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Rule Ordering in Uvwie

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Abstract: One of the assumptions underlying theories of phonological derivation is that the phonological architecture of any language consists of, at least, an abstract underlying form, its surface form and conditions which derive the surface form from its underlying form. It is further assumed that the conditions are serially ordered in frameworks which subscribe to the rule ordering such as orthodox generative phonology and lexical phonology. In the present study, these issues are engaged in the case of Uvwie. In particular, the study seeks to investigate the conditions (processes and rules) which derive surface forms from their corresponding underlying forms, and the order in which they apply. Thus the study will examine the different well-motivated phonological rules attested in the derivation of Uvwie formatives, and provide evidence for the order in which the processes apply. The study employe data documented in Ekiugbo (2016), and couched its analysis within rule ordering principle of generative phonology. The study identifies six rules, which are ordered thus: nasal assimilation > glide formation > vowel elision > tone fusion > vowel lengthening > consonant elision.
Keywords: rule ordering, Uvwie, phonological processes, underlying form, surface form

1. Introduction

Phonological rule refers to any rule which is posited as involved in deriving a pronunciation from an underlying phonological representation (Trask, 1996:273). A basic assumption in theories of derivation is that the phonological architecture of any language consists of; at least, an abstract underlying form, a surface form and conditions that map the underlying form unto the surface form. According to Trask (1996:366), the underlying representation is "…a more or less abstract phonological representation of a segment, a morpheme, a word or a phrase which is posited by an analyst and from which corresponding surface forms, including any variant realizations, are derived by the application of rules." The surface form is more or less an accurate transcription of the

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actual speech event (McCarthy, 2007). In orthodox generative phonology, the underlying and surface forms are the two designated levels of representation.

The third component of language architecture is the conditions which map underlying forms unto their surface forms. In orthodox generative phonology, these conditions are expressed in the form of rules. It has also been argued, beginning with Chomsky & Halle (1968), that the rules which derive surface forms from their corresponding underlying forms are faithfully ordered. Rule ordering employs the concept of precedence relationship (Mascaró, 2011), which refers to the sequential relation holding between a set of phenomena. When two or more phenomena are ordered, they occur one after another. Following Crystal (2008:380), precedence relationship takes the form X > Y, which means X must precede Y. The principle of rule ordering provides a mechanism for identifying the formal role of phonological rules and their interactions.

In the present study, the phonological processes attested in the native phonology of Uvwie, their representative rules as well as the order in which the rules apply in the phonological grammar of the language are examined. It shows how ordering allows for a better expression of the process phonology in Uvwie. The work is divided into five sections – introduction, literature review, methodology, data presentation and analysis, and conclusion. In what follows, extant literature relevant to this study is reviewed.

2. Literature review

Goldsmith (1995:2) defines the phonological rule as the "…mappings between two levels of sound representation." They are formalized accounts of processes or descriptive statements about the phonology of a language. In most theories of generative phonology, two levels of representation are noted. These are the underlying representation and the surface representation. The assumption is that the observed phonetic forms of formatives, the surface forms, are derived from some abstract underlying forms. The underlying form (or underlying representation) of a formative is the abstract form of the formative prior to the application of any phonological rule (O'Grady & Archibald, 2005; Bromberger & Halle, 2006). For instance, the phoneme /*t*/ in a word like *'wet'* may be realized differently in most varieties of American English as shown in (1) below.

(1) English (Gimson, 2008)

a. [*wɛtˀ*] 'wet'

b. [ˈ*wɛɾə*] 'wetter'

In (1a), the phoneme /*t*/ is realized as a glottalized sound while in (b), it is realized as a flap. In both cases, however, the underlying representation of the morpheme 'wet' is the same. The assumption here is that the phonemic/underlying form undergoes some derivations depending on the context. When sounds are juxtaposed with other sounds, they

sometimes become modified (Yul-Ifode, 2008; Birjandi & Salmani-Nodoushan, 2005). Also, the morphology or syntax of a language may juxtapose sounds in such a way that violates the well-formedness constraints of the language, in which case phonological processes apply as a strategy for arriving at the language's grammar specification. This accounts for why phonetic output of sounds may differ from their underlying representations.

