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NASALISATION AND NASAL ASSIMILATION IN AKAN

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Abstract

This paper discusses nasalisation and nasal assimilation in Akan, a Kwa (Niger-Congo) language. The paper demonstrates that nasalisation and nasal assimilation in Akan can be local, homorganic (partial), or total. The underlying voiced alveolar nasal /n/ surfaces with the initial consonant of the following stem to be realised as a homorganic or nasal sound. The paper shows that among the three major dialects of Akan (Fante, Asante, and Akuapem), Fante exhibits only place (homorganic) assimilation, while Asante and Akuapem demonstrate both places (homorganic) and manner assimilation. Moreover, the paper establishes that nasalisation and nasal assimilation in Akan is adjacent, partial, complete (total), bidirectional, and either regressive or reciprocal. Nasalisation and nasal assimilation in Akan occur mainly in the domains of stems, compound words, plural formation, negation, imperative, and reduplicative constructions. This paper therefore contributes to the typology of consonant-consonant (C-C) assimilations that occur in Akan: nasal place assimilation and consonant nasalisation. We formalise our discussions within the theoretical framework of Feature Geometry (FG) Phonology.

Keywords: *assimilation, feature geometry, homorganic, bidirectional, Akan*

1. Introduction

In this paper, we discuss nasal consonant assimilation in Akan, a member of the Kwa (Niger-Congo) group of languages spoken in most parts of southern Ghana. Assimilation has been studied cross-linguistically by different scholars using various theories. Some prominent Akan phonologists (Schachter & Fromkin 1968; Boadi 1988; 1991, Dolphyne 2006; Obeng 2000) have employed the traditional descriptive approach to account for some assimilatory processes in the language. The traditional descriptive approach to phonology does not go beyond the phonemic level in explaining phonological processes in the context of the behaviour of the phonetic correlates of phonemes.

Moreover, in Akan, vowel-vowel (V-V) assimilation and assimilation of vowel-consonant (V-C) and consonant-vowel (C-V) have been extensively studied in the existing literature on phonology (cf. Boadi 1988; Clements 1991; Obeng 2000; de Jong & Obeng 2000; O'Keefe 2003; Ballard 2010; Abakah 2012; Casali 2012; Kügler 2015).

Abakah (2012) has comparatively analysed some assimilatory processes in Akan via the Feature Geometry framework. He focuses his study on some processes such as palatalisation or coronalisation, posteriorisation, anteriorisation, stridentisation/sibilantisation/assibilation, labialisation, and labial-palatalisation. These assimilatory processes are all under consonant-vowel (C-V) assimilation. Other scholars such as Mensah (1987), Boadi (1988), de Jong & Obeng (2000) and Adomako (2018) have paid attention to a major consonant-vowel (C-V) assimilatory process known as palatalisation in Akan. Unlike long-distance assimilation (vowel harmony), vowel-consonant, and consonant-vowel assimilation which have received appreciable scholarly attention

by Akan phonologists, consonant-consonant assimilation is not as well documented as the other kinds of assimilatory processes. Therefore, this paper seeks to discuss one type of local assimilation in terms of how phonetic contrast between phonemes is neutralised in the formation of homorganic and nasal sounds in Akan. In assimilatory processes, a consonant may influence a neighbouring consonant, usually an adjacent consonant. Before consonant-consonant assimilation can occur, there should be a sequence of consonants with different phonetic features in a particular word domain, so that one feature can trigger the assimilation of the adjacent consonant. In this paper, we argue that consonant assimilation in Akan is local (the trigger and the target consonants are adjacent to each other), bidirectional, that is, features are transferred either from left to right or right to left, and that the process always results in the formation of homorganic and nasal consonant clusters. We refer to place and manner features, namely labialisation, coronalisation, dorsalisation, and nasalisation. The discussions are cast within the Feature Geometry (FG) framework.

The rest of the paper is organised as follows: Section 2 discusses the theoretical framework of the study. Section 3 reviews some relevant literature on the study. Section 4 presents the data and analyses it under the following sub-themes; trigger and target, directionalities, types, and domains of nasal consonant assimilation in Akan. Section 5 formalises the data within the FG theory to account for some place and manner feature processes that occur in Akan nasal consonant assimilation. Section 6 discusses some exceptional cases in nasal consonant assimilation in Akan, while section 7 presents the conclusion.

2. Theoretical framework

This study is cast within the framework of Feature Geometry Phonology propounded by phonologists such as Clements (1985), Sagey (1986), Halle (1989), McCarthy (1988), Clements and Hume (1995) and others. In a non-linear phonological model, features in the FG are organised in a hierarchical tree of one sort or the other. This means that some features may be dependent on others, or put differently, they may be dominated by others, while others may be completely independent. This type of model does away with many traditional concepts, including the concept of rule ordering. In a tree structure, features are not accorded the same values; some features are dominated by others. However, we comment briefly on the Articulator-Based model of the Feature Geometry Theory, also referred to as the Place Feature Theory (PFT) model of Feature Geometry, expounded by Clements and Hume (1995) to account for the assimilatory processes discussed in this paper.

Feature Geometry describes the internal dimension of segments: the features or ingredients that make up the segments. This tenet of Feature Geometry is used in this study to explain a feature that spreads and a feature that undergoes assimilation. In Feature Geometry, all phonological features are viewed as autosegments, and their behaviour and possible interactions are explained and constrained in the model. Features are hierarchically grouped. Class nodes are also autosegments and act as single units in phonological constraints.

Consonantal places of articulation attach to a C-Place node while vocalic articulations attach to a V-Place node. For consonants, the place features [Labial], [Coronal], [Dorsal], and [Pharyngeal] are dependent on the C-place node, whereas vocalic place features are dependent on the V-Place node (Clements & Hume 1995). The V-Place node is attached to the C-Place node via a vocalic node in secondary articulation. Laryngeal features [voice], [spread glottis] and [constricted glottis] are placed under a Laryngeal node. Clements and Hume's (1995) model does not have the feature [pharyngeal] although they comment on it. However, others have included this feature taking into consideration the evidence that shows that the feature is needed to cater for

the class of uvulars, pharyngeals, and laryngeals (gutturals), and the low vowel [a] (cf. McCarthy 1988, 1994; Hayward & Hayward 1989). The model predicts that consonants and vowels that share a particular place feature constitute natural classes. For example, coronal consonants and front vowels form a natural class and the low vowels and pharyngeal consonants form another natural class (Morén 2003).

This aspect of the model straightforwardly explains the largely predictable consonant-consonant interactions. The assumed Feature Geometry model also predicts that the aperture features and the V-Place features can function together as a single unit in phonological rules (Clements & Hume 1995: 277). V-Place features can function as a unit independent of the Aperture features and vice versa. This is explained as the spreading of the V-Place node. In summary, the Feature Geometry theory is the ideal tool for capturing the nasal place assimilation of Akan. This is because it presents features as unary or privative entities.

3. Literature review

3.1 Phonetic description of Akan segmental inventory

Akan consonants, as is generally the case, are described based on three main parameters: place or point of articulation, manner of articulation and the state of the glottis. There are fourteen (14) systematic consonantal phonemes that have single places of articulation in Akan, namely / p, b, t, d, k, g, m, n, r, f, s, h, j, w / (see Abakah 2006) and ten (10) consonants that mostly have double places of articulation; [tɕɥ, dʑɥ, ɕɥ, ɲ, ɲɥ, dz, ts, ɕ] out of which five [tɕ, dʑ, tɕɥ, dʑɥ, ɲɥ] are assumed to be phonemic. Table 1 below summarises the consonant inventory of Akan. In the table, where two consonants occur in a cell, the ones aligned to the left are voiceless while those to the right are voiced.

