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Why the Two Glide Argument is Unnecessary

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ABSTRACT
This paper examines the controversy in initial consonant mutation resulting in the argument that there are two of each of the glides [w] and [j] in Fulfulde. This argument is a product of the mutation pairings in the language. Out of the eight attested mutation pairings, only four: f/p, h/k, s/ʧ and r/d are in binary mutation relationships. The remaining four, i.e. w/b, w/ɡ, j/ʤ and j/ɡ show each of the glides in mutation correspondence with two sounds. The latter mutation correspondence is responsible for the proposition in the literature that there are two /w/ sounds in Fula, although two /j/ sounds have not been proposed in spite of its similar behaviour with /w/, i.e. being in mutation relationship with two sounds. This paper argues that in accounting for initial consonant mutation in Fulfulde, the stop grade is the underlying representation; leading to the pairing schema b/w, ɡ/w, ʤ/j and ɡ/j. The argument in this paper is that /ɡ/ is responsible for this complication because its continuant counterpart, /ɣ/, does not occur in the Fulfulde phoneme inventory. Nevertheless, since /ɡ/ is involved in mutation, it must pair with some sound. Shared voicing and place features are necessary. In the absence of a voiced velar continuant in the language therefore, /ɡ/ pairs with the labio-velar [w] before [back] vowels because they share [voice] and [dorsal] features. It also pairs with the palatal [j] before [front] vowels, equally because of the shared [voice] and [dorsal] features.
Keywords: Mutation, Glides, Dorsal, Palatal, Voicing

1. INTRODUCTION

This paper addresses initial consonant mutation defined by Lieber (1983, p.165, emphasis in original) as follows:

> Consonant mutation is a morphological phenomenon in which lexical stems exhibit two or more allomorphs that differ only in their initial, or in some cases final consonants and appear in distinct morphological environments, for example, one in the past tense; the other in the present, one in citation form, the other "triggered" by a neighboring morpheme.

Although mutation is a fairly straightforward morphophonological process, in Fulfulde, the phenomenon raises controversy. In normal mutation contexts, a phoneme participates in mutation with another phoneme; thus, forming a pair. For example, in **h/k** mutation, the pair ***h****oodu*/***k****oli* 'finger' shows a continuant – stop mutation involving two phonemes. However, there are mutation correspondences in which one phoneme goes into mutation relationship with two other phonemes. For example, /ɡ/ pairs with /w/ when followed by the vowels /o, ɑ, u/ but when it is followed by the vowels /i, e/, it pairs with /j/ as shown in (1) in which /w/, a continuant sound is in a mutation correspondence with both [b] and [ɡ] and in (2) where /j/, another continuant sound, is in a mutation relationship with both [ʤ] and [ɡ].

(1) /w/ in mutation with both [b] and [ɡ].

w/b	Singular	Plural	Gloss	w/g	Singular	Plural	Gloss
[ɑ]	*walb-o*	*balb-e*	shoulder	[ɑ]	*walaan-du*	*galaa-ɗi*	horn
[e]	*wecc-o*	*becc-e*	ribcage	[e]			
[ɪ]	*wiyeen-go*	*biyee-ɗe*	wing	[ɪ]			
[o]	*wow-ru*	*boɓ-i*	mortar	[o]	*wol-o*	*gol-e*	cheek
[u]	*wukk-u-ru*	*bukk-i*	bunch	[u]	*wudd-u*	*gull-i*	navel

The data represented in (1) is suggestive that the mutation is conditioned by vowels. Fulfulde has 5 vowel qualities contrasting in length; thus, 5 short and 5 long (Arnott, 1970). Before all the 5 vowels, /w/ shows a mutation correspondence with [b] as indicated in the left column. However, with [g], mutation occurs before 3 of the 5 vowels as shown in the right column. This "split" mutation behaviour of /w/ leads researchers on Fula (e.g. Arnott, 1970; Anderson, 1976) to propose the occurrence of two /w/ sounds in the language: a labial /w/ which is in full mutation with /b/ followed by any of the five basic vowels, and a velar /w/ in partial mutation with /g/ followed by one of the vowels [ʊ, o, ɑ]. What is not clear however, is why it has not been contended that there are two /j/ sounds in view of a similar split mutation that it displays with both /ʤ/ and /g/ as shown in (2).

