphatic dental-alveolar fricative	h̲	Voiceless pharyngeal fricative
θ	Voiceless interdental fricative	ð̲	Voiced emphatic interdental fricative	ˁ	Voiced pharyngeal fricative
ð	Voiced interdental fricative	r	Voiced dental-alveolar tap	ʔ	Voiceless glottal stop
t	Voiceless dental-alveolar stop	l	Voiced dental-alveolar lateral	h	Voiceless glottal fricative
d	Voiced dental-alveolar stop	ʃ	Voiceless postalveolar fricative		
n	Voiced dental-alveolar nasal	dʒ	Voiced postalveolar affricate		

As can be noticed from Table 1, MSA, as a member of the Semitic family, employs a set of glottal (ʔ, h), pharyngeal (h̲, ˁ) and uvular (x, ɣ) consonants. These consonants are grouped under one category labelled gutturals. Gutturals are consonants produced with "a primary constriction in the posterior region of the vocal tract" (McCarthy, 1994). The phonemic inventory of MSA also has a class of consonants whose production involves a primary constriction in the interior region of the vocal tract, or the oral cavity, accompanied by a secondary retraction of the tongue towards to the posterior region of the vocal tract, or the pharyngeal cavity. This class is referred to as emphatics and it includes four phonemes /t̲, d̲, s̲, ð̲/ which contrast with their non-emphatic counterparts /t, d, s, ð/ (e.g. *ti:n* 'figs' and *t̲i:n* 'mud'). Contrary to the rich consonantal inventory of MSA, the vocalic inventory of this variety of Arabic only contains three short vowels as shown in Table 2.

Table 2. MSA Short Vowels

i	high front unrounded
a	low central unrounded
u	high back rounded

Each of these three short vowels has a long counterpart. However, it is argued that even though long vowels have phonetic realizations, these vowels are not present on the underlying level of representation. Rather, a long vowel is composed of a sequence of a short vowel and a glide in the underlying representation. This sequence is changed to a long vowel through application of certain phonological processes such as syllabicity assimilation (e.g. /ij/→ /ii/→ /i:/) and glide deletion (e.g. /uwu/→ /uu/ → /u:/). In order to support this argument, many synchronic and diachronic pieces of evidence which suggest that this analysis of long vowels is capable of capturing significant generalizations about the shape of the basic stems in Arabic and the rules utilized for deriving the modified forms of these stems are presented (cf. Brame, 1970; Levy, 1971). In addition to the short and long monophthongs, MSA has two diphthongs, namely /aw/ and /aj/ (e.g. *nawm* 'sleeping', *bayt* 'house'). As for the permissible syllables in MSA, there are only five types which are listed below with illustrative examples:

1. a. CV (open, light): *da-ra-sa* 'he studied'
   b. CVC (closed, heavy): *min* 'from'
   c. CVV (open, heavy): *qa:-ma:* 'they (dual, masculine) stood up'
   d. CVVC (closed, super-heavy): *na:m* 'he slept'
   e. CVCC (closed, super-heavy): *bint* 'a girl'

1.1. Aims of the Study

This study attempts to explore the phonological processes that APs undergo during their derivation from triconsonantal verbs in MSA within the framework of autosegmental phonology. The AP, also known as the noun of agent and the noun of subject, is a nominal derivative of verbs which describes the entity that performs the action denoted by the verb from which it is derived (Al-Faxiri, 1996; Abd Al-Ghani, 2010; Al-Samurrai, 2013; among others). This nominal derivative belongs to the word class of substantives which consists of nouns and adjectives because it takes the same inflectional forms of this class, i.e., it is declined for definiteness (*ʔalka:tib* 'the writer', *ka:tibun* 'a writer') gender (e.g. *za:ʔirun* 'a male visitor', *za:ʔiratun* 'a female visitor'), number (e.g. *ba:ħiθ* 'a researcher', *ba:ħiθa:n* 'two researchers', and *ba:ħiθu:n* 'researchers') and case (e.g. the active participle form *mu^{c}allim* 'a teacher' is declined for the nominative, accusative and genitive cases in *mu^{c}allimun, mu^{c}alliman* and *mu^{c}allimin*, respectively) (Ryding 2005, 102). In terms of syntax, the AP may function as a noun (e.g. the AP *ṭa:libun* 'a student' in the phrase *ʔata: ṭa:libun* 'a student came'), an adjective (e.g. the AP *ba:ridun* 'cold' in the phrase *hawa:ʔun ba:ridun* 'cold air'), an adverb (e.g. the AP *mutaʔxxiratan* in the phrase *badaʔat mutaʔxxiratan* 'she started late') or a verb substitute (e.g. the AP *na:ʔimun* in the phrase *huwa na:ʔimun* 'he is sleeping') (Holes, 1995).

To make the examination feasible, one type of APs is chosen, namely the weak APs. Weak APs are chosen because they have a glide as one of their radicals. The APs which have glides are "more subject to various phonological rules than others, due to the instability of the glides in predictable phonological environment" (Mahadin, 1982, p. 211). The analysis of a category of APs that has glides can, thus, provide a more in-depth view of the phonological processes that are involved in their formation. Based on the position that the glide occupies, weak APs are classified into initially, medially, finally and doubly

weak (Wright, 1896). One of the major proposals concerning these weak stems is that, despite having irregular surface representations, their underlying representations are parallel to those of their strong counterparts. The apparent irregularity of weak stems is ascribed to their susceptibility to various phonological rules due to the inherent instability of the glides that constitute at least one of the radicals (cf. Brame, 1970 and Mahadin, 1982).

The APs can be derived from the ten forms of Arabic verbal stems whether the stems are triconsonantal or quadriconsonantal, transitive or intransitive, strong or weak (Ryding, 2005; Abd Al-Ghani, 2010; Alshdaifat, 2014). This study is restricted to examining the derivation of APs from form I of the imperfective verb. This form is generally identified as the basic, or non-derived, form of verbs which serves as the base of derivation for the other nine forms of verbs. Form I of the imperfective verb has the pattern |ja+$C_1C_2\begin{Bmatrix} a \\ u \\ i \end{Bmatrix}C_3$| (e.g. *ja-ktub* 'he writes') which consists of the third person masculine prefix |ja| and a triconsonantal stem that has one stem vowel. In addition to the |ja|, the unmarked prefix of the imperfective stem, a number of personal prefixes can attach to the imperfective stem such as |ʔa|, the first person singular prefix and |na|, the first person plural prefix. The |ja| prefix and other prefixes and suffixes are not part of the base for deriving forms from the verb, rather only the stem of the verb is used as the base of derivation.

It should be indicated that most of the analyses of the AP derivation considered the stem of the perfective verb, rather than that of the imperfective, as the base from which triconsonantal APs are derived (e.g. Shahin, 1980; Al-Raagihi, 1984). In contrast to the usual practice among researchers, Mahadin (1982), Benmamoun (1999) and Abdo (2008), among others, presented valid arguments for employing the imperfective stem as the base of derivation of the AP and the other derived forms in Arabic. For instance, Mahadin (1982) argued that the vowel of the perfective stem can be predicated form the vowel of imperfective stem, but not vice versa. That is, the stem vowel of the imperfective is lexically determined in the sense that it cannot be predicated accurately by general rules and thus native speakers are assumed to store the imperfective stems in their mental lexicons along with the rules that derive their perfective counterparts. Following these researchers, the use of the imperfective stem, instead of its perfective counterpart, as the base from which the APs are derived is tested in the present study.

1.2. Significance of the Study

The significance of the present piece of research derives from the fact that it employs a relatively recent innovation in generative phonological analysis, viz. the autosegmental approach, that no other studies have applied to the examination of the phonological processes that APs undergo throughout their derivation. That is, despite the fact that many studies analyzed the derivation of APs, none of these studies conducted their analyses within an autosegmental framework. The autosegmental approach is considered an important approach to phonology because it overcomes various theoretical and empirical inadequacies of a dominant theory, viz. generative phonology, in the field of linguistics. It is significant to assess the adequacy of this approach in accounting for various phonological processes that take place in MSA; especially that some of its aspects are proposed specifically for the analysis of the unique characteristics of the Semitic family but are not exhaustively examined on a corpus of one of its main members. Premising the analysis on the modifications introduced to the classical analysis of Arabic phonology adds further importance to the study (cf. Aniis, 1975; Shahiin, 1980; Abdo, 2010). Furthermore, the studies that explore the phonology of Arabic do not generally rely on corpora for their analyses, rather these studies provide examples in support of their arguments which might affect the comprehensiveness and thoroughness of the analyses. Accordingly, present study aims at bridging a gap

in the literature by employing the autosegmental approach of phonology for the analysis of an AP corpus which is built from a modern corpus-based dictionary.

2. Method

2.1. Data Collection

The first stage of the research involves building a corpus of APs from a well-established Arabic dictionary, namely *mu^{c}dʒam ʔalluɣah ʔal^{c}arabijjah ʔalmu^{c}a:s̲irah* 'Dictionary of Modern Arabic Language'. This dictionary (a four-volume work) is compiled by a large group of trained researchers lead by Omar in 2008 to cover the majority of words used in modern-day Arabic. One of the main goals of the dictionary compilers is avoiding the shortcomings of the pre-existing dictionaries. These shortcomings include mixing obsolete and common words in addition to excluding the new ones; building on earlier lexicographic work without conducting thorough examinations and failing to provide relevant morphological and semantic information (Omar, 2008). The dictionary is compiled from various written and auditory sources of MSA such as contemporary newspapers, news and news commentary programs, grammar books and dictionaries, children's stories and prominent publications on literature, psychology, law, economy, philosophy, history, arts, environment, technology, education, sports, science, etc.

The data from these sources are assembled in a corpus that contains more than one hundred million words. The large corpus is processed and analyzed statistically to include the common words in the dictionary and exclude the uncommon ones. The corpus-based monolingual dictionary, viz. *mu^{c}dʒam ʔalluɣah ʔal^{c}arabijjah ʔalmu^{c}a:s̲irah,* is meant for the general user of the language and thus it contains words of general use that represent various spheres of life. This dictionary provides morphological and semantic information on the words it defines as well as plenty of illustrative examples of the contexts in which the different senses of these words are used.

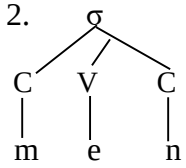
The 32.300 alphabetized dictionary entries are grouped under 5.778 consonantal roots and are dedicated for verbs (10. 475), nouns (21.457) and function words (368). Since the APs are derived from verbs, they are listed under verbal entries. The APs that are derived from triconsonantal weak verbs (form I) are listed in a corpus. The corpus contains 620 APs which are categorized, in accordance with the position of the glide in their stems, into initially, medially, finally and doubly weak APs. These are presented in Appendix (A), Appendix (B), Appendix (C), Appendix (D), respectively. It should be noted that the APs that have the same form are listed under separate entries in the corpus if they have different meanings (e.g. *ja:min* 'blessed' and *ja:min* 'turning right') or if they are derived from different imperfective verbs (e.g. the AP *wa:biq* 'perished' can be derived from the stems of the imperfective verbs *ja-biq* or *ja-wbaq*).

2.2. The Approach

Autosegmental phonology is a non-linear approach to generative phonology proposed for overcoming the inadequacies of its linear counterpart. One of the main proposals of this approach is splitting the linear phonological representation into several tiers. These tiers consist of groups of autosegments and they are ordered independently of each other but are interconnected by means of association lines (McCarthy, 1982). The autosegmental structure of representation is originally proposed to handle suprasegmental features and thereafter its empirical domain is extended to various phonological areas.

CV phonology is an autosegmental model designed by Clements and Keyser (1983) to represent the internal structure of syllable. This representation is composed of three tiers, i.e. the syllable node, CV and segmental tiers. The three-tier hierarchical structure of the syllable /men/ is employed as an illustrative example below:

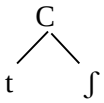
2.



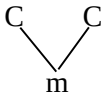
An advantage to utilizing distinct tiers for the characterization of the syllable structure is that the quantity of a segment can be referred to independently of its quality. In this regard, Spencer (1996) maintains that the CV tier is the level at which the quantity of a segment is represented, whereas its quality is described at the segmental tier. He refers to these tiers as the timing tier and melody tier, respectively. Employing these independent tiers facilitates accounting efficiently for the discrepancies between the quantity and quality of segments. To make this possible, a set of association conventions are used for connecting elements on these tiers.

Two of the major association conventions are the no-crossing constraint and the obligatory contour principle (OCP). The former prohibits the crossing of association lines and the latter prohibits identical adjacent segments at the segmental tier (Goldsmith, 1976). Adhering to these conventions allow accounting for cases in which the association between tiers is not formed in a one-to-one fashion. An example of a one-to-many association pattern is exemplified by complex segments, while a many-to-one association between the CV tier and the segmental tier is found in the representation of long segments. Instances of the two types of association are presented, respectively in 3:

3. a.



b.



Providing an accurate account of the internal structure of segments is not the only advantage of CV phonology. Another key advantage of this model is that it utilizes a purely phonological unit, viz. the syllable, for the statement of phonological rules and phonotactic constrains. Accordingly, various phonological rules, such as consonantal deletion and vocalic epenthesis, are found to receive natural and simple notations because they are formulated in terms of the syllable notion (cf. Kenstowicz, 1994; Spencer, 1996).