Table 1: Consonant inventory of Akan

	Bilabial	Labio-dental	Alveolar	Alveo-palatal	Palatal	Labialised alveopalatal	Velar	Labial-velar	Glottal
Stop	p, b		t, d				k, g		
Affricates			ts, dz	tɕ, dʑ		tɕɥ, dʑɥ			
Fricatives		f	s			ɕɥ			h
Nasals	m		n		ɲ	ɲɥ	ŋ		
Approximants	(w)		ɹ		ʃ			w	

Adapted from Adomako (2018: 9)

In terms of its vocalic inventory, Akan has ten oral vowels at the systematic phonetic level and five phonemic nasal vowels (cf. Schachter & Fromkin 1968; Dolphyne 2006; Odoom & Adomako 2021). The vowel [æ] is allophonic, not phonemic. It is in complementary distribution with /a/, where [æ] occurs before advanced high vowels and /a/ occurs elsewhere (cf. Dolphyne 2006; Adomako 2015; Odoom & Adomako 2021). Table 2 below summarises the vocalic inventory of Akan.

Table 2: Vocalic inventory of Akan

Vowels Features	/i/	/ɪ/	/e/	/ɛ/	/æ/	/a/	/ɔ/	/o/	/ʊ/	/u/	/ĩ/	/ɪ̃/	/ã/	/õ/	/ũ/
High	+	+	-	-	-	-	-	-	+	+	+	+	-	+	+
Back	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
Low	-	-	-	-	+	+	-	-	-	-	-	-	+	-	-
ATR	+	-	+	-	+	-	-	+	-	+	+	-	-	-	+
Nasal	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+

It can be seen from table 2 that the [+round] feature is not added to the vocalic feature matrix. This is because in Akan, all [+round] vowels are also redundantly [+back]. Moreover, among the five phonemic nasal vowels, only one is specified for [+Low], all the rest are [+High]. This shows that mid-vowels in Akan are inherently [-nasal].

3.2 Assimilation

The term assimilation usually refers to the contextual changeability of speech sounds, which is said to be caused by the influence of one sound on another. McCarthy (2003) explains assimilation as a phonological process in which a segment changes to resemble its neighbours more closely. Thus, a target sound becomes phonetically identical to the trigger sound through the process of assimilation. Similarly, Katamba (1989:80) defines assimilation as the modification of a sound in order to make it more similar to some other sound in its neighbourhood. He notes that the advantage of having assimilation is that it results in smoother, more effortless, more economical transitions from one sound to another. It also facilitates the task of speaking. From a feature-sharing perspective, according to Schane (1973:49), "assimilation is a phonological process whereby a segment takes on features from the neighbouring segment". With regard to the triggers and the targets of the phonological process, Schane postulates that "a consonant may pick up features from a vowel, a vowel may take on features of a consonant, and *one consonant may influence another consonant* or one vowel may affect another." The italicised statement is a clear indication that in a given domain, a consonant sound may take on the feature(s) of an adjacent consonant. The present study seeks to discuss a similar phenomenon in Akan.

Assimilation can either be local or distant depending on the distance between the assimilator and the assimilee. Local or contiguous assimilation occurs when there are no intervening segments between assimilee(s) and assimilator(s), that is, the assimilation obtains between strictly adjacent segments, such as between consonants in a consonant cluster (cf. Pavlik 2003; de Lacy 2007:335). Distant (non-contiguous) assimilation occurs when there are one or more intervening segments between assimilee(s) and assimilator(s).

This study primarily focuses on nasalisation and nasal assimilation which is a type of assimilation where two or more adjacent consonants become alike through the spreading of phonetic features from one consonant (nasal) to another (non-nasal). The correct mechanism of assimilation is the reduction of the target sound with the spreading of the trigger sound in articulation. This means assimilation can be treated as the process which takes the form of the spreading and reduction style whereby the trigger sound spreads its features to the neighbouring target sound, thereby reducing or eliminating the phonetic contrasts of the phonemes because of

the influence of the trigger sound in the neighbourhood (Nolan 1992). Assimilation can only be perceived where the target sound drops phonetic contrasts as it picks up the qualities of the trigger sound. In assimilation, the target sound is made more like the trigger sound because of the influence of the latter sound on the former.

The changes of segments via assimilatory processes are classified under three intersecting parameters, namely total or partial, adjacent or distant, regressive or progressive. Roach (2003) describes assimilation as a process that involves both partial and complete sound modification in terms of the phonetic properties of sounds. Complete or total (full) assimilation occurs when the assimilee adjusts to the assimilator so that they both have the same type and number of features (gestures). In other words, the resulting assimilant becomes identical to the assimilator. This can be expressed schematically as AB → AA or AB → BB.

Partial assimilation, on the other hand, occurs when the assimilee adjusts partially to the assimilator and shares some features with it. It accounts for the changes in which there remain some phonetic differences between the segments involved. In other words, the resulting assimilant and the assimilator are not identical (cf. Byrd 1992; Pavlik 2003; Odden 2005; Katamba 1989; Phiri, Dube & Mamvura 2015).

According to Pavlik (2003:7), consonant assimilation can either be progressive or regressive, depending on the direction of influence of one segment or feature on another. Pavlik (2003) notes that in regressive (anticipatory) assimilation, the direction is from the right to the left as the sound changes with reference to the following segment. Thus, if a target sound is affected by one that comes later (i.e., the trigger sound) in a word, the assimilation is termed regressive. On the other hand, progressive assimilation occurs when a preceding segment exerts influence on the following segment. That is, it involves the modification of a sound concerning the preceding segments, thus the direction appears to be from left to right (Dolphyne 2006; Pavlik 2003; Odoom 2013, 2020).

4. A description of assimilatory patterns

This subsection discusses the trigger and the target, directionalities, types, and the various morphological domains of nasal consonant assimilation in Akan. The subsection shows that although different morphological processes characterise nasalisation and nasal assimilation in Akan, they share the same phonological components.

4.1 Trigger and target of nasal consonant assimilation in Akan

The following data show the trigger and the target segment of nasalisation and nasal place assimilation in Akan. In the examples, the nasal consonants in (1a) and (1b) function as plural markers while the one in (1c), functions as a nominaliser (nominal marker).

(1)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*/N + a-**k**ʊkɔ/*	***ŋk**ʊkɔ*	***ŋk**ʊkɔ*	***ŋk**ʊkɔ*	‘chicken’
b.	*/N + a-boa/*	***mb**owa*	***mm**oa*	***mm**oa*	‘animals’
c.	*/N + **f**ɪrama/*	***ŋf**framã*	***ŋf**framã*	***ŋf**framã*	‘air’

It can be seen in example (1) that the initial consonant of the stem regressively assimilates the archiphoneme /N/ to surface as velar nasal in (1a), bilabial nasal in (1b), and a labial-dental nasal in (1c). This implies that the initial consonants /k/, /b/, and /f/ are the triggers, while the underlying archiphoneme /N/ is the target (cf. Adomako 2018). However, before the assimilation takes place

in (1a&b), the stem-initial vowels, which function as nominalisers, are deleted to create a smooth environment for the assimilation to take place.