(2) /j/ in mutation with both [ʤ] and [g].

y/j	Singular	Plural	Gloss	y/g	Singular	Plural	Gloss
[ɑ]	*yaa-re*	*jah-e*	scorpion	[ɑ]			
[e]	*yeh-i*	*jeh-i*	went	[e]	*yees-o*	*geec-e*	face
[ɪ]	*yid-a mo!*	*jid-ee mo!*	save him/her	[ɪ]	*yi-i*	*gi-i*	saw/said
[o]	*yont-e-re*	*jont-e*	fever	[o]			
[u]	*yuwaa-re*	*juwaa-je*	punch	[u]			

Like the data in (1), /j/ is equally in full mutation correspondence with [ʤ] before all the 5 vowels but with [g], mutation occurs only before two of the 5 vowels – the vowels before which /w/ does not pair with [g]. This inconsistency results in the proposal that in Fulfulde language there are two /w/ sounds even though two /j/ sounds have not been proposed in the literature. There are eight attested mutation pairings in Fulfulde, out of which only four: f/p, h/k, s/ʧ and r/d are in binary mutation relationships. The remaining 4, i.e. w/b, w/g, j/ʤ and j/g show each of the glides in mutation correspondence with two sounds. These controversial mutation patterns are addressed in this paper and it is argued that a single /w/ can handle mutation correspondence with both [b] and [g]. It is also argued that a single /j/ is adequate for mutation with both [ʤ] and [g].

2. Addressing the Controversial Mutation

To recapitulate, this mutation correspondence is responsible for the proposition in the literature that there are two /w/ sounds in Fula, although two /j/ sounds have not been proposed in spite exhibiting a similar mutation relationship with two sounds as /w/ does. The argument in this thesis is that /g/ is responsible for this complication: the continuant counterpart of /g/ is /ɣ/, a sound that is not found in the phoneme inventory of Fulfulde. Nevertheless, since /g/ is involved in mutation, it must find a suitable pair with which it shares voicing and place features. There is no voiced velar continuant in the language; /g/ therefore pairs with [w] because they share [voice] and [dorsal] features. The data in (1) show that /g/ can only alternate with /[w] before the vowels [ʊ, o, ɑ]. This mutation is blocked when /g/ is followed by either of the front vowels [ɪ, e]. It is argued that these vowels, like observed in other languages, cause velar fronting which results in palatalisation (See Keating, 1988; Hume, 1994; Hayes, 2009; Kochetov, 2011). This forces /g/, before [ɪ, e] to pair with /j/ which has the feature [palatal] and with which it also shares [voice] and [dorsal] features. Consequently, it is /g/ and not /w/ that exhibits "splitting" mutation. Consequently, the Fulfulde mutation chart should be modified as done in (3), with IPA notations.

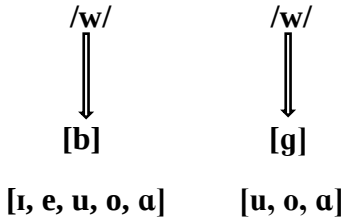
(3) Fulfulde mutation schema.