Central to the discussion on phonological rules is the motivation and domain of the application of a rule. According to Katamba (1989), languages undergo phonological processes for at least four reasons. These are (a) coarticulatory purposes, e.g., assimilation; (b) constraint on articulatory mechanism, e.g., voicing; (c) perceptual purposes, e.g., syncope/dissimilation; and (d) relation between articulation/perception, e.g., syllable processes. However, these may at best be seen as phonetic motivations for phonological processes, as there are phonological motivations. Broadly speaking, phonological rules are either phonetically or phonologically motivated. Phonetically motivated processes result from the natural response of the human vocal organ. Phonologically motivated rules, on the other hand, result from the requirement of the phonological grammar of the language. For instance, it is a standard phonological principle that in languages where sequences of syllabic elements are prohibited, an obligatory elision process or disyllabification occurs as a repair strategy when two or more syllabic elements occur either at morpheme or word boundary (cf. Pulleyblank, 1988; Aziza, 2010; Aziza & Okolo-Obi, 2014).

The issue of domain of application of phonological process has also dominated the literature. Crystal (2008:155) defines domain as "…the realm of application of any linguistic construct". He further explains that the 'domain' of a rule in a grammar would refer to the range of structures to which that rule was applicable. There are several domains within grammar generally and phonology in particular. According to Bickel et al. (2009), "the past few decades have seen various attempts to develop descriptive frameworks that capture the range of phonological domains expected across languages." However, the goal of predicting a finite and universally fixed set of phonological domains has not been without an attendant problem, given the language-specific nature of phonological domains.

3. Methodology

This study employs the Uvwie data corpus documented in the appendix section of Ekiugbo (2016). The corpus consists of six hundred and eighty-eight lexical and forty-one sentential formatives drawn from both primary and secondary sources. However, the data were cross-checked with a native speaker for the purpose of this study. The data were analysed using the rule ordering principle of the generative phonology theory. The principle of rule ordering is an attempt to account for observed phonetic patterning of the

formatives in a language as the result of the sequentially ordered rules which derives surface forms from their underlying form. Rules which apply sequentially are rules which apply one after another such that the output of one application is the input of the next rule (Ringen, 1972; Rasin, 2016), and contrast with simultaneously rule application proposed in Koutsoudas et al. (1974) in which all rules apply at the same time. The latter is problematic in accounting for the phonological processes in Uvwie as it is unable to account for the observed feeding and bleeding order relations in the language.

4. Data presentation and analysis

This section presents a discussion of Uvwie data in relation to the phonological processes in the language, their representative rules and the order in which the rules apply to arrive at well-formed structures. Six phonological rules which may be said to map underlying phonological forms unto their surface forms in Uvwie were identified. These are nasal assimilation, glide formation, vowel elision, tone fusion, vowel lengthening and consonant elision. In what follows, an attempt is made to provide evidence to show that these processes are attested in Uvwie, and that they apply in the order in which they are listed above. The rule proposed to account for the nasal assimilation in Uvwie is as stated in (2) below.

(2) [+Sonorant, -Nasal] → [+Nasal/ ($_{\sigma}$[+Nasal]) __ ([+Nasal]$_{\sigma}$)

The rule in (2) shows that all non-nasal sonorants are nasalized when they are preceded or followed by a [+Nasal] sound such as a nasal consonant or a nasal vowel. Examples are shown in (3) to illustrate this.

(3) a.	/*èrámú*/	>	[*èrámṹ*]	‘animal’
b.	/*dʒɛ̀mè*/	>	[*dʒɛ̀mɛ̃̀*]	‘drive away’
c.	/*bòbòmá*/	>	[*bòbòmɑ̃́*]	‘rise up’
d.	/*ìɲèmɛ́*/	>	[*ìɲɛ̃̀mɛ̃́*]	‘mother’
e.	/*álɛ̃̀*/	>	[*ànɛ̃̀*]	‘here’
f.	/*òmìjɛ̃́mɛ́*/	>	[*òmĩ̀jɛ̃́mɛ̃́*]	‘my brother’
g.	/*èrèrɪ̀*/	>	[*èrèrɪ̃̀*]	‘fish’
h.	/*ìwɔ̃̀*/	>	[*ìwɔ̃̀*]	‘mosquito’

In (3a-d), underlying oral vowels are realized as nasalized vowels in their surface forms, while (3e-h) shows that some consonants in Uvwie are realized as nasalized sounds when they precede nasal vowels. Although superficially, this seems to be two different processes (and by extension two rules), it is argued here that one rule is sufficient, thus only one nasal process is noted contrary to Ekiugbo (2016). In Ekiugbo (2016), two nasal processes are noted. These are: (i) progressive nasal spread in which the trigger and target are nasal consonant and oral vowel respectively, and (ii) regressive nasal spread in which the trigger

and target respectively are (contrastive) nasal vowel and some consonants. These two processes however collapse into one. This is because a single rule can capture both cases.