In the Asante and Akuapem dialects, after the spreading of the trigger consonant from the stem, the assimilant, also spreads to modify its assimilee. Thus, spreading here is reciprocal. For instance, in a word like /*N + (ɔ)baa*/ 'women', after the deletion of a nominal morpheme {ɔ-}, the stem-initial bilabial consonant /b/ spreads leftward to modify the underlying archiphoneme to surface as a bilabial nasal [*mbaa*]. The assimilant bilabial nasal [m] then spreads rightward to assimilate its assimilee to be realised as a bilabial nasal [m] to have the same manner feature value in the Asante and Akuapem Twi dialects of Akan. It is discernible from the illustrations above that both segments are assimilators and assimilees at the same time; with each playing a dual role in this instance.

4.2 Directionalities of nasal consonant assimilation in Akan

Depending on the direction of influence of the assimilator on the assimilee, we may distinguish between three directions of spreading in consonant assimilation in Akan, namely regressive, progressive and bidirectional reciprocal assimilation.

4.2.1 Regressive nasal consonant assimilation in Akan

In regressive consonant assimilation, as discussed before, the direction is from right to left as the sound changes with reference to the following segment. That is, in the sequence of segments AB, segment B exerts influence on segment A (A ← B) as shown in the following examples.

(2)	UR		Fante	Asante	Akuapem	Gloss
a.	*asɛ**m***	*# fua*	*asɛ**ɱf**ʷ**ua***	*asɛ**ɱf**ʷ**ua***	*asɛ**ɱf**ᶣ**ia***	'word'
b.	*asɛ**m***	*# ka*	*asɛ**ŋk**ã***	*asɛ**ŋk**ã***	*asɛ**ŋk**ã***	'statement'
c.	*mpani**n***	*# fʊ*	*mpɛɲ̃**ɱf**ʷ**ʊ***	*mpæni**ɱf**ʊɔ***	*mpæɲi**ɱf**ʷ**ʊ***	'elderly people'
d.	*kwantɪ**n***	*# pɔn(ʊ)*	*k**ʷ**antsɪ**mp**ɔn***	*k**ʷ**antɪ**mp**ɔ̃ʊ̃***	*k**ʷ**antɪ**mp**ɔŋ***	'high way'

It can be seen from (2) that the second stem-initial consonants regressively assimilate the stem-final consonants of the preceding stems to have the same place feature value.

4.2.2 Progressive nasalisation in Akan

In this process, the final consonant of the first stem spreads rightward to change the initial consonant of the second stem to have the same manner feature value. That is, in the sequence of segments AB, segment A exerts influence on segment B (A → B). This process occurs mainly in the Asante and Akuapem dialects of Akan as illustrated below.

(3)	UR	Asante	Akuapem	Fante	Stem$_1$+Stem$_2$
a.	*asɛm→bisa*	*asemmisa*	*asemmisa*	*asembisa*	'question'
b.	*nsam→bɔ*	*nsæmmɔ*	*nsæmmɔ*	*nsembɔ*	'announcement'
c.	*n→dua*	nn^{ɥ}ia	*nn^{ɥ}ia*	*nd^{ɥ}ia*	'trees'
d.	*n→da*	*nna*	*nna*	*nda*	'days'

The preceding [+nasal] consonant in stem one spreads progressively to the adjacent [-nasal] consonant in stem two to be realised as a nasal consonant at the output level. The two adjacent consonants, therefore, agree in the same manner feature value at the surface representations.

4.2.3 Bidirectional reciprocal nasalisation in Akan

This occurs when in the sequence of segments AB, segment B exerts influence on segment A, and at the same time, segment A exerts influence on segment B. In other words, both segments A and B are reciprocally assimilators and assimilees: (A ⇔ B) (Pavlik (2003). This assimilatory process involves two directions, regressive and progressive. The phenomenon occurs in the Asante and Akuapem dialects only. After the assimilator has changed or modified the assimilee, the assimilant progressively remodifies the former assimilee to have the same manner feature value as shown in example 4.

(4)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*N + (a)bɔfɪra*	*m-bɔfra*	*m-mɔfra*	*m-mɔfra*	'children'
b.	*N + da*	*n-da*	*n-na*	*n-na*	'days'
c.	*N +ʤɥʊm*	*ɲ-ʤɥʊm*	*ɲ-ɲɥʊm*	*ɲ-ɲɥʊm*	'songs'
d.	*N + (a)ʤanka*	*ɲ-ʤaŋka*	*ɲ-ɲaŋka*	*ɲ-ɲaŋka*	'orphans'

We note that Fante demonstrates place (homorganic) assimilation while Asante and Akuapem exhibit manner assimilation in addition. The stem-initial consonant spreads leftward to change the underlying archiphoneme to have the same place of articulation as shown in Fante. After place assimilation, the assimilant nasal (either bilabial, alveolar, palatal, or velar nasal) reciprocally spreads rightward to modify the former assimilator to have the same manner feature value as demonstrated in the Asante and Akuapem dialects. Therefore, bidirectional reciprocal direction involves both regressive and progressive assimilation. We frame this phonetic realisation as "from a place to manner assimilation". The nasal morphemes function as a plural marker in Akan.

4.3 Types of nasalisation and nasal assimilation in Akan

We categorise two types of consonant assimilation depending on the degree to which the assimilant resembles the assimilator in place and the manner of articulation. These are partial consonant assimilation and total or complete consonant assimilation.

4.3.1 Partial consonant assimilation in Akan

Partial consonant assimilation occurs when the assimilee adjusts partially to the assimilator and shares some but not all features with it. In other words, the resulting assimilant and the assimilator are not identical (cf. McCarthy 2003) as discussed already. The examples below demonstrate partial consonant assimilation in Akan.

(5)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*asɛm+ ka*	*asɛ**ŋk**ã*	*asɛ**ŋk**ã*	*asɛ**ŋk**ã*	'statement'
b.	*nam + ɔkɔm(ʊ)*	*nã**ŋk**ɔm*	*nã**ŋk**ɔm*	*nã**ŋk**ɔm*	'scarcity of fish'
c.	*asɛm+sin*	*ase**ns**ĩn*	*ase**ns**ĩnĩ*	*ase**ns**ĩŋ*	'phrase/syllable'
d.	*kwantɪn +pɔn(ʊ)*	*kʷantsɪ**mp**ɔ̃n*	*kʷantʲɪ**mp**ɔ̃ʊ̃*	*kʷantʲi**mp**ɔ̃ŋ*	'main road'
e.	*ɔ + N + fa*	*ɔ**ɱf**a*	*ɔ**ɱf**a*	*ɔ**ɱf**a*	's/he doesn't take it'

It can be seen from (5) that the assimilant and its assimilee are not identical, yet, they share one place of articulation feature value. When we look at the examples closely, we can see that the examples in (5a-b) demonstrate dorsal assimilation, the example in (5c) shows coronal assimilation, and the examples in (5d-e) display labial assimilation.