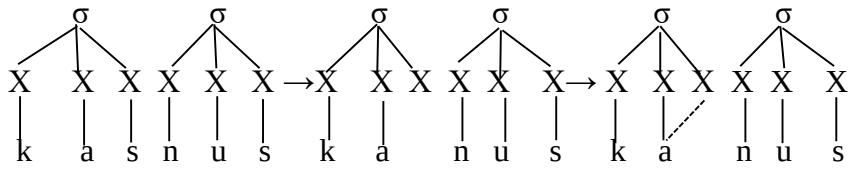
The development of CV phonology involves introducing some modifications to this model. One of these modifications is based on considering the distinction between the C and V elements on the CV tier redundant and arguing that these elements are to be replaced with empty uniform positions labelled as X slots (Levin, 1985). A major impetus for the development of the X-slot model is ascribed to observing that C elements can be associated with vowels and V elements can be mapped to consonants. An example of this observation is found in the analysis of the frequent phonological process of compensatory lengthening. This process involves the lengthening of a segment triggered by the deletion an adjacent segment (Clements & Keyser, 1983).

Hayes (1989, pp. 260-261) cites an example from Latin where "the segment /s/ was deleted before anterior sonorants." When the deleted /s/ followed a vowel, the vowel was lengthened in compensation. For instance, the deletion of the /s/ in the Latin word *kasnus* 'grey' causes the lengthening of its preceding vowel *ka:nus*. Within autosegmental phonology, the autonomy given for elements that occupy different tiers enables providing a straightforward account of the compensatory lengthening process.

That is, the deletion of the /s/ takes place only on the segmental tier which leaves its C element, or timing slot, empty (ibid, p. 261). The empty timing slot spreads to the vowel that precedes the deleted /s/ forming the long vowel /a:/.

Despite that fact that compensatory lengthening lends itself to being analyzed within the autosegmental approach, the CV model of this approach faces a challenge in the analysis of this process. The challenge is that the empty timing slot was attached to the consonant /s/ and thus it is assumed to be specified as [+consonantal]. Spreading an empty C slot to a vowel melody is problematic. To resolve this problematic issue, the C and V slots are replaced with X slots unspecified for the feature [±consonantal]. An X-slot analysis of the compensatory lengthening of the /a/ sound in the Latin word *ka:nus* is adopted from Hayes (1989, p. 261) and used as an illustrative example below:

4.



3. Results and Discussion

In line with Al-Faxiri (1996), Abd Al-Ghani (2010), Al-Samurrai (2013), among others, the analysis of the current AP corpus reveals that all the 620 instances of the APs which are derived from weak imperfective verbs (form I) are on the pattern $|C_1a:C_2iC_3|$. Accordingly, the present analysis of the derivation of the APs is restricted to the pattern $|C_1a:C_2iC_3|$. Table 3 below presents the frequencies of the initially, medially, finally and doubly weak APs that are analyzed in this study.

Table 3. The Frequencies of the Four Types of APs

APs of the pattern $\|C_1a:C_2iC_3\|$	Initially-weak APs	Medially-weak APs	Finally-weak APs	Doubly-weak APs	Total
Frequencies	99	264	230	27	620
Percentages	16%	42.6%	37%	4.4%	100%

As can be shown in Table 3, the most frequent AP type is the medially-weak which constitutes 42.6% of the AP corpus. It is followed by the finally-weak type which accounts for 37% then the initially-weak type which accounts for 16% and finally the doubly-weak type which accounts for 4.4%. The following sections attempt to analyze these four types of APs starting with the imperfective stems from which they are derived.

3.1. Initially-Weak Aps

3.1.1. The Imperfective Stems of Initially-Weak APs

Form I of initially-weak imperfective stems from which APs on the pattern $|C_1a:C_2iC_3|$ are derived have the underlying representation $|GC_2VC_3|$. The first radical in these stems, i.e. the glide, can be a /w/ or a /j/. Mahadin (1982) argued that the majority of initially-weak imperfective stems begin with a /w/ and a very few of them begin with a /j/. According to him, the initially-weak imperfective stems that begin with the /w/ have the following surface representations:

5. a. |C_2iC_3| (e.g. ja-**s̲il** ‘he arrives’)
   b. |wC_2uC_3| (‘e.g. ja-**wfur** ‘it is abundant’)
   c. |wC_2aC_3| (e.g. ja-**wdʒal** ‘he is scared’)
   d. |C_2aC_3| (e.g. ja-**d̲aˁ** ‘he puts’)

As can be noted, the /w/ is deleted in the imperfective stems which are shown in (a) and (d). Mahadin (1982) and Brame (1970) argued that the glide /w/ is deleted when the stem vowel is /i/ and it remains when the stem vowels are /u/ or /a/. The w-deletion rule is stated as follows:

6. w →∅/ Ca#--C_2iC_3] [+B-verbs] (# = morpheme boundary, +B = basic)
   [personal prefix]

The w-deletion rule stipulates that the /w/ is deleted when it is preceded by a personal prefix, in this case the third person masculine prefix ‘ja’ and followed by a |C_2iC_3| sequence. The rule only applies to basic, i.e. non-derived or form I, verbs when their stem vowel is /i/. Mahadin (1982) and Brame (1970) argued that the deletion of the glide /w/ in some of the imperfective stems that have the stem vowel /a/ does not contradict the w-deletion rule. This is attributed to the assumption that the stem vowel of the imperfective forms that are exemplified in (d) is originally /i/ but it becomes /a/ through the application of the laryngeal-assimilation rule.

This rule requires changing the vowel /i/ into /a/ in non-derived imperfective stems when it is adjacent to a laryngeal, where laryngeal includes “those sounds produced in the area extending from the larynx to the upper regions of the pharynx” (Brame, 1970, p. 159). As can be noted from the definition, the term laryngeal encompasses not only the laryngeals but also the pharyngeal and uvular sounds. Accordingly, the laryngeal assimilation rule, as stated in 7 below, is assumed to apply to these three categories of sounds which are subsumed under the guttural category in the present analysis and it is consistent with the lowering effect this category of sounds has on adjacent vowels (cf. McCarthy, 1994).

7. $i \rightarrow a \Big/ \begin{matrix} —L \\ L— \end{matrix} \Big/ \begin{pmatrix} \text{+ imperfect} \\ \text{- derived} \end{pmatrix}$

The w-deletion and the laryngeal assimilation rules apply in an ordered sequence to the imperfective stems that are exemplified in (d). The former rule deletes the /w/ from imperfective verbs of the pattern |ja-wCiL| or |ja-wLiC | *(e.g. ja-w*$\underline{d}i^c$ → *ja-*$\underline{d}i^c$ ‘he puts’) because they meet the deletion conditions. After the deletion of the /w/, the latter rule applies to |ja-CiL | or |ja-LiC | and changes the stem vowel /i/ to /a/ because it is adjacent to a laryngeal (e.g. *ja-*$\underline{d}i^c$ → *ja-*$\underline{d}a^c$). As for the non-derived imperfective stems which begin with the glide /j/, they are always on the pattern |ja-jCVC| which indicates that the glide /j/ is not subjected to the deletion rule which affects its counterpart, i.e. the /w/ (e.g. *ja-**jʔas* ‘he loses hope’) (Mahadin, 1982).

One can conclude from the analysis of form I of the imperfective stems from which initially-weak APs are derived that all of them share the underlying pattern |GC_2VC_3| and that the deletion of the glide in some of their surface representations is ascribed to the application of certain phonological processes. Accordingly, all of the initially-weak APs in the present analysis are assumed to be derived from bases on the pattern |GC_2VC_3|.

3.1.2. The Derivation of Initially-Weak APs from their Imperfective Stems

In the analyses of the derivation of APs from initially-weak verbs, there is a general agreement that they are derived in much the same way as those of strong verbs (Al-Raagihi, 1984; Ryding, 2005; Abd

Al-Ghani, 2010; Al-Samurrai, 2013). The regularity of the derivation of form I APs from initially-weak verbs implies that all the radicals in the underlying representation of the verbal stem, i.e. the source of derivation, are retained in the AP form, i.e. the target of derivation.

Within the analyses that adopted the insights of classical Arabic grammarians, the derivation of the AP (form I) from initially-weak verbs, akin to its derivation from strong verbs, merely involves placing the perfective verb (form I) on the pattern |C_1a:C_2iC_3| (e.g. the perfective verb *wadʒad* 'he found' is placed on this pattern to derive its AP form *wa:dʒid* 'a finder'). A more intricate analysis of this derivation process is carried out by Brame (1970) who argued, on the basis of the hypothesis that there are no long vowels in the underlying level of representation in Arabic, that the long vowel /a:/ does not exist in the underlying representation of the pattern |C_1a:C_2iC_3|, rather it only appears in its surface representation. He maintained that the derivation of APs on the pattern |C_1a:C_2iC_3| entails the infixation of /wa/ into the perfective stem.

The infixation of /wa/ to the perfective stem produces the form |Ca**wa**C_2iC_3| (e.g. *wadʒad* 'he found' *wa**wa**dʒid*). The /w/ in the form |C**awa**C_2iC_3| occurs in intervocalic position which triggers its deletion by the application of the glide elision rule (*wa**w**adʒid→ waadʒid*). Afterwards, the two adjacent /a/ vowels in |C**aa**C_2iC_3| are combined into a single long vowel through the application of a lengthening rule (*w**aa**dʒid→ w**a:**dʒid*). The /wa/-infixation, the glide elision and the lengthening rules are, respectively, stated in 8 below:

8. a- wa [CVX→ [CVwaX

   b- G→∅/V_i__V_j, if j=[+low], i=[+low]

   c- V_i V_i → V_i:

Brame (1970) asserted that the infixation of /wa/ in the course of the derivation of APs (form I) is plausible because the derivation of all the forms of the participles, whether they are active or passive, requires attaching a prefix to the verbal stem. The underlying representation of the participle prefix is /ma/ which is turned into /mu/ in the derived forms, i.e. forms other than form I, of the participles and turned into /wa/ when used as an infix. The rules that stipulate alternating /ma/ into /mu/ or /wa/ are given below:

9. a- ma→ mu/ [+derived]

   b- ma [CVX→ CVmaX→ CVwaX

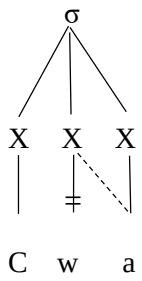
Brame (1970) proposed that the glide /w/ is part of APs (form I) affix because it surfaces in some of the forms to which the affix is added. This proposal is considered plausible by Mahadin (1982) who established that the affixes which are added to modify the meaning of the basic stem should have the shape of the syllable, i.e. |CV|, and not of a single segment.

Changing the affix /wa/ to the long vowel /a:/ can be accounted for straightforwardly if the imperfective stem is employed as the base of derivation. That is, the imperfective stems have underlying representations of the shape |$C_1C_2VC_3$| in which there is no vowel between their first and second consonants. As mentioned in Section 1, the syllables that begin with a cluster of two consonants are not permissible in MSA. For this reason, the imperfective stem can never surface without a personal prefix of the shape |CV|. The addition of a |CV| prefix to the imperfective stem results in the re-syllabification of the stem by placing its first consonant in the coda position of the first syllable and its second consonant in the onset position of the second syllable. The resultant sequence, i.e. |CVC_1-C_2VC_3|, is composed of two permissible syllables and thus it can appear as a surface representation (e.g. *jak-tub* 'he writes').

Infixing the /wa/, or any affix with a |CV| shape, to an imperfective stem to derive to its AP form causes the creation of a cluster of two consonants in the onset position of the syllable |**C_1w**aC_2VC_3|. This triggers the application of a deletion rule which deletes the /w/ and the lengthens its adjacent vowel in

compensation (cf. Section 2.2). In the adopted model of autosegmental phonology, the representation of the deletion and the compensatory lengthening, as depicted in 10, involves deleting the /w/ melody from the segmental tier and spreading its empty X-slot to its following vowel.

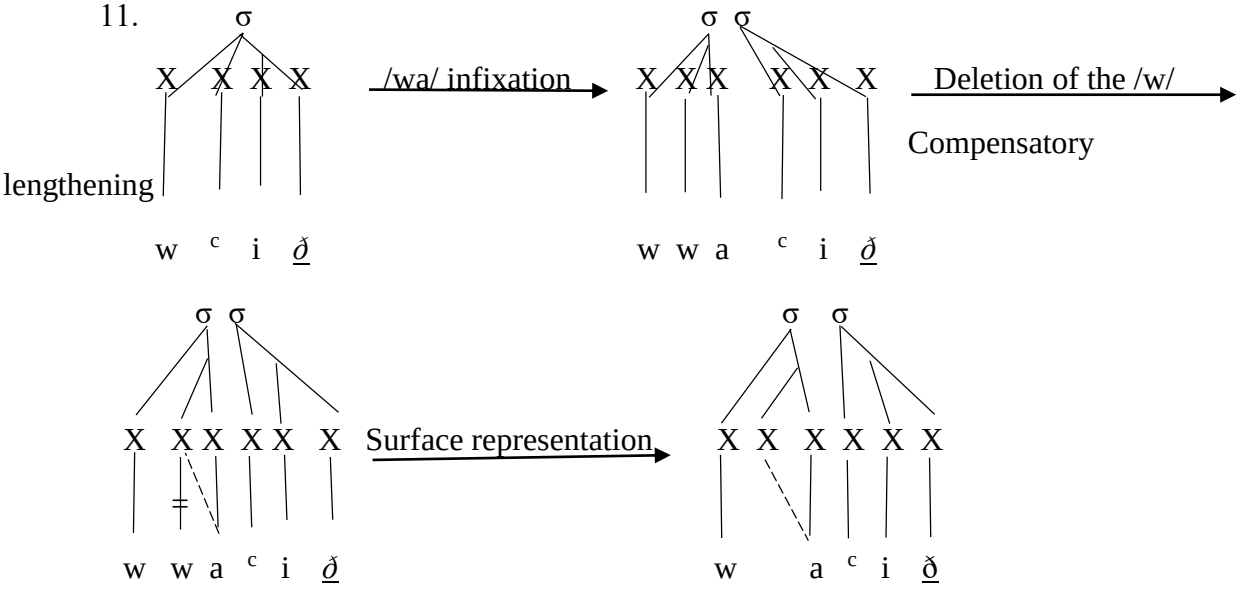
10.