As may be seen in example (3), all the affected sounds (i.e., the targets) are sonorant sounds, which form a natural class, while all the triggers in the examples are (contrastive) nasal sounds. Thus, it is risible to posit two distinct nasal assimilation processes, one affecting vowels and the other affecting consonant. Rather, only one rule is required to capture the nasal assimilation processes affecting consonants and vowels in Uvwie. The rule, as stated in example (2) implies that a sonorant becomes nasalized when preceded or followed by a nasal sound. Furthermore, the domain of nasal assimilation is the syllable. Nasal spread happens within a syllable. Thus the target sound must be in the same syllable with the trigger, and this process is blocked by the syllable boundary. This is the only process that operates within a syllable. Implicitly, this rule is ordered first in Uvwie before the application of any other rule.

As already noted in Section 2, in languages which do not permit underlying sequences of vowels in formatives, where the morphology of the language causes such sequences to arise, one of the two vowels occurring on either side of the boundary gets deleted (a phenomenon known as vowel elision) or desyllabified (a phenomenon known as glide formation). These two processes (deletion and glide formation) have been reported to be the main processes of hiatus resolution in most Niger-Congo languages (Casali, 1997; Hildebrandt, 2006). In these languages, V_1 in a VV sequence is realized as a glide when it is a [+High] vowel. However, where V_1 is not a high vowel, it is deleted. The rules as well as Uvwie examples showing cases of glide formation and vowel elision are presented in (4) and (5) respectively.

(4) $V_{[+High]} \rightarrow$ [-syllabic]/ ___V[①]

a. /*òbì#úβ̞ó*/	>	[*òbjũ:β̞ó*]	'Adam's apple'
b. /*tù#áró*/	>	[*twã́:ró*]	'blindness'
c. /*ùbí#údú*/	>	[*ùbjúdú*]	'heart'
d. /*òmìrágúá*/	>	[*òmìrágwá*]	'adult'
e. /*ùdí#ɔ̀djádjá*	>	[*ùdjɔ̀djádjá*]	'alcohol'
f. /*ùɻ̩íé*/	>	[*ùɻ̩jé*]	'river'

(5) V → Ø/ ___#V

a. /*lɔ́#íɻ̩íbó*/	>	[*líɻ̩íbó*]	'to grind pepper'
b. /*dá#ùdí*/	>	[*dû:dí*]	'get drunk'

[①] Ekiugbo & Ugorji (2019) notes that the /*e*, *o*/ sometimes behave as high vowels by undergoing glide formation, and as low vowels at other times, thereby undergoing vowel elision. The first instance has been shown to be reflexes of */ɪ*, *ʊ*/ which was once attested in the language, but has merged with /*e*, *o*/ respectively. (See Aziza, 1994 for a similar case in Urhobo).

c. /*sìmè#èré*/	>	[*sìmèré*]	'argue'
d. /*mɾɛ́#évṹ*/	>	[*mɾévṹ*]	'conceive'
e. /*ùkɛ̃́#ɔ́xɔ́*/	>	[*ùkɔ̃́xɔ̃́*]	'egg (of hen)'

The rule in (4) is a glide formation rule. It posits that the first vowel in a VV sequence is realized as a glide if the vowel is a high vowel. Thus /*i*/ is realized as [*j*] and [*u*] as [*w*] in that context. The rule in (5) on the other hand is a vowel elision rule. It posits that the first of the two vowels in a word boundary gets deleted in associative constructions. Thus, as shown in the Uvwie examples in (5a-e), the first vowel of the VV sequence in a word boundary gets deleted. In the examples in (4a-f), the V_1 in the VV sequences are realized as glides rather than being deleted like the examples in (5). The rule in (4) contradicts that in (5), at least, superficially. This is because while that in (5) requires a V_1 to be deleted in a VV context, the rule in (4) requires a V_1 to be preserved with slight modification in the same context. In the extant literature, cases of glide formation are often considered as an exception to vowel elision rule (Aziza, 2010; Okolo-Obi, 2014). According to Okolo-Obi (2014:85-86),

> *When there is a co-occurrence of two vowels in the language (usually in associative constructions), the first vowel in the sequence (V1) obligatorily deletes. However, when the first vowel across the boundary is a high vowel /i/ or /u/, deletion becomes impossible. Rather the front high vowel is converted to the voiced palatal approximant [j], while the back high vowel is converted to the voiced labio-velar approximant.*