4.3.2 Total consonant assimilation in Akan

Total (complete) or full assimilation occurs when the assimilee adjusts to the assimilator so that they both have the same type and number of features. In other words, the resulting assimilant becomes identical to the assimilator. This can be expressed by the formula: AB → AA or AB → BB (Pavlik 2003). This consonant assimilatory process occurs in only the Asante and Akuapem dialects of Akan. While Asante and Akuapem demonstrate total consonant assimilation, Fante alone demonstrates partial consonant assimilation. Consider the examples below:

(6)	UR	Fante	Asante	Akuapem	Gloss
a.	*N+dua*	*n-dia*	*n-nʸia*	*n-nʸia*	'trees'
b.	*N+duaba*	*n-duaba*	*n-nʸiaba*	*n-nʸiaba*	'fruits'
c.	*N+ (a)duro*	*n-dur*	*n-nuro/nnro*	*n-nuru*	'drugs/medicines'
d.	*N+ (a)bɛbɛ*	*m-bʲɛbʲɛ*	*m-mɛbɛ*	*m-mɛbɛ*	'grasshoppers'
e.	*N+ boa*	*m-bʷɔwa*	*m-mɔ̃a*	*m-mʸɪa*	'animals'

It is discernible from the examples above that Asante and Akuapem exhibit total consonant assimilation. The [+nasal] plural marker assimilates its adjacent [-nasal] consonant to have the same manner feature value. It is obvious that while the Fante variant shows [+coronal, -nasal] as in (a-c) and [+labial, -nasal] as in (d-e), the Asante and Akuapem variants demonstrate [+coronal, +nasal] and [+labial, +nasal] assimilation respectively.

4.4 Domains of nasalisation and nasal assimilation in Akan

Nasal consonant assimilation is a common phonological phenomenon in Akan. It occurs in stem words, morpheme boundaries such as plural, imperative/command, and negative constructions, in compound words and subjunctive cases. This subsection discusses the various morphological domains of nasal consonant assimilation in Akan.

4.4.1 Nasalisation and nasal assimilation within stems in Akan

Typically, all stems/roots that possess a nasal consonant sequence agree in terms of place or manner feature value as illustrated in example (7) below.

(7)	UR	Fante	Asante	Akuapem	Gloss
a.	*Nsu*	***ns***^{w}*u*	***ns***^{w}*uo*	***ns***^{w}*u*	'water'
b.	*Nsa*	***ns****a*	***ns****a*	***ns****a*	'hand'
c.	*Npa*	***mp****a*	***mp****a*	***mp****a*	'bed'
d.	*Nbutɛia*	***mb***^{w}*utɛia*	***mm****utɛia*	***mm****uka*	'a hearth'
e.	*Nfirama*	***ɱf****ramã*	***ɱf****ramã*	***ɱf****ramã*	'air'
f.	*Ngɔ*	***ŋg***^{w}*ɔ*	*ɛ****ŋŋ***^{w}*ɔ*	***ŋŋ***^{w}*o*	'palm oil'

It can be observed from (7) that in the stem words, a sequence of consonants in Akan agrees either in place feature value (all the dialects) or manner feature value (Asante & Akuapem only). We can see that in the examples in (7a-b), the UR /s/, which is specified for [+coronal, -nasal] demonstrates the assimilatory feature, whereas in examples (7c-e) where /p, b, f/ which are specified for [+labial, -nasal] show the assimilatory feature. In (7f), on the other hand, /g/, which has the feature specification [+dorsal, -nasal], shows an assimilatory feature.

4.4.2 Assimilation in plural formation in Akan

Akan forms plurals by adding prefixes and suffixes. The prefixes have two forms; nasal consonants and vowels, which include [n-, m-, ŋ-, ɱ-, ɲ-] and [a-, e-] respectively. The suffixes [-fʊ(ɔ)] and [-nʊm] are also used to form plurals in Akan. In this study, we do not pay attention to the vocalic prefix and suffix plural morphemes but rather to a nasal consonant prefix morpheme. These plural morphemes are influenced by the following adjacent consonant to have the same place or manner feature as illustrated in (8).

(8)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*N+panin + fʊ*	***mp****eɲĩɱfʊ*	***mp****æɲĩ****ɱf****ʊɔ*	***mp****æɲĩ****ɱf****ʊ*	‘elderly people’
b.	*N +(a)damfʊ*	***nd****a****ɱf****ʊ*	***nn****a****ɱf****ʊɔ*	***nn****a****ɱf****ʊ*	‘friends’
c.	*N + (a)bɪrantɪ*	***mb****ʲɪrantsɪ*	***mm****ɪrantɪɛ*	***mm****ɪrantɪ*	‘young men’
d.	*N+(a)daka*	***nd****aka*	***nn****aka*	***nn****aka*	‘boxes’
e.	*N +(a)fɪ*	***ɱf****ʲ****ɪ***	***ɱf****ʲie*	***ɱf****ʲ****ɪ***	‘years’

It can be seen that plurals that fall under this classification follow the place or manner feature assimilation. The underlying plural marker /N/ is realised as [m, ɱ, n] at the phonetic level. This means that pluralisation in Akan is highly influenced by the place or manner feature. The different phonetic realisations of the underlying nasal /N/ is as a result of the adjacent consonant that follows it. The /N/ in this context functions as a noun class marker.

4.4.3 Assimilation in verb negation and imperative/optative constructions in Akan

Basically, Akan uses the nasal consonant /N/ to mark negative and imperative constructions at the same time. However, these are differentiated by tone. While negation is marked with a low tone [Ǹ], the imperative is marked with a high tone /Ń/ (Dolphyne 2006; Abakah 2015). The underlying low-toned /Ǹ/ and high-toned /Ń/ default tonal morphemes are realised as [ǹ-, m̀-, ŋ̀-, ɲ̀-, ɱ̀-] and [ń-, ŋ́-, ḿ-, ɱ́-, ɲ́-] respectively, depending on the following consonant. This negative and imperative morpheme functions as a verbal inflectional marker as shown in (9) and (10) respectively.

(9)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*ɔ-n-kɔ*	*ɔ̀-ŋ̀-kɔ́*	*ɔ̀-ŋ̀-kɔ́*	*ɔ̀-ŋ̀-kɔ́*	‘s/he does not go’
b.	*ɔ-n-di*	*ò-ǹ-dzí*	*ò-ǹ-ní*	*ò-ǹ-ní*	‘s/he does not eat’
c.	*ɔ-n-fa*	*ɔ̀-ɱ̀-fá*	*ɔ̀-ɱ̀-fá*	*ɔ̀-ɱ̀-fá*	‘s/he does not take it’
d.	*ɔ-n-bɔ*	*ɔ̀-m̀-bɔ́*	*ɔ̀-m̀-mɔ́*	*ɔ̀-m̀-mɔ́*	‘s/he does not play’
e.	*ɔ-n-jarɪ*	*ɔ̀-ɲ̀-jàŕ*	*ɔ̀-ɲ̀-jàrí*	*ɔ̀-ɲ̀-jàrí*	‘s/he is not sick’

(10)					
a.	*ɔ-n-kɔ*	*ɔ́-ŋ́-kɔ́*	*ɔ́-ŋ́-kɔ́*	*ɔ́-ŋ́-kɔ́*	‘s/he should go’
b.	*ɔ-n-di*	*ó-ń-dzí*	*ó-ń-ní*	*ó-ń-ní*	‘s/he should eat’
c.	*ɔ-n-fa*	*ɔ́-ɱ́-fá*	*ɔ́-ɱ́-fá*	*ɔ́-ɱ́-fá*	‘s/he should take it’
d.	*ɔ-n-bɔ*	*ɔ́-ḿ-bɔ́*	*ɔ́-ḿ-mɔ́*	*ɔ́-ḿ-mɔ́*	‘s/he should play’
e.	*ɔ-n-jarɪ*	*ɔ́-ɲ́-jàŕ*	*ɔ́-ɲ́-jàrí*	*ɔ́-ɲ́-jàrí*	‘s/he should get sick’

It is obvious that the same phonological processes characterise negation and the imperative, even though they differ in terms of tone. The inflectional verb class marker /n/ agrees with the adjacent

non-nasal consonant to have the same place or manner feature value as shown in (9) and (10) respectively.