In addition to the insertion of the /wa/ infix between the first and second consonant, another modification to the imperfective stem to derive its AP form is changing the stem vowel, which might be an /a/, /u/ or /i/, to /i/ ($C_1C_2\begin{Bmatrix}\mathbf{a}\\\mathbf{u}\\\mathbf{i}\end{Bmatrix}C_3 \rightarrow C_1C_2\mathbf{i}C_3$). This requires the application of an ablaut rule, i.e. a rule that involves systematic alterations in the stem vowel to indicate modifications of meaning or inflectional information, which changes the features of the stem vowel to [+high] and [-rounded]. As can be noted, the application of the compensatory lengthening and the ablaut rules need not to be ordered because neither of these rules affects the other.

The derivation of the 99 initially-weak APs in the analyzed corpus, as shown in Appendix (A), from their imperfective stems show no deviation from the general pattern. For instance, the derivation the AP form *wa:ᶜiðˍ* 'a preacher' from *wᶜiðˍ*, i.e. the underlying representation of the stem of the imperfective verb *ja-ᶜiðˍ* 'he preaches', involves infixing the /wa/ between the /w/ and /ᶜ/, i.e. its first and second consonants, respectively. Afterwards, the /wa/ is changed to /a:/ through the application of the compensatory lengthening process. As for the ablaut rule that changes the stem vowel to /i/, there is no need for its application because the stem vowel of the verb *ja-ᶜ**i**ðˍ* is already /i/. The derivation of *wa:ᶜiðˍ* from its imperfective stem is shown in 11 below:

11.



3.2. Medially-Weak APs

3.2.1. The Imperfective Stems of Initially-Weak APs

The surface representations of medially-weak imperfective stems are on the pattern |C_1V:C_3|. This pattern is composed of two consonants and a long vowel and hence these stems are apparently biconsonantal. Based on the hypotheses that there are no long vowels in MSA underlying representations and that weak stems have the same structures as those of the strong stems, the medially-weak imperfective stems have underlyingly a pattern that resembles their strong counterparts, i.e.| $C_1C_2VC_3$|. The second consonant of these stems is generally assumed to be a glide that surfaces as a vowel due to its susceptibility to various phonological process (cf. Brame, 1970; Levy, 1971). Even though the glide does not exist in form I of the imperfective verb, it exists in the derived forms of the verb (e.g. *ja-xa:f* 'he fears' (form I) and *ju-xawwif* 'he causes someone to fear' (form II)). Accordingly, all the medially-weak imperfective stems have the underlying shape |C_1GVC_3| which surfaces as |C_1V:C_3| through the application of certain phonological processes.

Brame (1970) accounted for the surface representation of medially-weak imperfective stems by proposing a glide metathesis rule which applies to the sequence CGVC and metathesizes the glide and the stem vowel (e.g. *ja-ᶜ**wud*** → *ja-ᶜ**uwd***). After the application of this rule, an assimilation rule applies to the sequence CVGC and assimilates the glide to its following vowel (e.g. *ja-ᶜ**uwd*** → *ja-ᶜ**uud***). Finally, the two short identical vowels in the resultant sequence CV_iV_iC are combined into a single long vowel by the application of a vowel lengthening rule (*ja-ᶜ**uud*** → *ja-ᶜ**u:d***). The glide metathesis, assimilation and lengthening rules are, respectively, stated in 12.

12. a. CGVC→ CVGC

    b. CVGC→ CV_iV_iC

    c. ViVi→ Vi:

Mahadin (1982) regarded Brame's (1970) analysis as being partially incorrect because of its inability to account for the |aG| sequence. This is ascribed to the permissibility and as such the general stability of the |aG| sequence, as opposed to the |uG| and |iG| sequences, in Arabic. This can be manifested in the facts that the only two diphthongs in Arabic have the |aG| shape, i.e. /aj/ and /aw/, and that the |aG| sequence does not undergo Brame's (1970) assimilation rule in finally-weak verbs (e.g. ra**mayn**a 'we threw') and in the verbal nouns with the shape |CVGC| (e.g. the /aj/ and /aw/ sequences are stable in the verbal nouns *xawf* 'fear' and *baj*ᶜ 'selling').

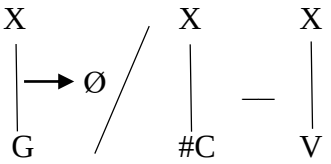
Mahadin (1982) proposed another rule to account for the surface representation of medially-weak verbs in Arabic. This rule, as shown in 13, applies to the sequence |CGV| when it is preceded by a morpheme boundary (#), such as the morpheme boundary of the personal prefix /ja/ in ***ja#ᶜwud*** 'he comes back', and causes the assimilation of the glide to its following vowel which results in the sequence |CV_iV_i|. The assimilation rule is followed by the vowel lengthening rule which is stated in 12 (c).

13. #CGV_i→ CV_iV_i (# designates morpheme boundary)

As can be noticed, this assimilation rule only applies to the |CGV| and not to metathesized |CVG| and this prevents its application to the stable |aG| sequence. Moreover, Mahadin (1982, 255) maintained that specifying the conditioning environment of the rule prevents it from applying to the finally-weak verbs and verbal nouns in that the two of them are not preceded by morpheme boundary. He further asserted that this assimilation rule also applies to various forms of nouns such as the nouns of place *ma#tyar* and *ma#qwam* which surface as *ma#ta:r* 'airport' and *ma#qa:m* 'site', respectively (ibid, 256).

The rule that is proposed by Mahadin (1982) accounts for cases where the glide assimilates to its cognate vowels, i.e. the assimilation of the /w/ and /j/ to the /u/ and /i/, respectively, but it faces problems in accounting for the assimilation of the glide to its non-cognate vowel, e.g. the assimilation of the /w/ to the /a/. This is ascribed the general assumption that the source and the target of assimilation processes should be phonetically similar (cf. Kenstowicz, 1994; Spencer, 1996). A straightforward analysis of the surface forms of medially-weak stems can be provided if the X-slot model of autosegmental phonology is adopted. That is, the glide in the sequence |#CGV$_i$| undergoes a glide elision process, instead of the glide assimilation process, and its adjacent vowel is lengthened in compensation. The statement of this process in the X-slot model of phonology is depicted in 14.

14.



3.2.2. The Derivation of Medially-Weak APs from their Imperfective Stems

In contrast to the derivation of the |C$_1$a:C$_2$iC$_3$| pattern from initially-weak verbs which resembles its derivation from strong verbs, this pattern shows some modifications when it is derived from medially-weak verbs. Traditional Arab linguists, such as Ibin Jinni, 1954; Sibawayh, 1982 and Ibin Asfor, 1987, and the researchers who followed their leads, such as Al-Raagihi, 1984; Al-Faxiri, 1996; Abd Al-Ghani, 2010 and Al-Samurrai, 2013, argued that the medially-weak perfective verbs from which the APs are assumed to be derived generally have the letter *ʔalif,* which corresponds to the long vowel /a:/, as their second radical (e.g. ***ba:***^{c} 'he sold'). The *ʔalif* is substituted with the glottal stop /ʔ/ when these verbs are placed on the pattern |C$_1$a:C$_2$C$_3$| to derive their AP forms (e.g. the *ʔalif* of the verb *ba:*^{c} 'he sold' is realized as /ʔ/ when it is placed on the pattern |C$_1$a:C$_2$C$_3$| to derive the AP *ba:ʔi*^{c} 'a seller').

Brame (1970) contended that the APs (form I) are expected to retain the three consonants, or radicals, of their medially-weak perfective bases. However, one of these radical, i.e. the second one which is originally a glide, is substituted with a glottal stop in the surface representation of these APs (e.g. the APs *sa:**w**id* and *za:**j**id* surface as *sa:ʔid* 'prevailing' *za:ʔid* 'increasing' by inserting a glottal stop in the place of their medial glides). To account for this alternation, he proposed a rule that changes a glide to a glottal stop when it is preceded by /a:/ and followed by a short vowel and called it the glottal formation rule. The glottal formation rule is also observed to apply to a broken plural form of nouns (e.g. the plural form of *dari:batun* 'a tax' surfaces as *dara:ʔibun* 'taxes' instead of *dara:**j**ibun* due to changing the /j/ which occurs between /a:/ and a short vowel into the /ʔ/) . This rule is given in 15.

15. G → ʔ / a:_V

Abdo (2010) assumed that the glottal stop /ʔ/ is infixed after the first stem vowel in these AP forms (e.g. qawil→ qaʔwil). Subsequently, a glide metathesis rule switches the position of the infixed /ʔ/ and its following glide (qaʔwil→ qawʔil). The glide metathesis is followed by an assimilation rule that assimilates the glide to its preceding vowel (qawʔil→ qaaʔil). Finally, a vowel lengthening rule combines the two identical adjacent vowels into a single long one (qaaʔil→ qa:ʔil 'a teller').

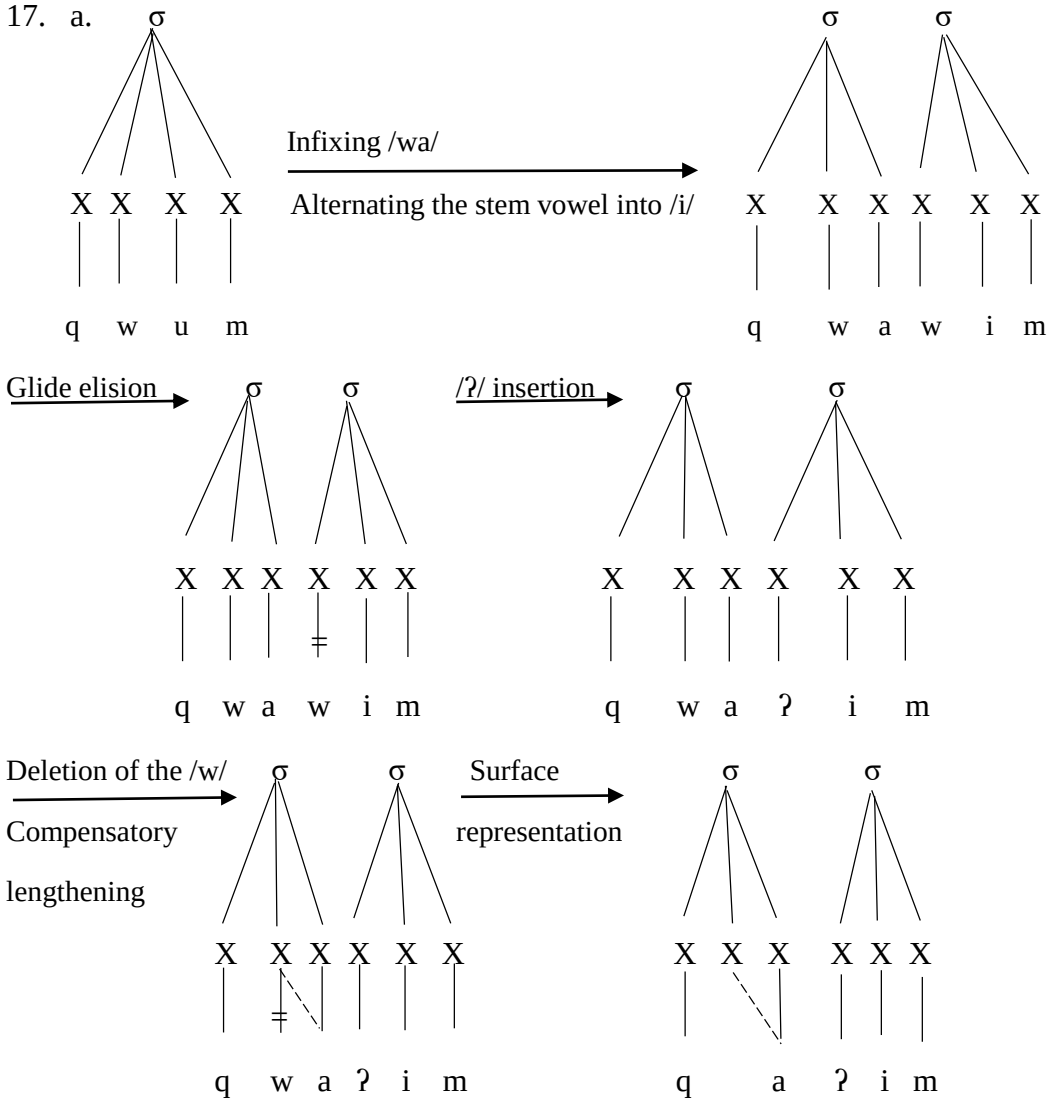
A problematic issue in these analyses is that the /a:Gi/ sequence in medially-weak APs surfaces in other nominal and verbal forms without undergoing any phonological processes. Examples of these forms are presented in 16.