'Continuant'	d	b	g	g	ʤ	p	ʧ (ʃʃ)	k	b	d	ʤ	g
	|	|	|	|	|	|	|	|	|	|	|	|
'Stop'	r	w	w	j	j	f	s	h	b	d	ʤ	g
	|	|	|	|	|	|	|	|	|	|	|	|
'Nasal'	nd	mb	ŋg	ŋg	nʤ	p	ʧ (ʃ)	k	mb	nd	nʤ	ŋg

Looking at the chart in (3) shows on the stop line that while each stop splits into two – one in mutation contexts and the other in paradigms where there is no mutation, /g/ splits into three: to [w], [j] and [g]. This forms the motivation for this paper to argue that the mutation feature is [+continuant]. Taking this approach precludes the contention of there being two /w/ sounds in the language. It also dispenses with the need to contend with the possibility of [b] surfacing where [g] is expected in a mutation context with /w/.

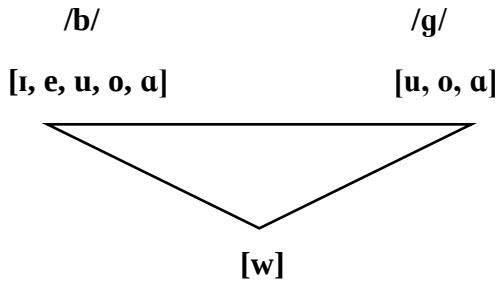
In the literature however, two /w/ sounds are asserted in Fulfulde; one alternating with /b/ and the other with /g/. Though sharing the view of Anderson (1976, p.130) that the /w/ in Fulfulde is a labial velar, this paper differs on the view that some /w/'s are "basic labials" and others "basic velars". A representation of the existing argument is shown in (4).

(4) Existing representation of /w/ in mutation with [b] and [g].



The diagram in (4) represents the mutation of /w/ in correspondence with [b] and [g] in Fulfulde according to Arnott (1970), Anderson (1976), etc. As already mentioned, a mutation relationship has been established between the labial /w/ and [b] irrespective of the vowel that comes after [b] while the other /w/, described as velar, alternates with [g] only when the vowels [u, o, ɑ] occur after it. With the vowels – [ɪ, e], /g/ alternates with [j]. What is not clear as mentioned in the introduction is why only one /j/ is posited although it behaves in a similar way as /w/: it alternates fully with [ʤ] before all the five vowels and with [g] only before [ɪ] and [e]. It is thus argued in this paper that there is only a single [w] with which both /b/ and /g/ alternate just like there is only a single [j] in mutation correspondence with both /ʤ/ and /g/ as shown in (5).

(5) Representation of /w/ mutation.



The above representation proposes a single /w/. The mutation schema is in Figure 1.

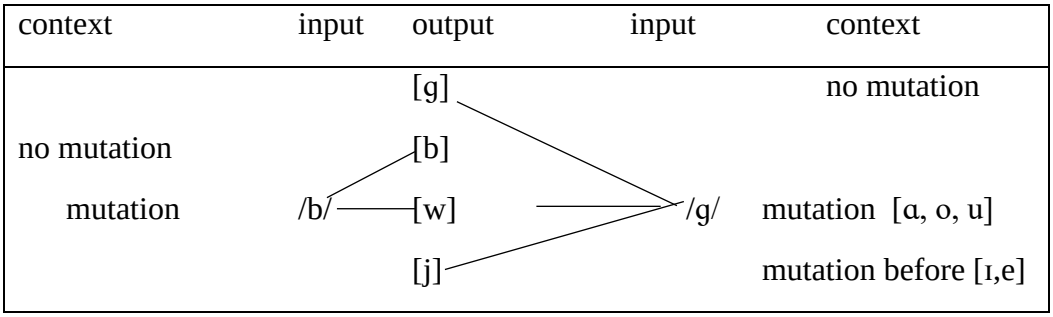


Figure 1: Fulfulde g/w mutation schema.

The representation proceeds as follows: the phoneme /b/ in the input is in a full mutation relationship with [w] with all the 5 vowels because of their shared [labial] features. The second line that connects /b/ with [w] on the left shows this. The first line connecting the /b/ in the input with the [b] in the output shows the lack of alternation in paradigms where there is no mutation.