4.3.4 Assimilation in compound and reduplicative constructions in Akan

Other morphological designations of nasal consonant assimilation in Akan are compound and reduplicative constructions. Though different morphological processes characterise them, they share the same phonological processes. Compounds are made up of two or more stems while reduplication is a type of compound formation that consists of the repetition of the whole or part of a stem (Thakur 2010; Dolphyne 2006; Odoom 2011). Reduplication may be used as an inflexion to convey grammatical functions such as plurality, intensification, etc., and in lexical derivations to create new words (Wilbur 1973; Lande 2003; Shaw 2004). In some CVC(V) reduplicated forms, where the initial consonant of the stem is repeated, the consonant of the reduplicant (RED) agrees with the initial consonant of the base in terms of the place feature value. In compound constructions, too, the final syllable of the first stem word agrees with the initial consonant of the second stem word. Examples (11) and (12) illustrate nasal consonant assimilation respectively.

(11)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*asɛmʊ # dua*	*asendʷua*	*asænnᵘia*	*asænnᵘia*	‘cross/root’
b.	*akwanɪ # bɔ*	*akwambɔ*	*akwammɔ*	*akwammɔ*	‘creation of footpath’
c.	*amanɪ # bu*	*amẽmbu*	*amæ̃mmuo*	*amæ̃mmu*	‘governance’
d.	*asɛmʊ # kɛsɪ*	*asɛŋkɛsɪ*	*asɛŋkɛsɪ*	*asɛŋkɛsɪ*	‘big/serious issue’
e.	*ntamʊ # ka*	*ntaŋkã*	*ntaŋkã*	*ntaŋkã*	‘oath’
f.	*ɔkɔmʊ # tɛɪnɪ*	*akɔntɛɪn*	*akɔntɛĩnĩ*	*akɔntɛɪŋ*	‘fasting’

(12)					
a.	*pamʊ*	*pʲɪmpam*	*pʲɪmpam*	*pʲɪmpam*	‘sew/stitch’
b.	*famʊ*	*fʲɪmfam*	*fʲɪmfam*	*fʲɪmfam*	‘fix/embrace’
c.	*sumu*	*sunsum*	*sunsum*	*sunsum*	‘spirit/shadow’
d.	*kanɪ*	*kɪŋkãn*	*kɪŋkãĩ*	*kɪŋkãŋ*	‘read’
e.	*kwanɪ*	*kõŋkwan*	*kõŋkwaĩ*	*kõŋkwaŋ*	‘paddle’

It can be seen that there is a stem final high vowel after the nasal consonants in all the underlying stem words. These high vowels are deleted for the nasal consonants to emerge as a word-final syllable at the systematic phonetic level. Abakah (2005) posits that:

> There is no morpheme in Akan that is consonant-final at the systematic phonemic level and, for this reason, any analysis that posits an underlying consonant as a morpheme-final consonant starts on a faulty note (Abakah 2005:7).

Thus, when these nasal consonants become syllabic, they agree with the feature of the adjacent consonant as seen in (11). The initial consonant of the second stem regressively modifies the adjacent syllabic nasal consonant to have the same place feature value. In the Asante and Akuapem variants, as shown in (11), the assimilant nasal consonant in (a-c) also progressively modifies the following non-nasal consonant to have the same manner feature value. In (12), the nasal consonant

in the reduplicant (RED) agrees homorganically with the initial consonant of the base. The reduplicant final consonant and the base initial consonant agree in terms of place feature value. This shows that compounded and reduplicated forms are subjected to the same phonological processes whereas they differ in their morphological designations.

5. Formalisation of the data within a Feature Geometry (FG) analysis

This section categorises the various nasal consonant assimilatory processes into their major place and manner features and how the triggering feature spreads to the target feature within the FG representations. There are two main types of nasal consonant assimilation, namely, place assimilation and manner assimilation in Akan as discussed in the following subsections.

5.1 Place assimilation

Place assimilation is a form of assimilation which involves the modification of the place of articulation, constriction or location features between adjacent sounds so that they become more similar to facilitate an effortless speech segment articulation. The nasal consonant harmonises in feature with the following adjacent consonant. We have already shown that when a nasal consonant agrees with the adjacent consonant in place feature value, we derive an output through the process of homorganic nasal assimilation. Homorganic nasal assimilation systematically occurs in all three dialects of Akan. It occurs wherever a nasal consonant is followed by another consonant in the same word (Katamba 1989). The following are the various distinctive place feature processes of nasal consonant assimilation in Akan.