16. a. ju-q**a:wi**m 'he resists' (imperfective verb)
b. q**a:ji**d 'trade' (imperative verb)
c. mu-q**a:wi**l 'a contractor' (active participle)

Even though the alternation between glides and the glottal stop is stated as a general rule, the examples of this alternation are only drawn from two forms (cf. Ibin Jinni, 1954; Brame, 1970; Sibawayh, 1982; Ibin Asfor, 1987; Al-Nuri, 2007). The first is the AP (form I) and second is the broken plural form on the pattern |$C_1aC_2a:C_3iC_4$|. One can argue, in line with Brame (1970), that the infixed /a:/ in these two forms is underlyingly /wa/. Based on this argument, the underlying pattern of the medially-weak APs and the broken plural form are |CwaGiC| and |$C_1aC_2waGiC_4$|, respectively.

In both of these patterns, the glide occurs between two short vowels and this triggers its deletion by the glide elision rule which is stated 8 (b). The deletion of the glide results in making its syllable onsetless. Because onsetless syllables are not allowed in MSA, a prosthetic glottal stop is inserted to function as the onset of the onsetless syllable (cf. Abu Salim, 1988; Żygis, 2010). The representation of the derivation of medially-weak APs from their imperfective stems in the X-slot model of autosegmental phonology is exemplified by the AP *qa:ʔim* ‘standing’ which is shown in 17.

17. a.



As can be shown in 17, the underling representation of the stem of the imperfective verb *ja-qu:m* ‘he stands up’ is *qwum*. The derivation of its AP form requires inserting the infix /wa/ between its first and second consonants and alternating its stem vowel into /i/. The second /w/ in the resultant sequence, i.e. *qwawim*, occurs between the two short vowels /a/ and /i/ and thus it is subjected to the glide elision rule. The deletion of /w/ causes the production of an onsetless syllable which triggers the application of a

glottal epenthesis process. Finally, the /w/ in the sequence *qwaʔim* is deleted to avoid violating the constrain on complex onsets in MSA syllable structure and its empty X-slot spreads to its following vowel which yields the surface representation *qa:ʔim* 'standing'.

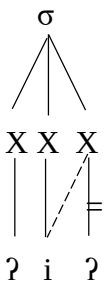
The 264 medially-weak APs, as presented in Appendix (B), that are analyzed in the current study are found to be regularly derived following this pattern except for six, which are shown in Table 4. It should be noted that these six AP forms are listed in the current corpus in the pattern |Ca:ʔin| instead of |Ca:ʔi:| because the nominative or genitive case markers and the indefinite suffix /n/ are attached to the forms that end with a long vowel in the dictionary from which the current corpus is built (see Section 3.3.2).

Table 4. Medially-Weak APs which Deviate from the Derivational Pattern

Dictionary entry number	Consonantal root	Imperfective verb	Gloss	Active participle
804	b w ʔ	ja-bu:ʔ	to deserve	ba:ʔin
3151	d̲ w ʔ	ja-d̲u:ʔ	to be lightened up	d̲a:ʔin
3902	f j ʔ	ja-fi:ʔ	to return	fa:ʔin
4148	q j ʔ	ja-qi:ʔ	to vomit	qa:ʔin
5265	n w ʔ	ja-nu:ʔ	to burden	na:ʔin
5492	h j ʔ	ja-ha:ʔ	to look good	ha:ʔin

As can be observed from Table 4, the imperfective verbs of these APs end with a glottal stop. The insertion of a glottal stop in the course of deriving their AP forms results in the sequence |Ca:ʔiʔ| which has a glottal stop as its second and third radicals. The sequence |Ca:ʔiʔ| surfaces as |Ca:ʔi:|. The surface representation of this sequence is consistent with Sibawayh (1982) who argued that adjacent glottal stops are not allowed in SA. In the current model of analysis, one can simply postulate that the second /ʔ/ is deleted in accordance with the OCP and its preceding vowel is lengthened in compensation, as depicted in

18.



Accounting for the alternation of the /ʔiʔ/ sequence into /ʔi:/ is only possible in the X-slot model of autosegmental phonology. This is ascribed to the observation that the /ʔ/ is not phonetically similar to the /i/ and thus it cannot assimilate to it which leaves its deletion as the only option for avoiding the adjacency of glottal stops. The deletion of a segment in the standard approach of phonology entails eliminating both its quantity and quality. On the other hand, the deletion of a segment within autosegmental phonology only takes place on the segmental tier, which represents the quality of segments, which leaves its quantity, represented in the CV tier or X-tier, intact and capable of spreading to its adjacent segment.

Moreover, utilizing the X-slot model of autosegmental phonology instead of the CV model of this approach for the representation of this instance of compensatory lengthening is attributed to the fact that the quantity, or timing, slots in the former model are not specified for the feature [±consonantal]. This enables accounting for the compensatory lengthening cases which are triggered by the deletion of a consonant and the lengthening of its adjacent vowel in compensation (see Section 2.2).

3.3. Finally-Weak Aps

3.3.1. The Imperfective Stems of Finally-Weak APs

The surface representations of finally-weak verbs are on the pattern |C_1C_2V:|. The long vowel in the pattern |C_1C_2V:| appears as /u:/ (e.g. *ja-ndʒu:* 'he survives'), /i:/ (e.g. *ja-bri:* 'he sharpens'), /a:/ (e.g. *jarqa:* 'he advances'), or alternative /a:/ and /i:/ (*ja-ɣθa:* and *ja-ɣθi:* 'he talks a lot'). Proposing that the underling representation of finally-weak imperfective verbs, as well as the other weak imperfective verbs, is identical to those of their strong counterparts, requires identifying the phonological processes that change their underling representation, i.e. |ja- C_1C_2VG|, to their surface representation, i.e. |ja- C_1C_2u:|. In this regard, Mahadin (1982) observed that most of the changes to the underling representations of finally-weak verbs are triggered by the interaction between their stems and the suffixes that are attached to them. He maintained that the third radical of finally-weak verbs, i.e. the glide, is regularly deleted when these verbs inflect for their indicative case. The deletion is caused by the glide elision rule, as stated in 8 (b), which takes place when a glide occurs between two vowels VGV, except for when the first vowel is high and the second is low, i.e. uGa and iGa.

For instance, the addition of the indicative case suffix /u/ to the imperfective verb *ja-dˁuw* 'he invites' causes the occurrence of the glide /w/ between two high vowels, i.e. |uGu|, which triggers its deletion by the glide elision rule. Subsequently, the two identical short vowels become one long vowel by the application of the vowel lengthening rule which is stated in 12 (c). The application of these phonological processes changes the underlying representations of the imperfective verb *ja-dˁuw* to its surface representation, i.e. *ja-dˁu:* 'he invites, indicative case'.

On the other hand, the addition of the subjunctive case suffix /a/ to *ja-dˁuw* places the glide /w/ between the high vowel /u/ and the low vowel /a/. The sequence |uGa| does not undergo the glide elision rule and thus this imperfective verb surfaces as *ja-dˁuwa* 'he invites, subjunctive case'. The addition of the subjunctive case suffix does not always result in retaining the glide of finally-weak verbs. For example, inflecting the imperfective verb *ja-lqaj* 'he encounters' for the subjunctive case results in the sequence *ja-lqaj-a*. Because the glide /j/ in this sequence occurs between two short low vowels, it undergoes the glide elision rule. After application the glide elision, the two adjacent /a/ vowels are combined into the long vowel /a:/ which results in the surface representation *ja-lqa:* 'he meets, subjunctive case'.

As for the imperfective verbs that have non-identical stem and case vowels, a vowel assimilation rule is to be posited between the glide deletion rule and the lengthening rule to enable their derivation. This can be demonstrated by inflecting the imperfective verb *ja-rmiy* 'he throws' for the indicative case which produces *ja-rmiy-u*. The application of the glide elision rule to this sequence leads to the existence of the two adjacent vowels /iu/. Apparently, these two vowels are not identical and hence they cannot be contracted into a single long vowel. The /iu/ vowel cluster is not allowed because two vowels cannot occupy the same nucleus position and if each of these vowels is assumed to constitute its own syllable, then the second syllable becomes onsetless which is not allowed in Arabic. According to Mahadin (1982, 234), the /iu/ cluster undergoes a vowel assimilation rule in which the second member of the cluster assimilates to the first member. The resultant sequence, i.e. /ii/, undergoes the vowel lengthening rule and the targeted imperfective verb surfaces as *ja-rmi:* 'he throws, indicative case'.

3.3.2. The Derivation of Finally-Weak APs from their Imperfective Stems

All what is mentioned about finally-weak APs in the traditional analyses of their derivation is that their third radical, i.e. the glide, when their indefinite forms are inflected for the nominative and genitive cases (e.g. *ra:min* 'a thrower, nominative/genitive case') and its retained when they are inflected for the accusative case (e.g. *ra:mijan* 'a thrower, accusative case) (Al-Faxiri, 1996; Abd Al-Ghani, 2010; Al-Samurrai, 2013; among others). These analyses tend to consider the indefinite form which is declined

for the nominative/genitive case and has the surface pattern |C_1a:C_2in| as the unmarked form of finally-weak APs. Similarly, *mu^{c}dʒam ʔalluɣah ʔal^{c}arabijjah ʔalmu^{c}a:s̲irah*, i.e. the dictionary from which the current corpus is compiled, uses this form as the citation form of finally-weak APs as opposed to the initially and medially weak APs which are listed in it in their uninflected, i.e. pausal, forms.

The deletion of the glide in these forms was observed by Brame (1970) who found that declining the indefinite form of finally-weak APs for the nominative or genitive case results in causing their final glide to be in a position that meets the conditions of the glide elision rule. For instance, attaching the genitive case suffix to the AP *da:^{c}iw* yields *da:^{c}iw-i*. The /w/ of this AP occurs between two short /i/ vowels and this prompts its deletion by the glide elision rule. The identical contiguous vowels in the resultant form, i.e. *da:^{c}ii*, are turned into the long vowel /i:/ due to the application of the vowel lengthening rule. Attaching the indefiniteness suffix /n/ to the surface form *da:^{c}i:* derives the form *da:^{c}i:-n* 'a caller'. This form undergoes a vowel shortening rule which shortens long vowels when they are followed by one consonant which occurs in the final position of the word. This rule, as presented in 19, causes the form *da:^{c}i:-n* to surface as *da:^{c}in* 'a caller'.

19. V: → V/ ___CΨ (Ψ designates the word boundary)

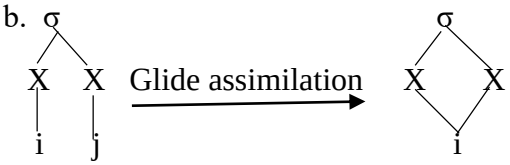
The declination of this AP for the nominative case results in the same representation, i.e. *da:^{c}in*, but requires the application of the vowel assimilation rule after the glide elision (*da:^{c}ij-un→ da:^{c}i-un→ da:^{c}iin*). The removal of the indefiniteness suffix /n/ from *da:^{c}in* changes it to *da:^{c}i:* 'caller' due to its failure to meet the conditioning environment for the vowel shortening rule. Finally, similar to its imperfective base, the declension of this AP for the accusative case results in retaining its final glide (*da:^{c}ijan* 'a caller, accusative case').

It should be indicated that the derivation of the uninflected forms of finally-weak APs is generally neglected in the literature since the changes to the underlying representation of these APs are, similar to their verbal bases, assumed to be stimulated by the interaction between their stems and the suffixes that are attached to them. The analysis of the derivation of the uninflected forms of finally-weak APs requires taking a closer look at their underlying representation. The underlying representation of these APs, in the current analysis, is |C_1waC_2iG| which results from inserting the infix /wa/ between the first and second consonants of the underlying representation of their imperfective stems, which are on the pattern |C_1C_2VG|, and alternating their stem vowels into /i/. The glide in the pattern |C_1waC_2iG| might be a /j/ or a /w/ and thus the /iG/ sequences are realized as /ij/ or /iw/.

These two vowel/glide sequences are not permissible diphthongs in MSA and thus they are not allowed to occur in the same syllable. The /ij/ sequence is regularly changed to /ii/ through the application of the glide, or syllabicity, assimilation process which involves the assimilation of glides to their cognate vowels when they are preceded by these vowels (cf. Brame, 1970; Abushunar & Mahadin 2017; among others). The glide assimilation rule, as stated in 20 (a), alternates the sequences /ij/ and /uw/ into /ii/ and /uu/, respectively, when these sequences occur at the end of the word or when are followed by consonants. This rule is argued to be a natural rule that reflects the facts that Arabic does not have the /ij/ and /uw/ diphthongs and that the diphthongs that it has, i.e. /aj/ and /aw/, are not affected by this rule because the /a/ vowel does not have a cognate glide which assimilates to it. The application of this rule to the /ij/ to change it to /i:/ in the X-slot model is depicted in 20 (b).

20. a. $\begin{Bmatrix} j \\ w \end{Bmatrix} \rightarrow \begin{Bmatrix} i \\ u \end{Bmatrix} / \begin{Bmatrix} i \\ u \end{Bmatrix} \_\_ \begin{Bmatrix} C \\ \Psi \end{Bmatrix}$

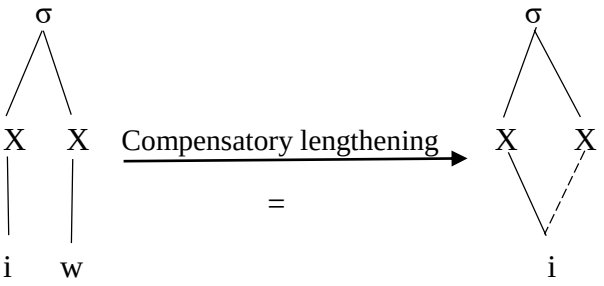
b.