A similar relationship is established between /g/ and [w]. As a voiced velar stop, /g/ has specification for the features [+velar], [+dorsal], [+voice] among others. The non-occurrence of /ɣ/ in Fulfulde as observed earlier, forces /g/ to pair with some other sound. Only [w] is a voiced continuant specified for the feature [+velar] and since it has the additional features of [+back] and [+round], it is an appropriate continuant for mutation with /g/ when followed by any of [u, o ɑ]. However, when /g/ occurs with either of [ɪ, e], "velar fronting" results (Hayes, 2009, p.92) giving rise to palatalisation; hence, mutation with [w] as a continuant is blocked because of the constraint stated in (6). "[P]alatals, palatalization and high front vowels are said to share similar tongue body articulations" (Keating, 1988, p.7) and as Kochetov (2011, p.1666) explains, palatalization:

> ...denotes a phonological process by which consonants acquire secondary palatal articulation or shift their primary place to, or close to, the palatal region. This usually happens under the influence of an adjacent front vowel and/or a palatal glide...palatalization is a type of consonant-vowel interaction.

Since mutation features are *floating features*, the constraint in (6) is proposed for the mutation behaviour of /g/. As no language is in the literature on mutation is found exhibiting this type of complexity, the constraint proposed is language-specific and high-ranking in Fulfulde. This constraint, in this paper is called Voiced Velar Mutation Constraint.

(6) *[g $_{[ɪ, e]}$ [w]

No g/w mutation correspondence before the vowels [ɪ, e].

The constraint in (6) forces /g/ to seek a voiced continuant that is specified for the features [palatal] and [dorsal]; hence, the mutation correspondence with [j] before [–back] vowels as shown in Figure 1 above. In the Figure, the middle line that connects /g/ to [w] indicates mutation contexts before [ʊ, o, ɑ] whereas the lower line that connects /g/ to [j] is for mutation before [ɪ, e] as the data in (8) show. The upper line connecting /g/ with [g] indicates contexts where there is no mutation.

(7) Examples of g/w mutation in Fulfulde nouns (7.a) and verbs (7.b).

a. Examples from nouns

gud-e	[gʊd-e]	*wude-re*	[wʊde-ɾe]	'cloth'
gujj-o	[gʊʤʤ-o]	*wuy-ɓe*	[wʊj-ɓe]	'thief'
gor-ko	[gor-ko]	*wor-ɓe*	[wor-ɓe]	'man'
godd̆-o	[godd̆-o]	*woɓ-ɓe*	[woɓ-ɓe]	'someone'
galaa-ɗi	[gɑlɑ:-ɗi]	*walaan-du*	[wɑlɑ:n-dʊ]	'horn'
gabb-e	[gɑbb-e]	*wabbe-re*	[wɑbbe-ɾe]	'grain'

b. Examples from verbs

Singular		Plural		Gloss
o-war-i	[ʔo-wɑɾ-ɪ]	*ɓe-gar-i*	[ɓe-gɑɾ-ɪ]	s/he/they came
o-wart-i	[ʔo-wɑrt-ɪ]	*ɓe-gart-i*	[ɓe-gɑrt-ɪ]	s/he/they returned
o-wadd-i	[ʔo-wɑdd-ɪ]	*ɓe-gadd-i*	[ɓe-gɑdd-ɪ]	s/he/they brought
o-wood-i	[ʔo-wo:d-ɪ]	*ɓe-good-i*	[ɓe-go:d-ɪ:]	s/he/they have (sth)
o-waɗ-i	[ʔo-wɑɗ-ɪ]	*ɓe-gaɗ-i*	[ɓe-gɑɗ-ɪ]	s/he/they did (sth)

(8) Examples of ɡ/j mutation in nouns (8.a) and verbs (8.b).