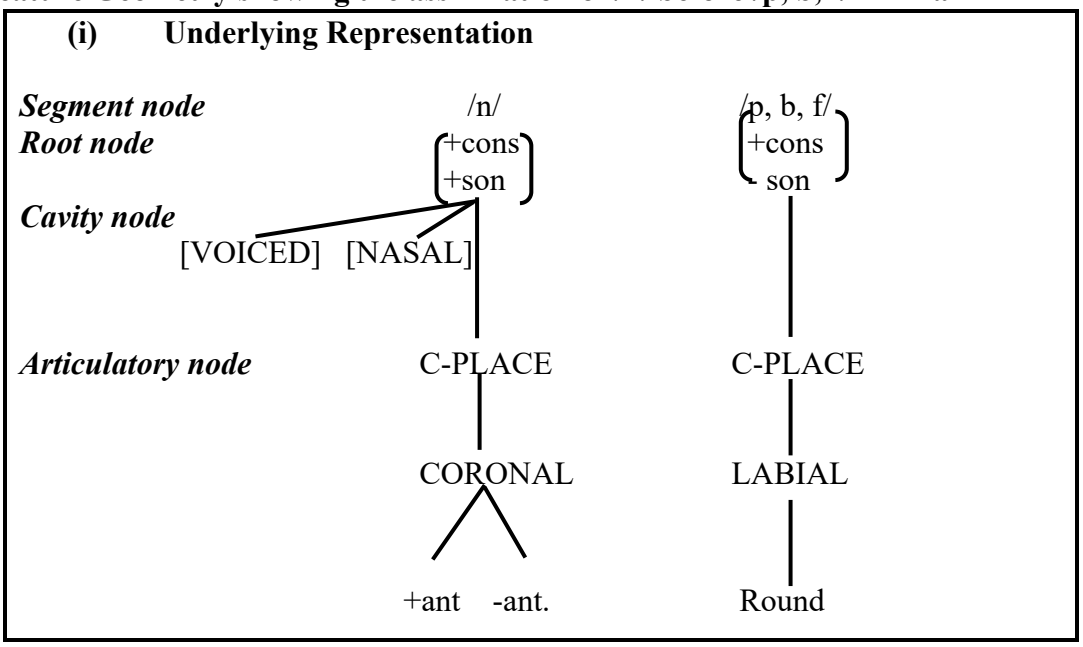
5.1.1 Labialisation

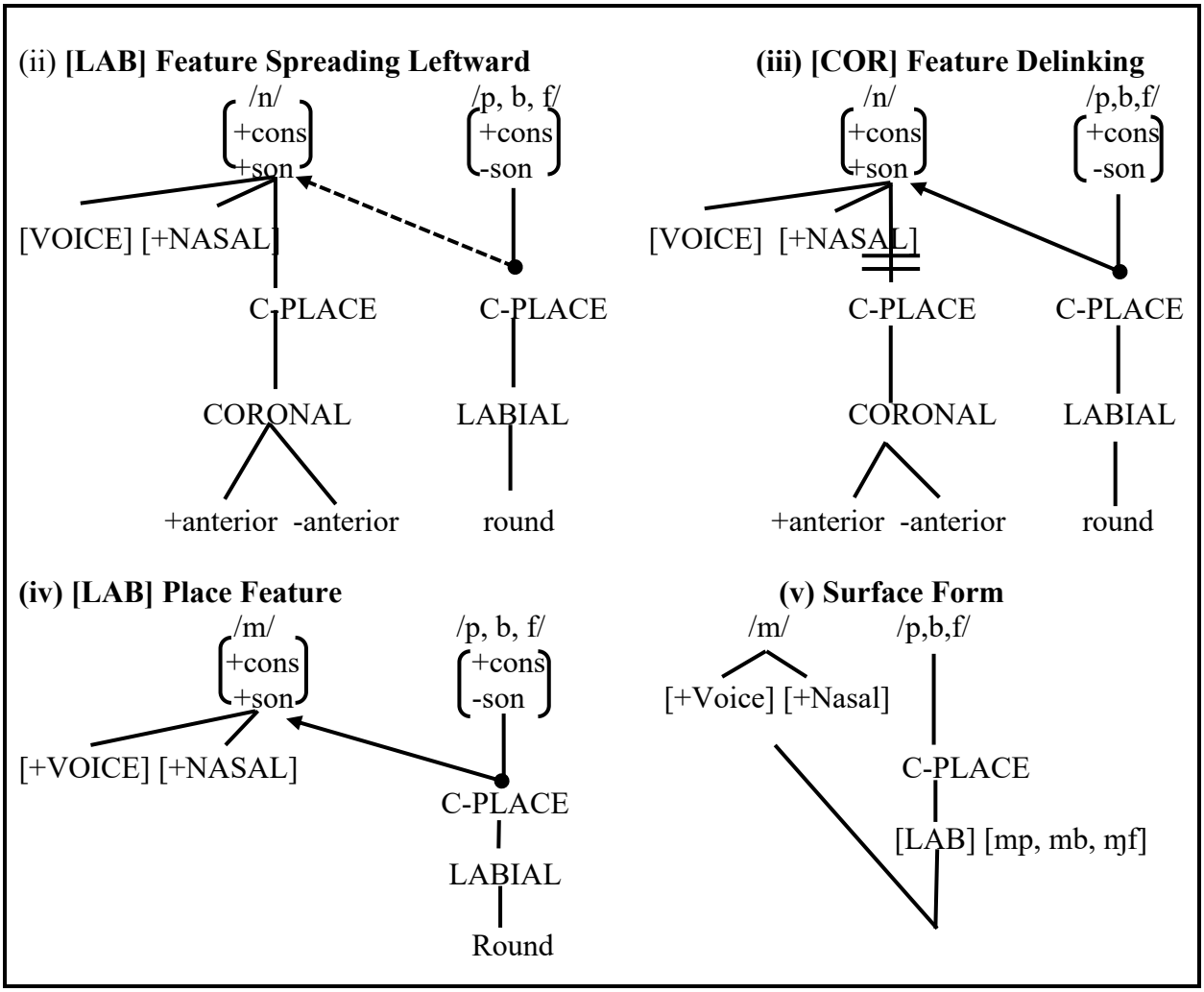
This subsection discusses place assimilation involving voiced and voiceless labial stops and voiceless labial fricatives in Akan. We illustrate this in (13) below.

(13)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*N + bɪpɔwʊ*	***m-b***^{j}*ɪpɔw*	***m****-mɪpɔ*^{a}	***m****-mɪpɔw*^{a}	‘mountains’
b.	*N + (a)bʊatia*	***m-b****ʊwatsia*	***m****-mʊat*^{j}*ia*^{b}	***m****-m*^{ɥ}*ɪat*^{j}*ia*^{b}	‘dwarfs’
c.	N + *(a)pakan*	***m-p****akan*	***m-p****akaɪ̃*	***m-p****akaŋ*	‘hammocks’
d.	*N + pɪrɛko*	***m-p****reko*	***m-p****rœko*	***m-p****rœko*	‘pigs’
e.	*N + fafɪranta*	***ŋ-f****afranta*	***ŋ-f****afrantɔ*	***ŋ-f****afrantɔ*	‘butterflies’
f.	*N + (a)fidie*	***ŋ-f***^{j}*ir*	***ŋ-f***^{j}*idie*	***ŋ-f***^{j}*iri*	‘machines’

The trigger sounds are the labial sounds [b, p, f]. The archiphoneme /N/ becomes [labial] nasal consonants [m, ŋ] due to the influence of the adjacent [labial] consonant. The labial consonants /b, p, f/ spread leftward to assimilate the preceding archiphoneme morpheme /N/ to have the same place feature value. The labial assimilant nasal morpheme [m] occurs before bilabial triggers /b, p/ and the labial-dental assimilant nasal [ŋ] also occurs before labial-dental consonant /f/. In Asante and Akuapem as shown in (13a & b), when the trigger is the voiced bilabial plosive /b/, the assimilant nasal morpheme [m] equally influences its assimilee to emerge as a nasal. Thus, it changes from a place to a manner feature. This makes Asante and Akuapem have both total and partial assimilation. We express labialisation in line with Clements and Hume’s (1995) formalisation of the rule capturing the labialisation process as illustrated in 14 below:

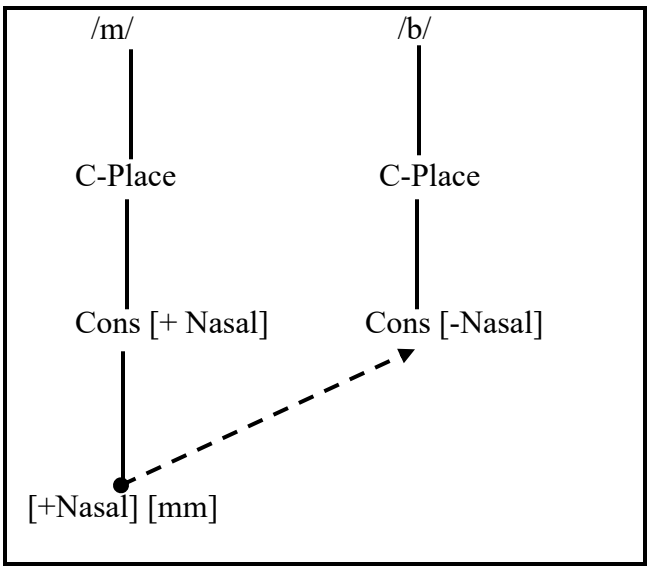
(14) Feature Geometry showing the assimilation of /n/ before /p, b, f/ in Akan





The two adjacent consonants [COR] /n/ and [LAB] /p/ are represented on the FG tree diagram. The /n/ is [+cons, +son] at the root node while the bilabial stop is [+cons, -son]. At the cavity node, /n/ is [+voice, +nasal] while /p/ is [-voice, -nasal]. At the articulatory node, the underlying alveolar nasal is [Cor] and the following bilabial stop is [Lab]. Hence, the place feature of the bilabial stop /p/ spreads leftward to assimilate the place feature of the underlying alveolar nasal /n/. This makes the place feature of the alveolar nasal delink all its features to acquire the feature of the adjacent labial consonant /p/. At the terminal node, the [Lab] is also [+round]. These representations show that FG is unary. In Asante and Akuapem however, as explained above, when the trigger is a bilabial stop /b/, the assimilant [labial] nasal consonant /m/ similarly modifies its assimilee to have the same manner feature value as illustrated in 15 below.