Because the stem vowel of the pattern |C_1waC_2iG| is /i/, the surface representation of the finally-weak APs that have the glide /j/ as its last radical can be straightforwardly accounted for by the application of the glide assimilation rule. For instance, the application of this rule to *rwamij*, i.e. the underlying representation of the AP *ra:mi:* 'thrower', causes the assimilation of the /j/ to its cognate vowel /i/ and this yields *rwamii*. This sequence undergoes the vowel lengthening rule and surfaces as *ra:mi:* 'thrower'. As opposed to the surface representation of the finally-weak APs that end with the /j/, accounting for the surface representation of those that end with the /w/ cannot be done through the glide assimilation rule. This is ascribed to the fact the /w/ cannot assimilate to the /i/ in the sequence /iw/ because it is not its cognate vowel.

Since the assimilation rule cannot apply to the sequence /iw/ because its two members are phonetically dissimilar and the deletion of the first member of the sequence, i.e. the /i/, is not possible because it constitutes the nucleus of the syllable, resolving the problem of the impermissible sequencing of the /i/ and /w/ needs to target the second member which can be done in two ways. The first way is applying a rule proposed by Brame (1970) which changes the /w/ into /j/ when it is preceded by /i/ and applying the glide assimilation rule to the resultant sequence, i.e. /ij/. The other way, which is simpler and more economic, is deleting the /w/ and lengthening its adjacent vowel, i.e. the /i/, in compensation which yields /i:/. This can be exemplified in the alternation of the underlying representation *dwa^{c}iw* to its surface representation *da:^{c}i:* 'caller' which involves, in addition to changing the infix /wa/ into /a:/, the deletion of the /w/ and the lengthening of the /i/ in compensation as presented in 21.

21.

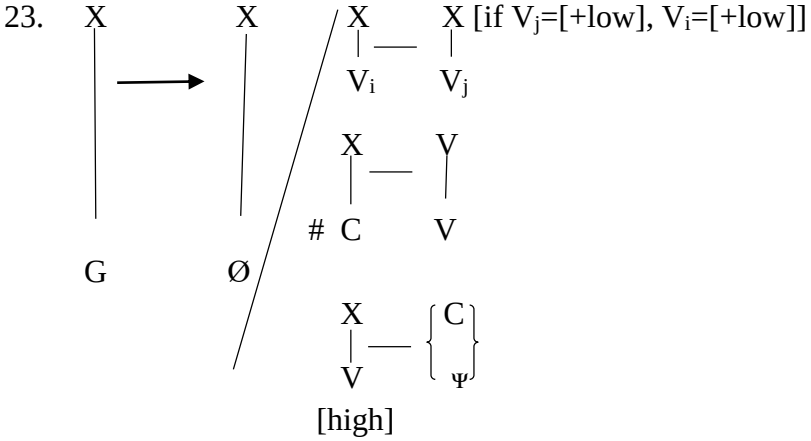


As shown in 20 (b) and in 21, glide assimilation and compensatory lengthening rules produce similar surface representations in the X-slot model of phonology. However, the latter rule is considered more general because in addition to accounting for the alternations of /ij/ and /uw/ into /i:/ and /u:/, respectively, it also straightforwardly accounts for the alternations of /iw/ and /uj/ into /i:/ and /u:/, respectively. One can add that the latter rule is mainly employed in the standard approach of phonology due its inability to account for compensatory lengthening processes. Therefore, the compensatory lengthening rule is going to be used instead of the glide assimilation to account for changing impressible diphthongs to long vowels in MSA. On the grounds that compensatory lengthening follows elision rules, the conditioning environment for the glide elision in the impressible diphthongs needs to be specified. Since the permissible diphthongs in MSA are composed of the low vowel /a/ and a glide and the impermissible ones are composed of a high vowel, i.e. /u/ or /i/, and a glide, the glide elision in the latter

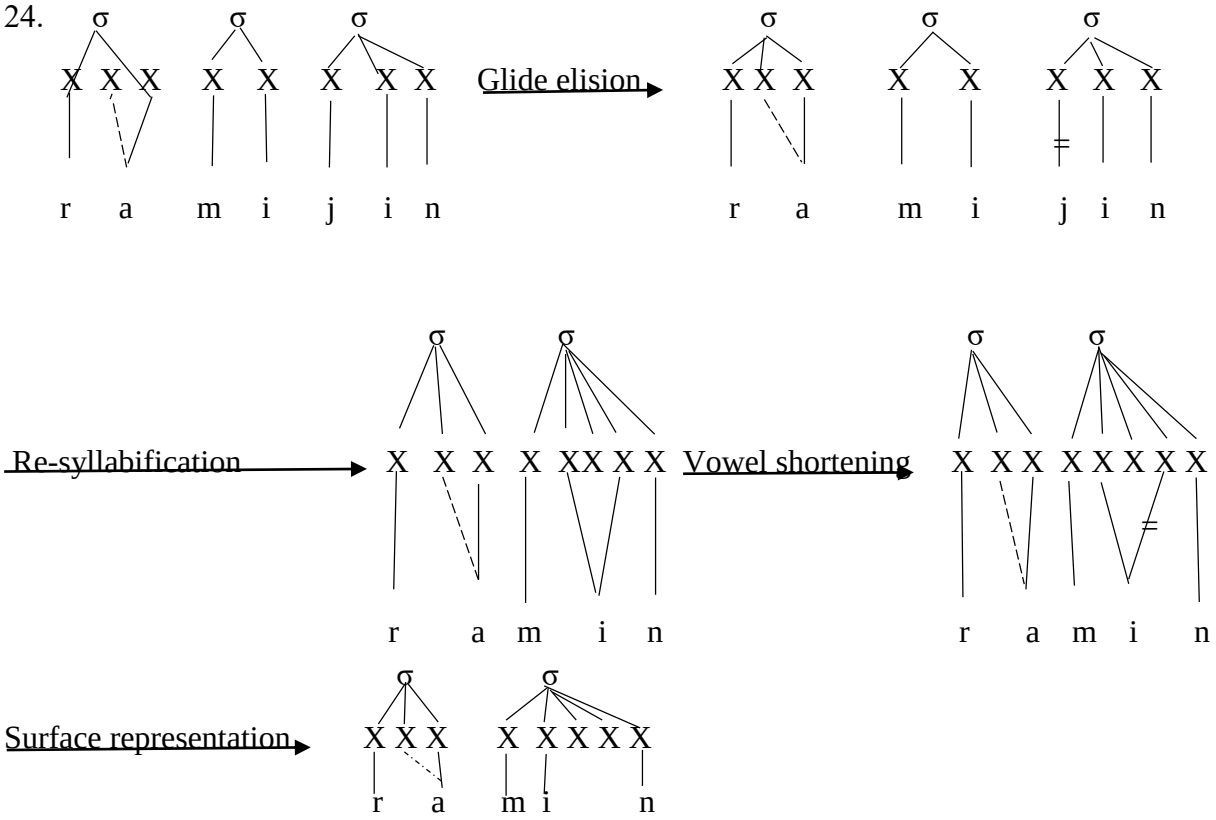
diphthongs occurs when the glide is preceded by a high vowel. Re-stating the glide assimilation rule which is given in 20 (b) as an instance of glide elision is shown in 22.

22. $G \rightarrow \emptyset /\ V\_\_\_\ \begin{Bmatrix} C \\ \Psi \end{Bmatrix}$
[high]

The conditioning environments for the all the three instances of glide elision that have been discussed so far, as stated in 8 (b), 14 and 22, are combined into one rule to form a general account of glide elision in MSA. The statement of this rule in the X-slot model of phonology is shown in 23.

23. 

The surface representations of the 230 finally-weak APs which are listed in Appendix (C) are all of the pattern $|C_1a:C_2in|$. The representation of the derivation of these forms from their imperfective stems in the X-slot model of autosegmental phonology, ignoring the alternations of the infix /wa/ into /a:/ and of the stem vowel into /i/, is exemplified in *ra:min* 'a thrower, genitive case' as depicted in 24.

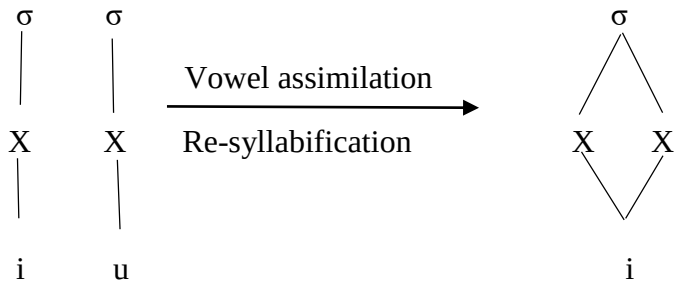
24. 

Two points should be indicated regarding the derivation process in 24. The first is that if the empty X-slot, or timing slot, is not filled by the insertion of a segment like in 17 or by the application of the compensatory lengthening process like in 18, it remains floating (cf. van der Hulst and Smith, 1982). Two instances of floating X-slots are shown in 24. One of them results from the application of the glide elision rule to the /j/ and the other results from the application of the vowel shortening rule to the /i:/.

The second point is that when the output of a phonological rule does not conform to the constraints on syllable structures in the course of derivation, re-syllabification processes operate to re-syllabify it in accordance with these constraints (Clements & Keyser, 1983; Mahadin, 1994). For example, the application of the glide elision rule in 24 causes the appearance of the two adjacent syllables /mi/ and /in/. The second syllable, i.e. /in/, is onsetless which violets MSA syllabification constraints. Accordingly, a re-syllabification rule applies and combines these two syllables into one syllable. The syllable /miin/ conforms to permissible syllable structures in MSA but it violates the OCP principle which bans adjacent identical elements at the segmental tier. Consequently, the two adjacent identical elements /ii/ are combined into the single long element /i:/ to ensure maintaining the OCP at the segmental tier.

As mentioned previously in this section, the AP surface representation *ra:min* is not only the result of declining *ra:mi:* for its genitive case but it can be also the outcome of declining this AP for its nominative case. Even though the declinations of this AP to its genitive and nominative cases yield the same surface representation, the latter case requires an extra rule, i.e. the vowel assimilation rule, to change the /iu/ sequence into /i:/. The representation of this instance of vowel assimilation rule is given in 25.

25.



3.4. Doubly-Weak Aps

3.4.1. The Imperfective Stems of Doubly-Weak Aps

Doubly-weak imperfective stems, i.e. the stems that possess two glides in their consonantal roots, which serve as the bases for deriving doubly-weak APs in the current study are divided into two categories. The first category consists of stems which have their second and third radicals as glides, whereas the second category consists of stems which have glides as their first and third radicals. These two categories are identified by traditional grammarians as *ʔallafi:f ʔalmaqru:n* 'weak stems that have adjacent glides in their consonantal roots' and *ʔallafi:f ʔalmafru:q* 'weak stems that have non-adjacent glides in their consonantal roots', respectively (cf. Al-Faxiri, 1996; Abd Al-Ghani, 2010 and Al-Samurrai, 2013). The former category of stems exhibits an underlying representation of the shape $|C_1G_1VG_2|$ which surfaces as $|C_1G_1V:|$ (e.g. *ja-**lwij**→ja-**lwi:*** 'he bends') and the latter has an underlying representation of the shape $|G_1C_2VG_2|$ which surfaces as $|C_2i:|$ (e.g. *ja-**wqij**→ ja-**qi:*** 'he protects').

The derivation of the surface representations of the second category from their underlying representations conforms to the regular patterns of deriving initially and finally weak verbs. That is, the glide which occurs underlyingly in the initial position of these stems is /w/ and their stem vowel is /i/ and thus they all undergo the w-deletion rule stated in 6 (e.g. *ja-**w**hij→ ja-hij*) and the glide that occurs

underlyingly in their final position undergoes the glide elision process stated in 23 (e.g. *ja-<u>h</u>**ij**→ ja-<u>h</u>i:* 'he inspires').

As for the stems of the first category, they follow the same derivational pattern of finally-weak verbs (e.g. *ja-<u>t</u>w**ij**→ ja-<u>t</u>w**i:*** 'he folds'*)* but they deviate from the pattern of deriving medially-weak verbs. This is ascribed to the observation that the |GV| sequence in these forms fails to alternate to |V:| akin to its counterpart in medially-weak verbs. For instance, the |GV| sequence in the medially-weak verb *ja-ʿ**wu**d* surfaces as *ja-ʿ**u:**d* 'he returns' but this sequence does not alternate to |V:| in the doubly-weak verb *ja-r**wi**j* which surfaces as *ja-r**wi:*** 'he narrates/quenches'. In this regard, Brame (1970, p. 267) stated that "the medial glide of all roots of the shape CGG is exceptional with regard to Glide Metathesis." The glide metathesis is, according to Brame (1970), the first step for deriving the surface representations of medially-weak verbs from their underlying representations (see Section 3.2.1). This rule creates an environment in which the glide assimilation and vowel lengthening rules can apply. As a result of not applying the glide metathesis rule to the doubly-weak verbs which have roots of the shape |CGG|, the conditioning environment for its subsequent rules are not met in these verbs and thus their medial glides are retained.

Allowing the imperfective verbs that have roots of the shape $|CG_1G_2|$ to bypass the regular derivation of medially-weak verbs can be avoided if the second conditioning environment for the glide elision rule which is stated in 14 is slightly modified. Based on this conditioning environment, the glide which is preceded by a consonant and followed by a vowel, i.e. |C**G**V|, undergoes the elision rule. The elision of the glides that occur in the |C**G**V| sequence can be further restricted by proposing that the vowel in this sequence must be followed by a [consonantal] consonant. The only consonants that lack the feature [consonantal] are the glides (Spencer 1996). Thus, $|G_1|$ in the sequence $|CG_1VG_2|$ does not undergo the glide elision rule because its following vowel is followed by a glide, i.e. $|G_2|$, lacking the [consonantal] feature.