a. Examples from nouns

giɗ-o	[gɪɗ-o]	*yiɗu-ɓe*	[jɪɗʊ-ɓe]	'lover'
giggu-ɗo	[gɪggʊ-ɗo]	*yiggu-ɓe*	[jɪggʊ-ɓe]	'one that scrubbed'
giɗaa-ɗo	[gɪɗɑ:-ɗo]	*yiɗaa-ɓe*	[jɪɗɑ:-ɓe]	'loved/favoured'
gim-oo	[gɪm-o:]	*yimoo-ɓe*	[jɪmo:-ɓe]	'singer'
ginotoo-ɗo	[gɪnoto:-ɗo]	*yinotoo-ɓe*	[jɪnoto:-ɓe]	'swimmer'
geec-e	[ge:ʧ-e]	*yees-o*	[je:s-o]	'face'
geet-o	[ge:t-o]	*yeɗɗu-ɓe*	[jeɗɗʊ-ɓe]	'kind'
gedd-o	[gedd-o]	*yeddu-ɓe*	[jeddʊ-ɓe]	'hypocrite'
geewtu-ɗo	[ge:wtʊ-ɗo]	*yeewtu-ɓe*	[je:wtʊ-ɓe]	'speaker'
geey-oo	[ge:j-o:]	*yeeyoo-ɓe*	[je:jo:-ɓe]	'hawker'

b. Examples from verbs

Singular		Plural		Gloss
o-yiit-i	[ʔo-jɪ:t-ɪ]	*miŋ-giit-i*	[mɪŋ-gɪ:t-ɪ]	s/he/we discovered
o-yigg-i	[ʔo-jɪgg-ɪ]	*miŋ-gigg-i*	[mɪŋ-gɪgg-ɪ]	s/he/we scrubbed
o-yiɗ-i	[ʔo-jɪɗ-ɪ]	*min-giɗ-i*	[mɪŋ-gɪɗ-ɪ]	s/he/we loved/liked
o-yim-i	[ʔo-jɪm-ɪ]	*ɓe-gim-i*	[ɓe-gɪm-ɪ]	s/he/they sang
o-yett-i	[ʔo-jett-ɪ]	*ɓe-gett-i*	[ɓe-gett-ɪ]	s/he/they thanked
o-yedd-i	[ʔo-jedd-ɪ]	*ɓe-gedd-i*	[ɓe-gedd-ɪ]	s/he/they shared
o-yeggit-i	[ʔo-jeggɪt-ɪ]	*ɓe-geggit-i*	[ɓe-geggɪt-ɪ]	s/he/they forgot
o-yeewt-i	[ʔo-je:wt-ɪ]	*ɓe-geewt-i*	[ɓe-ge:wt-ɪ]	s/he/they spoke

Seemingly, the dual mutation of /ɡ/ and not of /w/ as previously reported, results from labialisation with [w] and palatalisation with [j]. /ɡ/ cannot fully alternate with [w] because of the constraint stated in (6). These instances provide a vivid description of why /ɡ/ alternates with both [w] and [j]. Recall that mutation features are *featural* affixes. They may not be realised phonetically without recourse to some other segments. A schematic of [j] mutation is also provided in Figure 2 below like the [w] mutation in Figure 1.

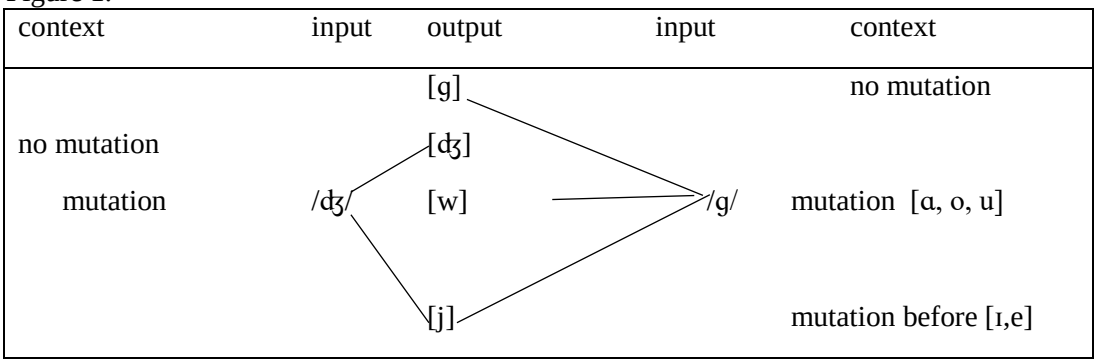


Figure 2: Fulfulde ɡ/j mutation framework.