(15) Assimilation of /b/ after /m/ in Asante and Akuapem Twi



Based on the foregone discussions, it can be concluded that labialisation is an active process in Akan. When the trigger is /p, f/, there is homorganic assimilation in all the Akan dialects. However, when the trigger is /b/, Fante experiences partial or homorganic assimilation and Asante and Akuapem show total or manner of assimilation.

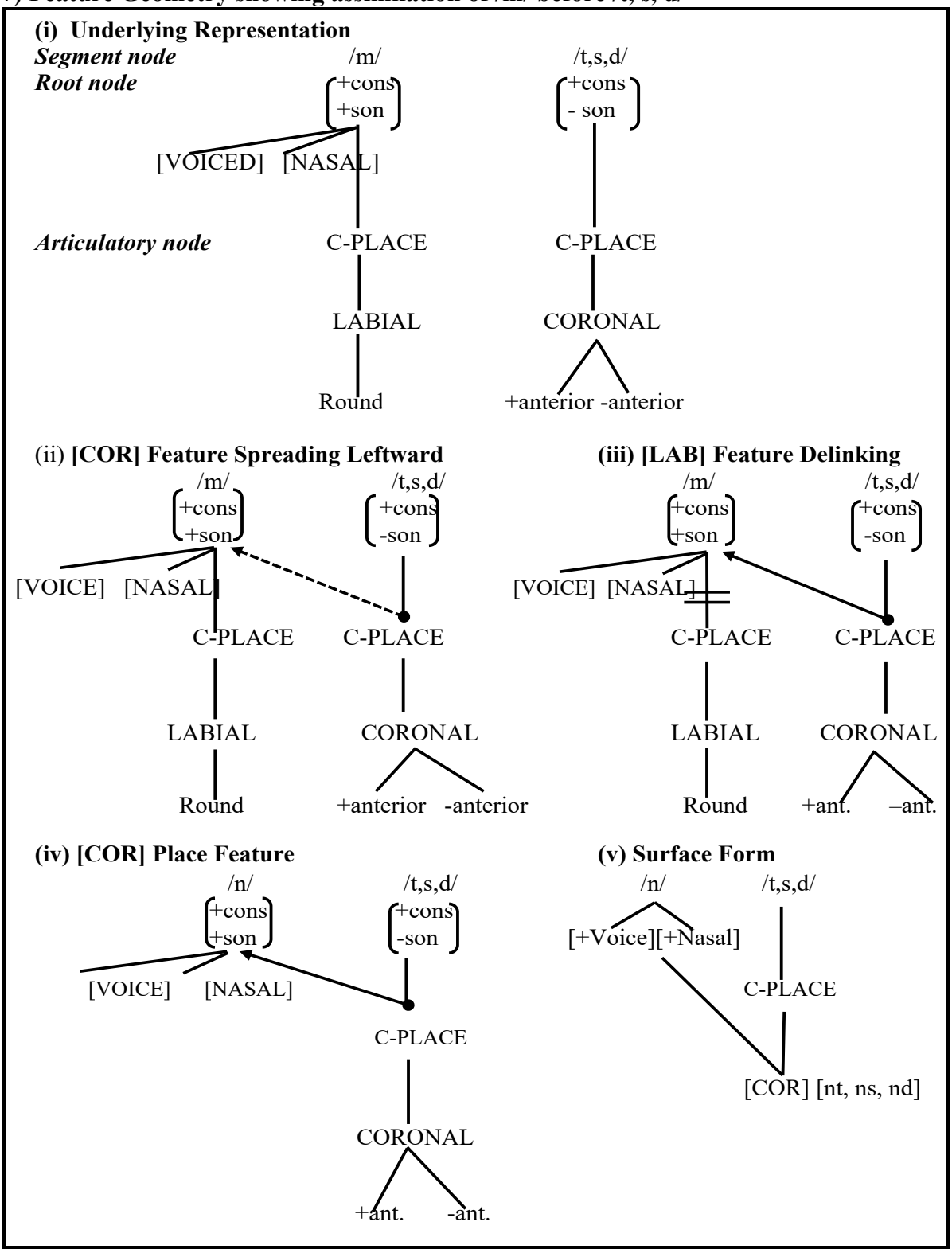
5.1.2 Coronalisation

We define *coronalisation* in this paper as a phonological process by which a consonantal sound, which does not have C-Place [CORONAL] specification in its distinctive feature geometry in phonological representations, becomes coronal at the surface representation as a result of being articulated with a constriction formed by the front of the tongue (Abakah 2012). Such consonant sounds consistently come after a C-Place [CORONAL] articulator in phonological representations. Coronalisation of consonants occurs in all the dialects of Akan as shown in (16) and (17).

(16)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*asɛmʊ + sasʊnʊ*	*asɛ**ns**asʊn*	*asɛ**ns**asʊnʊ*	*asɛ**ns**asʊnʊ*	‘angry comments’
b.	*asɛmʊ + sɪrɪwʊ*	*asɛ**ns**^{j}ɪrɪw*	*asɛ**ns**^{j}ɪrɪɛ*	*asɛ**ns**^{j}ɪrɪw*	‘humour’
c.	*asɛmʊ + di*	*ase**nd**i*	*ase**nn**ie*^{c}	*ase**nn**i*	‘arbitration’

d.	*apɪmʊ + tu*	*apʲ**ent**u*	*ape**ntuo***	*ape**ntu***	'a species of plantain'
e.	*abʊsʊmʊ + ɔsʊmʊ*	*abʊsʊ**ns**ʊm*	*abʊsʊ**ns**ʊm*	*abʊsʊ**ns**ʊm*	'idol worship'

(17) Feature Geometry showing assimilation of /m/ before /t, s, d/

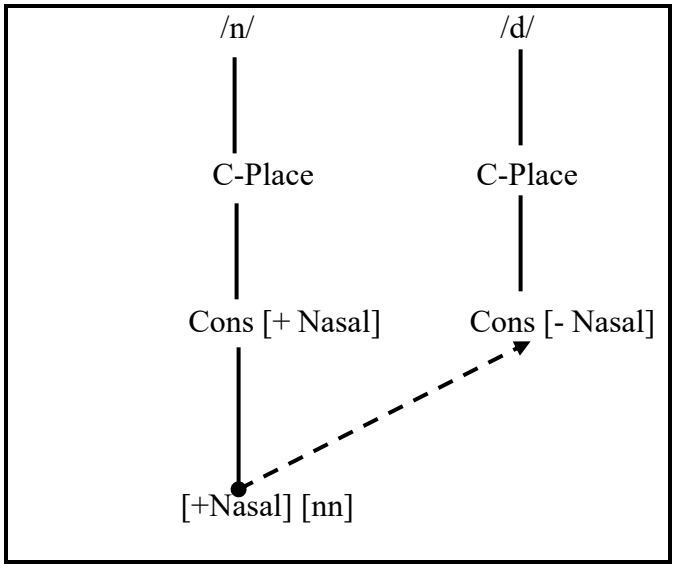


We have explained that every consonant which surfaces as a syllabic consonant at the systematic phonetic representation has a deleted high vowel at the stem-final position (cf. Abakah 2005:7). From (16) above, we observe that consonants that do not have a C-Place [CORONAL] specification in their feature geometry are absolutely assimilated to become coronals at the surface representation. Similarly, the stem-final labial nasal consonant /m/ is assimilated by the adjacent initial coronal consonant of the second stem word.