We argue here that these 'violating' instances are not necessarily exceptional cases. Instead, it is argued that this is as a result of the ordering glide formation > vowel elision, such that glide formation is in a bleeding[①] relation with vowel elision. Glide formation rule applies first before vowel elision rule. This accounts for why the examples in (4a-f) seem to evade the rule in (5), given that at the time of application of this rule, the context to which it can apply has been removed by the rule in (4). Accordingly, the application of glide formation rule decreases the number of context to which vowel elision rule can apply. In this sense, no adhoc rule specifying exception to vowel elision rule is needed. Another evidence which suggests that glide formation applies before vowel elision is the fact that glide formation can apply across syllable boundary as may be seen in example (4d-f), whereas, vowel elision can only apply across word boundary.

Given that nasal assimilation applies syllable-internally, whereas glide formation and vowel elision apply across syllable and word boundaries respectively, it is assumed that nasal assimilation is applied prior to glide formation and vowel elision. That this is the case

[①] Bleeding is a functional relationship between rules, in which the application of one rule eliminates the context in which another can apply.

is shown in example (6) in which the VV sequence *ɛ̃ɔ* is shown to undergo nasal spread first resulting in *ɛ̃ɔ̃*, before undergoing vowel elision resulting in *øɔ̃*. If the reverse was the case, that is, vowel elision applying before nasal assimilation, the resulting surface form would be *[*ukɔxɔ], as there would be no room for nasal assimilation to apply because the nasal feature would have been deleted via vowel elision rule. Invariably, nasal assimilation is in a counter-bleeding[①] relation with vowel elision in Uvwie.

(6) *a. ukɛ̃#ɔxɔ* Underlying form
b. ukɛ̃ɔ̃x̃ɔ̃ Nasal spread
c. ukøɔ̃x̃ɔ̃ Vowel elision
d. [*ukɔ̃x̃ɔ̃*] '*egg*' Surface form

It is also observed from our data that there is a feeding order relation between vowel elision and tone fusion, and between tone fusion and vowel lengthening. The representative rules for both are given in examples (7) and (8) respectively.

(7) LT → CT/ VE

(8) V → V:/$_{(\acute{\sigma})\ (\grave{\sigma})}$

The rules in (7) and (8) respectively are tone fusion rule and vowel lengthening rule. In the first, a floating tone fuses with the tone of the tone bearing unit to its right, while the second rule requires that vowels in syllables with contour tone be lengthened. Following Ezenwafor (2014), contour tones in most African languages are mere surface features which are motivated by some underlying rules that arise from the merging or fusion of tone at morpheme boundaries, historical loss of segments and the association of a floating tone. This has the concomitant effect of lengthening the vowel of the syllable the 'floating tone' docks on. Evidence for both processes and their interaction with other processes in Uvwie are illustrated in example (9).

(9) a. */èmà#ágɔ́gɔ́/*	>	*èmø̀ágɔ́gɔ́*	>	[*èmă:gɔ́gɔ́*]	'happiness'
b. */ùdú#ɔ̀mé/*	>	*ùdúø̀mé*	>	[*ùdû:mé*]	'my chest'
c. */èsɔ́#ɔ̀mé/*	>	*èsɔ́ø̀mé*	>	[*èsɔ̂:mé*]	'my ears'
d. */òbèlé#àmé/*	>	*òbèlǿàmé*	>	[*òbèlâ:mé*]	'earthen-pot'

As may be observed from the data in example (9) above, the underlying inputs of the different formatives are shown in the first column. In the second column, elision rule is shown to apply on V#V context, resulting in the tone borne by the elided vowel being set afloat. This tone re-links with the tone bearing unit to its right, hence the tone fusion rule. The resulting phonetic form is a contour tone and a lengthened vowel. Thus, given that the contour tones in Uvwiẹ are derived from the fusion of two un-identical level tones after

① B counterbleeds A (or A and B are in counterbleeding order) iff B would bleed A if the order were B < A (Mascaró, 2011).

vowel elision rule has applied, and a concomitant perceivable increase in the length of the vowels when the contour tone is formed (i.e., vowels increase in length when tone fusion occurs), it follows that there is feeding order relation[①] between vowel elision and tone fusion, and between tone fusion and vowel lengthening in Uvwiẹ. Accordingly, the order vowel elision > tone fusion > vowel lengthening is posited. This is because the context for the application of tone fusion rule results from the application of vowel elision rule, while tone fusion creates the context for which vowel lengthening applies.