In Figure 2 above, the /ʤ/ in the input is in full mutation with [j] before all the five basic vowels of the language – indicated by the lower line in the left column. The upper line connecting the /ʤ/ in the input to the [ʤ] in the output indicates paradigms where there is no mutation. However, only one lower line in the right column connects /g/ to [j] in mutation with the vowels [ɪ, e]. The middle line in the right column establishes the labial mutation of /g/ with [w], while the upper line connects /g/ to [g] to show paradigms where there is no mutation.

Under the approach adopted in this paper, g/w and g/j mutation consist of the features [dorsal] and [labial] as well as [dorsal] and [palatal] which are all parts of the *featural affixes* and are licenced to be realised on the same segment in the stem. Alignment ensures that these *featural affixes* are prefixally realised at the left edge of the stem and nowhere else.

3. DISCUSSION

Looking at mutation in terms of featural rather than segmental affixation obviates the need to posit two /w/ sounds, two /j/ sounds or even two /g/ sounds in Fulfulde. Figure 3 below, shows the overall mutation correspondence between /g/ and [w], /b/ and [w] as well as between /g/ and /j/ and /ʤ/ and /j/.

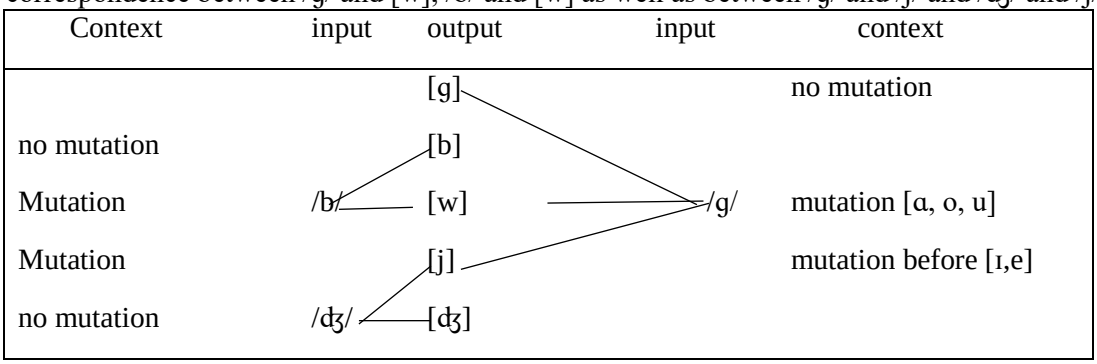


Figure 3: Fulfulde /g/-induced dual mutation.

Figure 3 above shows that taking the mutation feature to be [+continuant] and the stop grade, i.e. [–continuant] as the underlying representation is a promising approach. With /g/ in the input and with the Alignment constraint, only [w] or [j] will be expected. Additionally, with the [+back] or [–back] vowels in the input, only one of these will be the optimal candidate. The constraint in (6) eliminates the possibility of [b] surfacing in the context of g/w mutation since the mutation feature is [+continuant]. The same argument holds for [ʤ], it cannot surface in the context of g/y mutation because it is [–continuant] like /g/. It is argued therefore that the above representation resolves the puzzles of w's and y's in Fulfulde that there are neither two w's nor two y's in the inventory of the language as shown in the following tableaux. To remove [w] where [j] is the attested output, the constraint in (6) above will be invoked. To get rid of [j] where [w] is needed, an IDENT constraint stated in (9) below is necessary.