Since the underlying form of the doubly-weak imperfective stems that have the root shape $|CG_1G_2|$ is $|CG_1VG_2|$, the glide elision rule does not apply to their medial glides. On the other hand, $|G_2|$ in these stems meets the third conditioning environment for the glide elision rule, as stated in 23, hence, it undergoes this rule. For example, the derivation of the surface representation of the doubly-weak verb as *ja-rwi:* 'he narrates/quenches' involves applying the glide elision rule to the final radical in the underling representation of its stem, i.e. *rwi**j***, and retaining its medial glide because it does not meet the conditioning environments for the glide elision rule.

3.4.2. The Derivation of Doubly-Weak APs from their Imperfective Stems

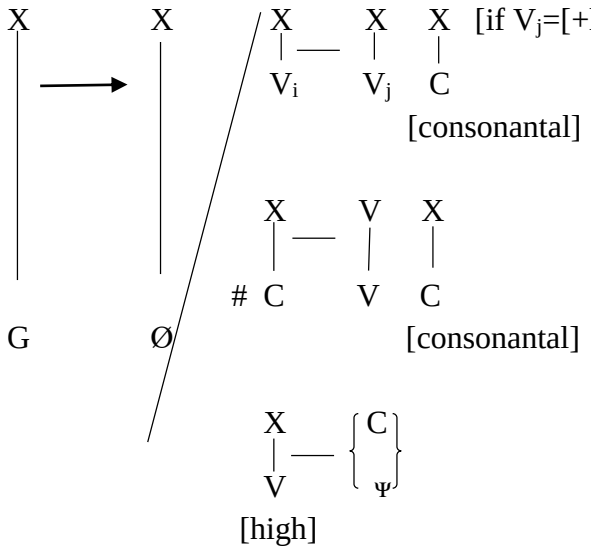
The 27 doubly-weak APs, which are listed in Appendix (D), exhibit derivational patterns that resemble the two categories of the imperfective bases form which they are derived. The APs that are derived from the imperfective bases of the shape $|G_1C_2VG_2|$, akin to their imperfective bases, follow the general derivational patterns of initially and finally weak APs. Accordingly, the initial glide in these APs is retained and the final glide undergoes the elision rule. For instance, the derivation of the AP *wa:qin* 'a protector' from the imperfective stem *wqij* involves, in addition to alternating the stem vowel into /i/ and the infix /wa/ into /a:/, applying the glide elision, re-syllabification and vowel shortening rules that are stated in 24.

On the other hand, similar to their imperfective bases, the doubly-weak APs which are derived from bases of the shape $|C_1G_1VG_2|$ follow the same pattern of deriving finally-weak APs but deviate from the derivational pattern of medially-weak APs. That is, the medial |G| alternates to a glottal stop in medially-weak APs (e.g. *qa:wil→ qa:ʔil* 'a teller') but this alternation does not take place in these doubly-weak verbs (e.g. *ta:win→ta:win* 'a folder'). According to Brame (1970), the roots of the shape |CGG| are not only considered exceptions to the application of the glide metathesis rule but they are also exceptional with regard to the glottal formation rule and thus their medial glide does not alternate into |ʔ|.

Similar to their imperfective bases, the apparent irregularity of these AP stems can be simply accounted for by making a minor modification to the first conditioning environment for the glide elision rule which is stated in 23. Based on this conditioning environment, the glide which occurs between two vowels |VGV| undergoes the elision rule, except for the glides which are preceded by high vowels and followed by low vowels. The elision of the glides that occupy intervocalic positions can be further restricted by postulating that the second vowel in the |VGV| sequence must be followed by a [consonantal] consonant. Accordingly, $|G_1|$ in the sequence $|VG_1VG_2|$ does not undergo the glide elision rule because the second vowel in this sequence is followed by a consonant which lacks the [consonantal] feature, i.e. $| G_2|$. The underlying representation of the doubly-weak APs which have the root |CGG| is $|CwaG_1iG_2in|$. $|G_1|$ in this representation is preceded by the vowel /a/ and followed by the vowel /i/ which in turn is followed by $|G_2|$. Therefore, the glide elision does not target $|G_1|$ because it does not meet the first conditioning environment for this rule.

The restatement of the glide elision rule in 4.19 with the modifications to the its first and second conditioning environments, which are made in Sections 3.4.2 and 3.4.1, respectively, is shown in 26.

26.



4. Conclusions

The analysis of the current AP corpus reveals that the derivation of initially-weak APs from their imperfective bases involves no additional processes to the ones employed for the derivation of their strong counterparts. On the other hand, the medially, finally and doubly weak APs undergo, in addition to the process that derive strong APs, the glide elision rule which is followed by compensatory lengthening, re-syllabification and insertion processes. Accounting for these processes is only possible in the X-slot model of autosegmental phonology due to its reference to the quantity of segments independently of their quality and to it utilization of a purely phonological unit, viz. the syllable, for the statement of phonological rules.

5. Ethics Committee Approval

The author(s) confirm(s) that the study does not need ethics committee approval according to the research integrity rules in their country (Date of Confirmation: October 22, 2020).

References

Abd Al-Ghani, A. (2010). *ʔassarf ʔalka:fi:* [sufficient morphology]. Cairo: da:r ʔttawfi:qijjah liltura:θ.

Abdo, D. (2008). *ʔabḥa:θ fi: ʔalkalimah wa ʔadʒumlah* [studies in the word and the sentence]. Amman: da:r ʔalkarmil.

Abdo, D. (2010). *dira:sa:t fi: ʿilm ʔaswa:t ʔalʿarabijjah* [studies in Arabic phonology]. (VOL 2). Amman: da:r dʒari:r.

Abu Salim, I. (1988). On the phonological status of /ʔ/ in Classical Arabic. *Albahth, 36*, 71-79.

Abushunar, M. and Mahadin, R. (2017). An autosegmental analysis of Arabic passive participle of triliteral verbs, *Arab Society of English Language Studies*, *8*, 252-267.

Al-Faxiri, S. (1996). *tasri:f ʔalʔfʿa:l wa ʔalmasa:dir wa ʔalmuʃtaqqa:t* [the inflection of verbs, verbal nouns and derived forms]. Cairo: ʿasmi liʔannaʃir wa ʔattwzi:ʿ.

Al-Nuri, J. (2007). *ʿilm ʔalʔaswa:t ʔalʿarabijjah* [Arabic phonology]. Palestine: dʒa:miʿat ʔalquds ʔalmaftu:hah.

Al-Raajihi, A. (1984). *ʔattatbiiq ʔassarfi:* [morphological application]. Beirut: da:r ʔannahd ʔalʿarabijjah.

Al-Samurrai, M. (2013). *ʔassarf ʔalʿarabij ʔahka:m wa maʿa:ni:* [the rules and meanings of Arabic morphology]. Sharjah: da:r ʔibin kaθi:r.

Alshdaifat**,** A. (2014). *The formation of nominal derivatives in the Arabic language with a view to computational linguistics* (Unpublished Doctoral dissertation), University of Salford, Salford.

Aniis, I. (1975). *ʔalʔaswa:t ʔalluɣawijjih* [Arabic sounds]. Cairo: maktabat alʔa:nglo ʔalmasirijjah.

Benmamoun, E. (1999). Arabic morphology: The central role of the imperfective. *Lingua, 108*,175-201

Clements, G & Keyser, S. (1983). *CV phonology: A generative theory of the syllable.* Cambridge: The MIT Press.

Goldsmith, J. (1976). An overview of autosegmental phonology. *Linguistic Analysis*, 2, 23-68.

Hayes, B. (1989). Compensatory lengthening in moraic phonology. *Linguistic Inquiry, 20*, 253-306.

Hetzron, R. (1992). Semitic languages. In W. Bright (Ed.), *International Encyclopedia of Linguistics* (pp. 412-417). Oxford: Oxford University Press.

Holes, C. (1995). *Modern Arabic: Structures, functions and varieties***.** London: Longman.

Hulst, H. & Smith, N. (1982). An overview of autosegmental and metrical phonology. In H. Hulst, H. & N. Smith (Ed.), *The structure of phonological representations* (pp.2-45). Dordrecht: Foris Publications.

Ibin Asfor, A. (1987). *ʔlmumtiʿ fi: ʔttasri:f* [enjoyable morphology] (Vol. 1). Beirut: da:r ʔlmaʿrifah.

Ibin Jinni, A. (1954), *ʔalmunsif* [the equitable] (Vol. 2). Cairo: da:r ʔihaja:ʔ ʔattura:θ ʔalqadi:m.

Kenstowicz, M. (1994). *Phonology in generative grammar.* Cambridge, Mass. & Oxford: Blackwell.

Levy, M. (1971). *The plural of the noun in Modern Standard Arabic.* Ph.D. dissertation, University of Michigan.

Mahadin, R. (1982). *The morphophonemics of the standard Arabic triconsonantal verbs.* Unpublished Doctoral Dissertation, University of Pennsylvania, Philadelphia.

Mahadin, R. (1994). An X-skeleton of some phonological processes in Arabic. *Al-Abhath, 42*, 49-95.

McCarthy, J. (1982). Nonlinear phonology: An Overview. *GLOW Newsletter*. 50. Retrieved August 23, 2019 from https://scholarworks.umass.edu/linguist_faculty_pubs/50

McCarthy, J. (1994). The phonetics and phonology of Semitic pharyngeal. In P. Keating (Ed.), *Phonological Structure and Phonetic Forms* (pp. 191-233). Cambridge: Cambridge University Press.

Omar, A. (2008). *muᶜdʒam ʔalluɣah ʔalᶜarabijjah ʔalmuᶜaa̲si̲rah* [the dictionary of Modern Standard Arabic]. Cairo: ᶜaalam alkutub.

Ryding, K. (2005). *A reference grammar of modern standard Arabic*. Cambridge: Cambridge University Press.

Shahin, A. (1980). *ʔalmanhadʒ ʔs̲s̲awt̲i lilbunjah ʔalᶜarabijjah* [a phonological analysis to Arabic structure]. Beirut: ʔarrisa:lah.

Spencer, A. (1996). *Phonology: Theory and description*. Oxford: Blackwell.

Sibawayh, A. (1982). *ʔalkita:b* [the book] (Vol. 4). ᶜa:lam ʔalkutub wa ʔattiba:ᶜah wa ʔannaʃir: Beirut.

Watson, J. (2002). *The phonology and morphology of Arabic*. Oxford: Oxford University Press.

Wright, W. (1896). A *grammar of the Arabic language*. Cambridge: Cambridge University Press

Żygis, M. (2010). Typology of consonantal insertions. *ZAS Papers in Linguistics***,** *52,* 111-40.

Appendix A. An example appendix

Table 5. Initially-Weak APs of the Pattern $C_1a{:}C_2iC_3$

Number	Dictionary entry number	Gloss	Active participle
1	5525	to bury alive	wa:ʔid
2	5527	to agree with	wa:ʔim
3	5539	to perish	wa:biq
4	5539	to perish	wa:biq
5	5540	to rain heavily	wa:bil
6	5540	to have bad consequences	wa:bil
7	5541	to wedge	wa:tid
8	5542	to hold back	wa:tir
9	5545	to jump	wa:θib
10	5547	to trust	wa:θiq
11	5548	to settle	wa:θin
12	5499	to fall down to be imperative to have a meal to beat rapidly	wa:dʒib
13	5550	to be sad for to adore to hate to come across to have money to know	wa:dʒid
23	5571	to settle down	wa:diᶜ
24	5575	to leave	wa:ðir
25	5577	to inherit	wa:riθ
26	5578	to arrive	wa:rid
27	5583	to expand	wa:rif
28	5584	to put forth leaves	wa:riq
29	5585	to have large hips	wa:rik
30	5587	to become swollen	wa:rim
31	5592	to sin	wa:zir
32	5594	to stop	wa:ziᶜ
33	5596	to weigh	wa:zin
34	5600	to be centered	wa:sit
35	5601	to expand	wa:siᶜ
36	5601	to encompass	wa:siᶜ
37	5602	to envelop	wa:siq
38	5603	to need	wa:sil
39	5604	to mark	wa:sim
40	5608	to intertwine	wa:ʃidʒ
41	5613	to tattoo	wa:ʃim
42	5616	to be consistent	wa:sib
43	5618	to describe	wa:sif
44	5619	to arrive to connect to treat good	wa:sil