The sixth phonological rule identified in Uvwie is the consonant elision rule stated in (10) below. This rule requires that the voiced alveolar tap, /*ɾ*/ be deleted in intervocalic position as shown in example (11).

(10) r →ø/ V___V

(11)

	UR		Syllabi.		Cons. Elision		Surface form	
a.	/*òg͡béɾì̀*/	>	*ò.g͡bé.ɾì̀*	>	*òg͡béøì̀*	>	[*òg͡béì̀*]	‘tortoise’
b.	/*ɔ̀mɔ̀róxwá*/	>	*ɔ̀.mɔ̀.ró.xwá*	>	*ɔ̀mɔ̀øóxwá*	>	[*ɔ̀mɔ̀óxwá*]	‘boy’
c.	/*eɾũ*/	>	*e.ɾũ*	>	*eøũ*	>	[*eũ*]	‘jump’
d.	/*kàɾe*/	>	*kà.ɾe*	>	*kàøe*	>	[*kàe*]	‘lock’
e.	/*ʒɛ̀#ìròɾò*/	>	*ʒøì.ròɾò*	>	*ʒìøòɾò*	>	[*ʒìòɾò*]	‘make plans’
f.	/*ɔ̀ké#ré#úvó*/	>	*ɔ̀.ké.røúvó*	>	*ɔ̀kéøúvó*	>	[*ɔ̀kjúvó*]	‘dry season’

In the surface forms of the examples, the second vowels in the vowel-vowel sequences (i.e., V_2) are preceded by the voiced alveolar tap sound /*ɾ*/ at the underlying level. This sound is relatively short in duration and may undergo elision in intervocalic position during rapid speech, especially where the value of the sonority distance between the intervocalic vowels is less than three, that is, the maximum sonority distance between the two vowels is two. The fact that this process gives rise to sequences of vowels at the surface level suggests that vowel elision is ordered well before consonant elision; hence, none of the vowels in the resulting VV sequence is deleted from the formative. Rather, the VV sequences are realized at the surface form.

5. Conclusion

It is the goal of this study to examine the set of phonological rules that apply in the derivation of surface structure from their corresponding underlying structure in Uvwie, and the order in which they apply. In the first instance, six well motivated phonological processes are identified. These are glide formation, vowel elision, tone fusion, vowel lengthening, nasal assimilation and consonant elision. Glide formation in Uvwie involves the de-syllabification of a high vowel in a VV context, either within or across a syllable

① In feeding order relation, the application of rule A creates the context for the application of rule B.

boundary to form a corresponding glide. Vowel elision is also a syllable process. It affects one of the vowels in a V#V sequence. In tone fusion, a tone which is set afloat through the process of vowel elision links with the (often un-identical) tone of the tone bearing unit to its right. The resultant effect of this is a perceived lengthening of the vowel. It is also observed in the study that the sonorants, vowels, lateral, approximants and rhotics are nasalized when they occur with nasal sounds within a syllable; and that in some contexts, the voiced alveolar tap is elided.

It was further argued that these processes apply in the order: nasal assimilation > glide formation > vowel elision > tone fusion > vowel lengthening > consonant elision. Evidence from this was drawn mainly from bleeding, feeding, counter-feeding and counter-bleeding order relations. It was first assumed that rules which apply at the lowest domain of rule application in Uvwie were deemed to apply first before rules which apply at higher domains. In particular, two domains of rule application were identified in the Uvwie data. These are (i) within syllable boundary, and (ii) across syllable or word boundary. Only nasal assimilation solely applies in the first domain; hence it is deemed to apply first in phonological derivation in Uvwie.

Glide formation applies in both domains, and has a bleeding order relation with vowel elision; hence, it was argued that glide formation applies before vowel elision. Also, a feeding order relation between the tri-rules: vowel elision, tone fusion and vowel lengthening provided the evidence for the order: vowel elision > tone fusion > vowel lengthening. This is because it is the application of vowel elision rule that creates the chain context for which tone fusion and vowel lengthening can occur. The rule to apply last is consonant elision, given that it creates room for VV sequence, in which none of the V is deleted, given that at the time of the application of consonant elision rule, vowel elision has applied.

Abbreviations and symbols

ˊ	High Tone	CT	Contour Tone
ˋ	Low Tone	LT	Level Tone
ˇ	Rising Tone	r	Rhotic
ˆ	Falling Tone	Syllabi.	Syllabification
#	word Boundary	UR	Underlying Representation
→	Is Realized as	V	Vowel
>	Becomes	VE	Vowel Elision
ø	Null	VV	Sequence of Two Vowels
Cons.	Consonant		

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