(9) IDENT-IO [+BACK]

The feature [+back] in the input has a correspondent in the output.

(10) Tableau for [wol-o] 'cheek'.

	/gol- + o [+CONT]/[+BACK]/	ALIGN	IDENT- [+B]	IDENT-IO
	a. [gol-o]	*!		
☞	b. [wol-o]			*
	c. [jol-o]		*!	

In (10), taking [+continuant] as the mutation feature, with the stop grade as the input forestalls the need to posit two /w/ sounds as stated above. Similarly, where b/w mutation is involved, the concern for [ɡ] as a candidate is no longer there as shown in (12) although the constraint in (11) is needed to remove candidates with /j/-initial stems. However, the ranking in (10) shows that IDENT-IO [+BACK] is not ranked with respect to ALIGN. This is because a reversal of the ranking cannot change the winning candidate.

(11) IDENT-LAB
Input and output segments share identical [labial] features.

(12) Tableau for [weʧʧ-o] 'ribcage'.

	/beʧʧ- + o [+CONT]/[+LAB]/	ALIGN	IDENT-LAB	IDENT-IO
	a. [beʧʧ-o]	*!		
☞	b. [weʧʧ-o]			*
	c. [jeʧʧ-o]		*!	

A similar solution presents itself with ʤ/j mutation as demonstrated in (14) for which the constraint in (13) is required and ɡ/j mutation in (15) for which the constraint in (6) is needed.

(13) IDENT-COR
Input and output segments share identical [coronal] features.

(14) Tableau for [jobbɑ:-ɾe] 'ring'.

	/ʤobbɑ:- + ɾe [+CONT]/[+COR]/	ALIGN	IDENT-COR	IDENT-IO
	a. [ʤob:ɑ:-ɾe]	*!		
☞	b. [jobbɑ:-ɾe]			*
	c. [wobbɑ:-ɾe]		*!	

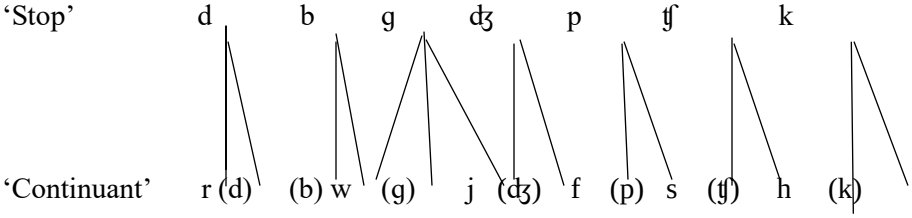
(15) Tableau for [je:s-o] 'face'.

	/ɡe:s- + o [+CONT]/[+PAL]/	ALIGN	*[ɡ$_{[-\text{BACK}]}$[w]	IDENT-IO
	a. [ɡe:s-o]	*!		
☞	b. [je:s-o]			*
	c. [we:s-o]		*!	

4. CONCLUSION

The approach adopted in this paper faces a potential challenge though: the stems that are stops in both singular and plural cannot be accounted for with the [+continuant] mutation feature. However, with the stop grade as the underlying representation, it is argued that such stems by surfacing as stops in their singulars, are not subject to mutation. These noun stems refer to non-human subjects. In Fulfulde, nouns that do not refer to human beings which are involved in mutation are consistently continuant-initial in their singulars. This explains why nouns with *unchanging* initial segments do not undergo mutation; if they do, their plurals will then be in the continuant grade; a violation of the attested pattern in the language. Fulfulde mutation schema can consequently be revised to the one in (16).

(16) Fulfulde Consonant Mutation System



The main distinguishing features of the figure in (16) above and the one in (3) is that *unchanging* initial segments are represented in parentheses alongside the mutating ones. This means that the bracketed segments occur in paradigms where there is no mutation. This is because placing them independent of the mutating segments as done in (3) implies the occurrence of two tokens of each segment in the language.

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