14	5551	to be brief	wa:ʤiz
15	5552	to be hidden to fear	wa:ʤis
16	5554	to hurry up	wa:ʤif
17	5556	to be speechless	wa:ʤim
18	5558	to hit one's face	wa:ʤih
19	5559	to be alone	wa:hid
20	5565	to pierce	wa:xiz
21	5566	to become gray-haired	wa:xit
22	5571	to leave	wa:diˁ
54			
55	5636	to be persistent	wa:ðib
56	5638	to collect	wa:ˁib
57	5640	to promise to threaten	wa:ˁid
58	5641	to be bumpy	wa:ˁir
59	5642	to designate	wa:ˁiz
60	5643	to preach	wa:ˁið
61	5644	to be in pain	wa:ˁik
62	5648	to be filled with hatred	wa:ɣir
63	5648	to be filled with hatred	wa:ɣir
64	5649	to intrude upon to delve into	wa:ɣil
65	5651	to arrive at	wa:fid
66	5652	to increase	wa:fir
67	5654	to be right	wa:fiq
68	5656	to darken	wa:qib
69	5657	to time	wa:qit
70	5659	to inflame	wa:qid
71	5661	to be deaf	wa:qir
72	5663	to happen to appear to fall to insult	wa:qiˁ
73	5664	to stand up to inform to stop	wa:qif
74	5671	to nest	wa:kir
75	5672	to hit	wa:kiz
76	5673	to decrease	wa:kis
77	5675	to flow	wa:kif
45	5620	to disgrace	wa:sim
46	5624	to be clear	wa:dih
47	5625	to put to humiliate to deprive	wa:diˁ
48	5626	to put on the cutting board	wa:dim
49			
50	5627	to weave	wa:din
51	5628	to be simple to step	wa:tiʔ
52	5632	to break	wa:tis
53	5634	to inhabit	wa:tin
78	5676	to delegate	wa:kil
79	5678	to decrease	wa:lit
80	5679	to enter	wa:liʤ
81	5680	to give birth	wa:lid
82	5682	to drink	wa:liy
83	5685	to grieve	wa:lih
84	5685	to grieve	wa:lih
85	5688	to indicate	wa:miʔ
86	5690	to twinkle	wa:mid
87	5694	to bestow	wa:hib
88	5695	to inflame	wa:hiʤ
89	5698	to imagine	wa:him
90	5698	to be delusional	wa:him
91	5699	to be weak	wa:hin
92	5699	to weaken	wa:hin
93	5709	to lose hope	ja:ʔis
94	5724	to be dry	ja:bis
95	5739	to become easy to be rich to dispense with	ja:sir
96	5739	to become easy	ja:sir
97	5743	to shout	ja:ˁir
98	5749	to hit on the fontanelle	ja:fix
99	5750	to be young	ja:fiˁ
100	5757	to make blessed	ja:min
101	5757	to turn right	ja:min

Appendix (B)

Table 6. Medially-Weak APs of the Pattern $C_1a:C_2iC_3$

Number	Dictionary entry number	Gloss	Active participle
1	804	to deserve	ba:ʔin
2	812	to reveal	ba:ʔih
3	813	to become silly	ba:ʔix
4	817	to leave uncultivated	ba:ʔir
5	822	to kiss	ba:ʔis
6	829	to sell	ba:ʔiˤ
7	834	to urinate	ba:ʔil
8	850	to become	ba:ʔit
9	855	to diminish	ba:ʔid
10	871	to lay eggs	ba:ʔid
11	873	to sell	ba:ʔiˤ
12	879	to appear to leave	ba:ʔin
13	1006	to repent	ta:ʔib
14	1013	to long	ta:ʔiq
15	1018	to get lost	ta:ʔih
16	1022	to make possible for	ta:ʔih
17	1029	to be in love	ta:ʔim
18	1031	to get lost	ta:ʔih
19	1079	to come back to one's senses	θa:ʔib
20	1080	to rebel	θa:ʔir
21	1261	to wander	ʤa:ʔib
22	1264	to exist in large numbers or amounts	ʤa:ʔid
23	1267	to be unjust	ʤa:ʔir
24	1269	to be accepted	ʤa:ʔiz
25	1270	to keep coming back	ʤa:ʔis
26	1271	to be hungry	ʤa:ʔiˤ
27	1275	to roam	ʤa:ʔil
28	1282	to occur	ʤa:ʔin
29	1287	to quake	ʤa:ʔiʃ
30	1288	to rot	ʤa:ʔif
31	1497	to sin	ha:ʔib
32	1500	to keep	ha:ʔið
33	1501	to come back	ha:ʔir
34	1502	to possess	ha:ʔiz
35	1503	to stop	ha:ʔiʃ
36	1507	to guard	ha:ʔit
37	1510	to contrive	ha:ʔik
38	1511	to elapse to stop	ha:ʔil
39	1513	to move in circles	ha:ʔim
40	1518	to alter one's course	ha:ʔid
41	1519	to be confused	ha:ʔir
42	1520	to possess	ha:ʔiz
43	1523	to try to escape	ha:ʔis
44	1524	to menstruate	ha:ʔid
45	1526	to be unfair	ha:ʔif
46	1527	to confine	ha:ʔiq
47	1528	to weave	ha:ʔik
48	1529	to change	ha:ʔil
49	1530	to approach	ha:ʔin
50	1703	to roar to become weaker	xa:ʔir
51	1705	to go through	xa:ʔid
52	1706	to be scared	xa:ʔif
53	1708	to betray	xa:ʔin
54	1710	to fail	xa:ʔib
55	1711	to pick	xa:ʔir
56	1715	to sew	xa:ʔit
57	1716	to be arrogant to assume	xa:ʔil
58	1882	to feel dizzy	da:ʔix
59	1884	to keep moving in circles	da:ʔir
60	1887	to step on	da:ʔis
61	1892	to be changed	da:ʔil
62	1896	to persist	da:ʔim
63	1898	to be despicable	da:ʔin
64	1922	to borrow	da:ʔin
65	1984	to melt	ða:ʔib
66	1985	to prevent	ða:ʔid
67	1986	to experience	ða:ʔiq
68	1993	to be widespread	ða:ʔiˤ
69	1994	to have a tail	ða:ʔil
70	2216	to make skeptical	ra:ʔib
71	2218	to drop dung	ra:ʔiθ
72	2219	to be current	ra:ʔiʤ
73	2220	to leave	ra:ʔih
74	2220	to feel comfortable	ra:ʔih
75	2221	to lead	ra:ʔid
76	2228	to train	ra:ʔid
77	2229	to be scared	ra:ʔiˤ
78	2230	to elude	ra:ʔiɣ
79	2231	to be pure	ra:ʔiq
80	2234	to aspire to	ra:ʔim

81	2243	to make skeptical	ra:ʔib
82	2244	to slow down	ra:ʔiθ
83	2246	to smell	ra:ʔih
84	2247	to have feathers	ra:ʔiʃ
85	2248	to increase	ra:ʔiˁ
86	2250	to be poured	ra:ʔiq
87	2252	to depart	ra:ʔim
88	2253	to cover	ra:ʔin
89	2370	to run	za:ʔib
90	2373	to dislocate	za:ʔih
91	2374	to prepare supplies	za:ʔid
92	2375	to visit	za:ʔir
93	2377	to be removed	za:ʔiˁ
94	2378	to deviate	za:ʔiy
95	2382	to cease to exist	za:ʔil
96	2383	to get angry	za:ʔim
97	2386	to oil	za:ʔit
98	2390	to disappear	za:ʔih
99	2391	to increase	za:ʔid
100	2394	to become noisy	za:ʔit
101	2395	to swerve	za:ʔiy
102	2396	to act in a dishonest way	za:ʔif
103	2399	to beautify	za:ʔin
104	2667	to prevail	sa:ʔid
105	2669	to get angry	sa:ʔir
106	2670	to rule	sa:ʔis
107	2672	to lash	sa:ʔit
108	2673	to be permitted	sa:ʔiy
109	2677	to lead	sa:ʔiq
110	2678	to rub	sa:ʔik
111	2682	to wander	sa:ʔim
112	2687	to flow	sa:ʔib
113	2692	to flow to cruise	sa:ʔih
114	2693	to sink	sa:ʔix
115	2695	to walk	sa:ʔir
116	2703	to taste good	sa:ʔiy
117	2707	to stream	sa:ʔil
118	2916	to blemish	ʃa:ʔib
119	2921	to kick	ʃa:ʔit
120	2923	to see	ʃa:ʔif
121	2925	to yearn	ʃa:ʔiq
122	2926	to become strong	ʃa:ʔik
123	2926	to be pierced with a thorn	ʃa:ʔik
124	2928	to become high	ʃa:ʔil
125	2931	to be ugly	ʃa:ʔih
126	2938	to build	ʃa:ʔid
127	2941	to burn	ʃa:ʔit
128	2943	to spread	ʃa:ʔiˁ
129	2947	to pick up	ʃa:ʔil
130	2949	to disgrace	ʃa:ʔin
131	3073	to be correct	sa:ʔib
132	3074	to yell	sa:ʔit
133	3078	to direct	sa:ʔir
134	3079	to measure	sa:ʔiˁ
135	3080	to mold	sa:ʔiy
136	3082	to assault	sa:ʔil
137	3085	to fast	sa:ʔim
138	3087	to protect	sa:ʔin
139	3089	to scream	sa:ʔih
140	3090	to hunt	sa:ʔid
141	3092	to become	sa:ʔir
142	3095	to stay in the summer	sa:ʔif
143	3151	to be lightened up	da:ʔin
144	3152	to be hungry	da:ʔir
145	3154	to smell good	da:ʔiˁ
146	3156	to harm	da:ʔir
147	3158	to be lost	da:ʔiˁ
148	3159	to host	da:ʔif
149	3160	to be narrow	da:ʔiq
150	3161	to be unjust	da:ʔim
151	3252	to go astray	ta:ʔih
152	3258	to obey	ta:ʔiˁ
153	3259	to go around	ta:ʔif
154	3260	to bear	ta:ʔiq
155	3261	to reach	ta:ʔil
156	3294	to go astray	ta:ʔih
157	3265	to fly	ta:ʔir
158	3266	to be headless	ta:ʔiʃ
159	3267	to obey	ta:ʔiˁ
160	3268	to go around	ta:ʔif

161	3269	to bear	ta:ʔiq
162	3271	to throw mud at	ta:ʔin
163	3489	to contort	ʿa:ʔidʒ
164	3490	to return	ʿa:ʔid
165	3491	to seek protection	ʿa:ʔið
166	3493	to miss	ʿa:ʔiz
167	3496	to compensate	ʿa:ʔid
168	3497	to be stopped	ʿa:ʔiq
169	3498	to be unjust	ʿa:ʔil
170	3500	to float	ʿa:ʔim
171	3504	to disfigure	ʿa:ʔib
172	3505	to ravage	ʿa:ʔiθ
173	3506	to disgrace	ʿa:ʔir
174	3510	to hate	ʿa:ʔif
175	3511	to stop	ʿa:ʔiq
176	3512	to become poor	ʿa:ʔil
177	3625	to fall in	ya:ʔir
178	3628	to dive	ya:ʔis
179	3629	to sink	ya:ʔit
180	3631	to destroy	ya:ʔil
181	3633	to speak ill of somebody to fall into a coma to absent oneself from	ya:ʔib
182	3634	to help	ya:ʔiθ
183	3636	to be jealous	ya:ʔir
184	3637	to disappear	ya:ʔid
185	3638	to sink	ya:ʔit
186	3639	to enrage	ya:ʔið
187	3642	to harm	ya:ʔil
188	3643	to be cloudy	ya:ʔim
189	3872	to pass	fa:ʔit
190	3879	to spread a strong odor	fa:ʔih
191	3880	to boil over	fa:ʔir
192	3882	to win	fa:ʔiz
193	3890	to surpass to hiccup	fa:ʔiq
194	3900	to utter	fa:ʔih
195	3902	to return	fa:ʔin
196	3905	to spread a strong odor	fa:ʔih
197	3916	to be filled with	fa:ʔid
198	4129	to feed	qa:ʔit
199	4131	to lead	qa:ʔid
200	4133	to measure	qa:ʔis
201	4134	to demolish	qa:ʔid
202	4137	to follow	qa:ʔif
203	4138	to cackle	qa:ʔiq
204	4141	to speak	qa:ʔil
205	4145	to stand up	qa:ʔim
206	4148	to vomit	qa:ʔin
207	4151	to tie	qa:ʔid
208	4154	to measure	qa:ʔis
209	4158	to crack	qa:ʔid
210	4159	to become hot	qa:ʔið
211	4160	to crackle	qa:ʔiq
212	4161	to nap	qa:ʔil
213	4451	to drink from a jug	ka:ʔiz
214	4473	to exist	ka:ʔin
215	4480	to deceive	ka:ʔid
216	4487	to weigh	ka:ʔil
217	4494	to be weak	ka:ʔin
218	4641	to dirty	la:ʔiθ
219	4644	to appear	la:ʔih
220	4645	to escape	la:ʔið
221	4649	to ask for protection	la:ʔiz
222	4651	to cling to to be gay	la:ʔit
223	4653	to be impatient	la:ʔiʿ
224	4655	to chew	la:ʔif
225	4656	to chew	la:ʔik
226	4660	to blame	la:ʔim
227	4666	to deprive from	la:ʔit
228	4675	to be fit for	la:ʔiq
229	4945	to die	ma:ʔit
230	4947	to surge	ma:ʔidʒ
231	4949	to surge	ma:ʔir
232	4968	to be rich in water	ma:ʔih
233	4974	to sway	ma:ʔid
234	4976	to provide	ma:ʔir
235	4977	to distinguish	ma:ʔiz
236	4978	to strut	ma:ʔis

237	4979	to move away from	ma:ʔit
238	4980	to become fluid	ma:ʔiˤ
239	4990	to deviate from	ma:ʔil
240	4996	to be rich in water	ma:ʔih
241	5265	to burden	na:ʔin
242	5266	to return to be affected by to take place of	na:ʔib
243	5269	to moan	na:ʔih
244	5271	to illuminate	na:ʔir
245	5275	to vacillate	na:ʔis
246	5276	to take	na:ʔiʃ
247	5278	to resort to	na:ʔis
248	5279	to be dependent on	na:ʔit
249	5281	to rise	na:ʔif
250	5284	to get	na:ʔil
251	5285	to sleep	na:ʔim
252	5291	to be unfortunate	na:ʔib
253	5296	to line up	na:ʔir
254	5303	to achieve	na:ʔil
255	5480	to repent	ha:ʔid
256	5482	to collapse	ha:ʔir
257	5484	to tremble	ha:ʔiʃ
258	5486	to fear	ha:ʔil
259	5492	to look good	ha:ʔin
260	5494	to fear	ha:ʔib
261	5496	to be agitated	ha:ʔidʒ
262	5510	to break	ha:ʔid
263	5511	to be wide	ha:ʔiˤ
264	5517	to wander to be thirsty	ha:ʔim

Appendix (C)

Table 7. Finally-Weak APs of the Pattern $C_1a{:}C_2iC_3$

Number	Dictionary entry number	Gloss	Active participle
1	43	to become a father	ʔa:bin
2	45	to refuse	ʔa:bin
3	56	to come	ʔa:tin
4	83	to have a brother	ʔa:xin
5	178	to comfort	ʔa:sin
6	179	to heal	ʔa:sin
7	253	to weaken	ʔa:lin
8	324	to slow down	ʔa:nin
9	522	to appear	ba:din
10	605	to sharpen	ba:rin
11	689	to be unjust to want	ba:yin
12	703	to stay	ba:qin
13	713	to cry	ba:kin
14	751	to test	ba:lin
15	751	to wear off	ba:lin
16	789	to build	ba:nin
17	803	to look beautiful	ba:hin
18	985	to follow to recite	ta:lin
19	1057	to bleat	θa:yin
20	1078	to bend	θa:nin
21	1110	to collect	ʤa:bin
22	1111	to collect	ʤa:bin
23	1114	to bow	ʤa:θin
24	1164	to run	ʤa:rin
25	1172	to recompense	ʤa:zin
26	1197	to harden	ʤa:fin
27	1214	to rinse	ʤa:lin
28	1245	to commit a crime to gather	ʤa:nin

29	1328	to throw	ha:θin
30	1329	to throw	ha:θin
31	1337	to be wise	ha:dʒin
32	1337	to be wise	ha:dʒin
33	1347	to sing for camels to follow	ha:din
34	1355	to imitate	ha:ðin
35	1397	to sip	ha:sin
36	1404	to stuff	ha:ʃin
37	1434	to give generously	ha:fin
38	1434	to walk barefoot	ha:fin
39	1446	to talk	ha:kin
40	1459	to be sweet	ha:lin
41	1476	to be hot	ha:min
42	1477	to protect to put someone on a diet to be hot	ha:min
43	1493	to feel compassion for	ha:nin
44	1494	to bend	ha:nin
45	1553	to be extinguished	xa:bin
46	1624	to fear	xa:ʃin
47	1632	to be castrated	xa:sin
48	1650	to walk	xa:tin
49	1657	to be hidden	xa:fin
50	1658	to hide	xa:fin
51	1658	to be hidden	xa:fin
52	1673	to be empty to be devoted to	xa:lin
53	1696	to use impolite language	xa:nin
54	1697	to use impolite language	xa:nin
55	1747	to become dark	da:dʒin
56	1753	to flatten	da:hin
57	1754	to flatten	da:hin
58	1803	to call	da:ˁin
59	1840	to express one's opinions	da:lin
60	1856	to bleed	da:min
61	1863	to get closer	da:nin
62	1876	to be experienced by	da:hin
63	1878	to be experienced by to be insightful	da:hin
64	1958	to disperse	ða:rin
65	1959	to disperse	ða:rin
66	1969	to intensify	ða:kin
67	2032	to increase	ra:bin
68	2032	to row	ra:bin
69	2045	to commemorate	ra:θin
70	2046	to commemorate	ra:θin
71	2059	to hope	ra:dʒin
72	2066	to cause to revolve	ra:hin
73	2067	to grind	ra:hin
74	2104	to moor	ra:sin
75	2112	to bribe	ra:ʃin
76	2124	to be satisfied	ra:din
77	2140	to herd sheep to care for	ra:ˁin
78	2146	to froth to grunt	ra:ɣin
79	2160	to get married	ra:fin
80	2171	to recite Quran over someone for healing and protection	ra:qin
81	2171	to advance	ra:qin
82	2196	to throw	ra:min
83	2206	to look forward to	ra:nin
84	2274	to push gently	za:dʒin
85	2297	to mock	za:rin
86	2325	to increase	za:kin
87	2326	to increase	za:kin
88	2365	to fornicate	za:nin

89	2369	to be arrogant	za:hin
90	2434	to imprison	sa:bin
91	2454	to be calm to cover	sa:dʒin
92	2466	to dredge	sa:hin
93	2466	to dredge	sa:hin
94	2474	to become generous	sa:xin
95	2475	to become generous	sa:xin
96	2511	to walk to spread	sa:rin
97	2520	to assail	sa:tin
98	2527	to strive to betray	sa:ʿin
99	2545	to disperse	sa:fin
100	2554	to give someone a drink	sa:qin
101	2590	to forget	sa:lin
102	2590	to cause to forget	sa:lin
103	2618	to rise up	sa:min
104	2652	to lighten	sa:nin
105	2658	to forget	sa:hin
106	2760	to rain	ʃa:tin
107	2766	to become sad	ʃa:dʒin
108	2788	to sing	ʃa:din
109	2792	to smell good	ʃa:ðin
110	2813	to buy	ʃa:rin
111	2858	to heal	ʃa:fin
112	2866	to be distressed	ʃa:qin
113	2873	to complain	ʃa:kin
114	2875	to complain	ʃa:kin
115	2969	to long for	sa:bin
116	2970	to act boyishly	sa:bin
117	2977	to wake up	sa:hin
118	2978	to wake up	sa:hin
119	2991	to get thirsty	sa:din
120	3010	to decline from	sa:yin
121	3011	to decline from	sa:yin
122	3020	to be pure	sa:fin
123	3039	to be tortured	sa:lin
124	3113	to be in the forenoon	da:hin
125	3126	to fight hard	da:rin
126	3136	to increase	da:fin
127	3184	to flatten	ta:hin
128	3208	to be despotic	ta:yin
129	3217	to float	ta:fin
130	3030	to paint	ta:lin
131	3040	to silt	ta:min
132	3248	to cook	ta:hin
133	3249	to cook	ta:hin
134	3308	to be arrogant to be very old	ʿa:tin
135	3311	to cause mischief	ʿa:θin
136	3312	to cause mischief	ʿa:θin
137	3330	to run to be unjust	ʿa:din
138	3355	to befall	ʿa:rin
139	3356	to get nacked	ʿa:rin
140	3367	to be ascribed to	ʿa:zin
141	3368	to be ascribed to	ʿa:zin
142	3395	to disobey	ʿa:sin
143	3419	to be removed to forgive	ʿa:fin
144	3449	to be high	ʿa:lin
145	3451	to rise	ʿa:lin
146	3482	to take by force to submit to	ʿa:nin
147	3484	to pay attention to to be exhausted	ʿa:nin
148	3530	to feel sick	ya:θin
149	3531	to feel sick	ya:θin
150	3531	to feel sick	ya:θin
151	3531	to talk a lot	ya:θin
152	3538	to leave at lunch time to become	ya:din
153	3540	to feed	ya:ðin
154	3559	to glue	ya:rin
155	3565	to invade	ya:zin
156	3571	to darken to come upon	ya:ʃin

157	3590	to sleep	ya:fin
158	3591	to sleep	ya:fin
159	3603	to become expensive to be excessive	ya:lin
160	3604	to boil	ya:lin
161	3622	to become rich	ya:nin
162	3714	to sacrifice	fa:din
163	3761	to lie	fa:rin
164	3779	to fart	fa:sin
165	3787	to spread	fa:ʃin
166	3797	to be empty	fa:din
167	3845	to delouse	fa:lin
168	3848	to delouse	fa:lin
169	3863	to perish	fa:nin
170	3945	to bend	qa:bin
171	3970	to have motes in the eye	qa:ðin
172	4007	to follow	qa:rin
173	4008	to host	qa:rin
174	4021	to be harsh	qa:sin
175	4042	to become distant	qa:sin
176	4046	to judge	qa:din
177	4058	to miaow	qa:tin
178	4073	to follow	qa:fin
179	4089	to fry	qa:lin
180	4089	to hate	qa:lin
181	4121	to become red	qa:nin
182	4224	to fall	ka:bin
183	4342	to sheathe	ka:sin
184	4372	to have enough	ka:fin
185	4428	to call	ka:nin
186	4428	to imply	ka:nin
187	4544	to peel	la:hin
188	4570	to blaze	la:ðin
189	4585	to smatter	la:yin
190	4585	to smatter	la:yin
191	4603	to encounter	la:qin
192	4634	to be amused to be distracted	la:hin
193	4634	to divert from	la:hin
194	4754	to remove	ma:hin
195	4756	to erase	ma:hin
196	4769	to stab	ma:din
197	4808	to be ungrateful	ma:rin
198	4838	to walk	ma:ʃin
199	4848	to go away to sign	ma:din
200	4888	to whistle	ma:kin
201	4927	to test	ma:nin
202	4928	to test	ma:nin
203	4999	to be distant	na:ʔin
204	5026	to be inconsistent with	na:bin
205	5055	to make a secret conversation to survive	na:ʤin
206	5066	to head for	na:hin
207	5076	to be proud	na:xin
208	5103	to need	na:zin
209	5116	to leave	na:sin
210	5117	to forget	na:sin
211	5133	to get drunk	na:ʃin
212	5142	to catch from the forelock	na:sin
213	5150	to undress	na:din
214	5171	to make a sound	na:ʿin
215	5172	to announce the death of someone	na:ʿin
216	5183	to babble	na:yin
217	5200	to deny	na:fin
218	5235	to defeat	na:kin
219	5248	to grow	na:min
220	5250	to increase	na:min
221	5264	to prevent	na:hin
222	5350	to rise	ha:bin
223	5366	to satirize	ha:ʤin
224	5379	to guide	ha:din
225	5383	to ramble	ha:ðin
226	5399	to hit with a baton	ha:rin
227	5402	to wear out clothes	ha:rin
228	5429	to be mistaken	ha:fin
229	5464	to wander	ha:min

Appendix (D)

Table 8. Doubly-weak APs of the Pattern $C_1a:C_2iC_3$

Number	Dictionary entry number	Gloss	Active participle
1	372	to accommodate	ʔa:win
2	1083	to settle	θa:win
3	1709	to be empty	xa:win
4	1514	to include	ha:win
5	1901	to make loud noise	da:win
6	1990	to wither	ða:win
7	2241	to quench to narrate	ra:win
8	2385	to dismiss	za:win
9	2932	to barbeque	ʃa:win
10	3155	to join	da:win
11	3155	to be weak	da:win
12	3262	to fold	ta:win
13	3503	to bark	ʿa:win
14	3632	to deviate from what is right	ya:win
15	4477	to burn	ka:win
16	4664	to bend	la:win
17	5289	to depart to intend	na:win
18	5490	to fall to perish	ha:win
19	5564	to inspire	wa:hin
20	5574	to give blood money	wa:din
21	5615	to adorn to inform against	wa:ʃin
22	5646	to realize	wa:ʿin
23	5655	to fulfill to increase	wa:fin
24	5665	to protect	wa:qin
25	5687	to be close to rule	wa:lin
26	5692	to abandon	wa:nin
27	5701	to be weak	wa:hin

Modern standart Arapça'da üç ünsüzden oluşan fiillerden zayıf aktif sıfat-fiil türetilmesinin otomatik segment analizi

Öz

Bu çalışma, otosegmental fonolojinin X-slot modelinde triconsonantal eksik fiillerden zayıf aktif sıfat fiil türetilmesini analiz etmeyi amaçlamaktadır. Araştırmanın ilk aşaması, sağlam köklü bir sözlükten korpus oluşturmayı içerir. Korpus, başta, ortada, sonda ve iki kat zayıf sıfat fiil olarak kategorize edilen 620 sıfat fiil içerir. Analiz, düzensiz yüzey temsillerine sahip olmalarına rağmen, zayıf sıfat fiillerin temeldeki temsillerinin güçlü emsallerininkilerle paralel olduğunu ortaya koymaktadır. Bu sıfat fiillerin yüzey düzensizlikleri, kaymaların çeşitli fonolojik kurallara duyarlı olmalarına neden olan doğal kararsızlığına atfedilebilir. Bu fonolojik kurallara, bu yaklaşımda farklı katmanlardaki öğelerin sahip olduğu özerklik nedeniyle, otomatik segmental fonolojide doğru ve basit temsiller verilmiştir.

Anahtar sözcükler: Otosegmental fonoloji; MSA; korpus çalışması; zayıf gövdeler; sıfat fiil

AUTHOR BIODATA

Eman Awni Ali is a lecturer at the University of Jordan. She received her BA in English Language and Literature from Al-Balqa'a Applied University in 2010 and her PhD in Linguistics from the University of Jordan in 2020. Ali's research interests include the areas of phonology and phonetics, language acquisition and sociolinguistics. ORCID: https://orcid.org/0000-0001-5652-4813

Radwan Salim Mahadin is a Professor of linguistics at the University of Jordan, Amman, Jordan. He received his BA in English Language and Literature from the University of Jordan in 1976 and his PhD in Linguistics from the University of Pennsylvania in 1982. Mahadin's research interests include, but not limited to, the areas of phonology and phonetics, discourse analysis, semantics, pragmatics and historical linguistics.