We formalise the preceding analysis within Clements and Hume's (1995) FG phonology in (17) above to illustrate that a C-Place feature [CORONAL] spreads to the place node of the non-coronal segment to have the same [CORONAL] C-Place feature at the surface representation. It is evident from the FG that the coronal homorganic place assimilation is invariably partial, adjacent, and regressive (anticipatory). The C-Place feature [CORONAL] spreads from right to left to influence the preceding non-coronal nasal sonorant to surface as a coronal nasal sonorant. Thus, the two adjacent consonants have the same C-Place of articulation.

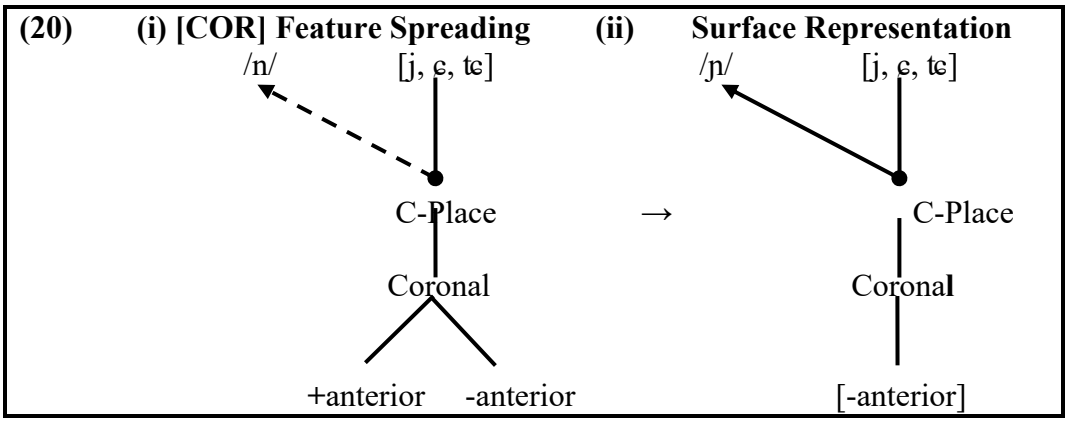
In Asante and Akuapem however, as shown in (16c above), when the trigger is a voiced alveolar stop /d/, the assimilant [coronal] nasal consonant /n/ similarly assimilates its assimilee to have the same manner feature value as illustrated below in (18).

(18) Assimilation of /d/ after /n/ in Asante and Akuapem Twi



Moreover, on the same note, an inherently [coronal, +anterior] segment surfaces as [coronal, -anterior] when it comes after a [-anterior] consonant in Akan as shown in (19).

(19)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
a.	*N- ʧɛɪ-namɔ*	***ɲ-ʧɛ****ɪnãm*	***ɲ-ʧɛ****ɪnãm*	***ɲ-ʧɛ****ɪnãm*	'fried fish'
b.	*N-jamɔ*	***ɲ-j****am*	***ɲ-j****am*	***ɲ-j****am*	'do not grind'
c.	*N-ɕireni*	***ɲ-ɕ****iren*	***ɲ-ɕɥ****ireɪ̃*	***ɲ-ɕɥ****ireŋ*	'flowers'



It can be seen from figure 20 that an inherently [coronal, +anterior] segment is assimilated to the [coronal, -anterior] segment due to the influence of an adjacent [-anterior] consonant.

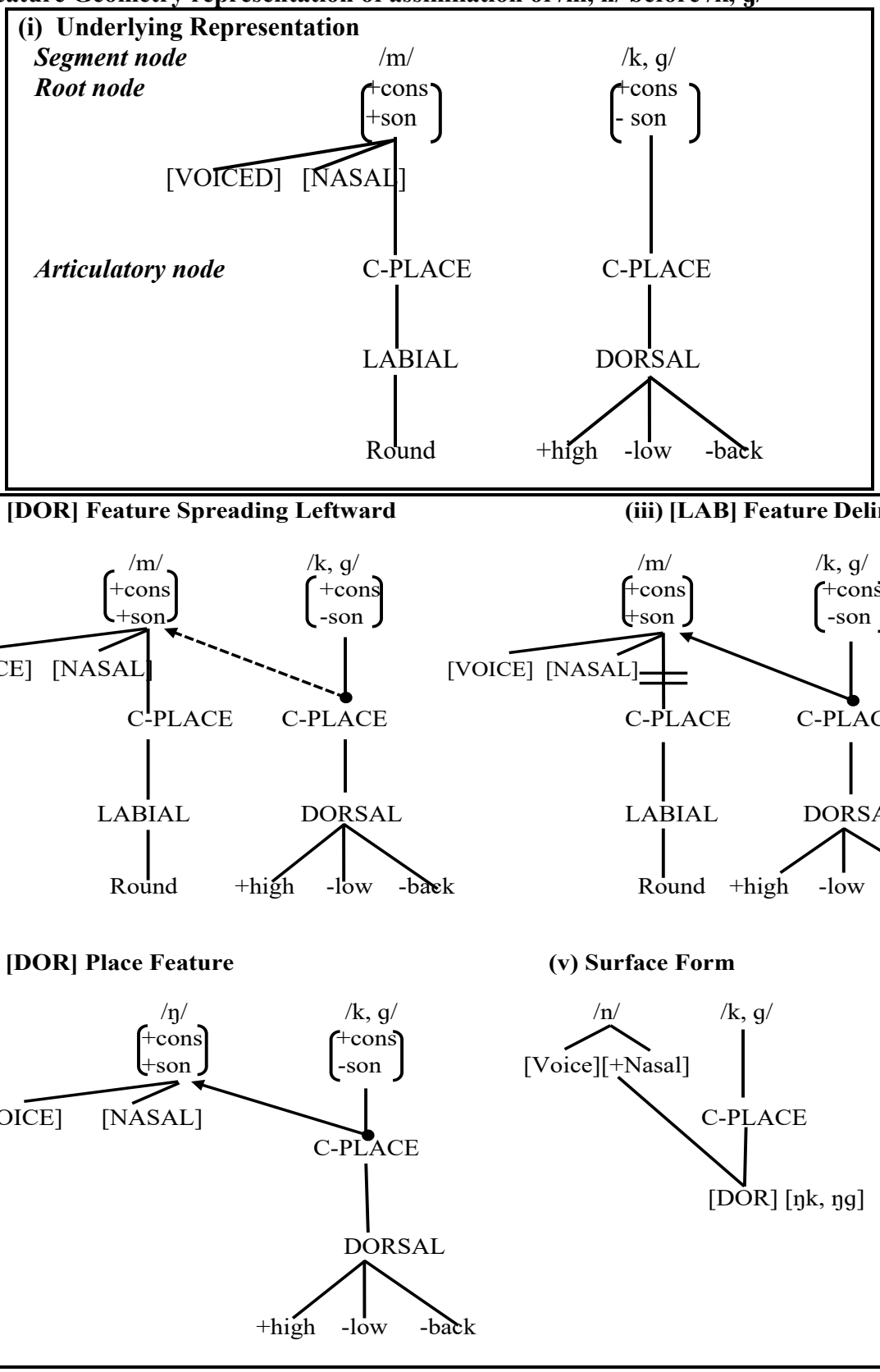
5.1.3 Dorsalisation

Dorsalisation can be defined as a phonological process through which a non-dorsal consonant acquires a dorsal feature within a specified phonetic environment as a result of being articulated with a constriction formed by the back of the tongue (cf. Ladefoged 1982; Abakah 2012). The target consonant invariably occurs in the environment of an adjacent dorsal consonant causing the adjacent dorsal consonant to regressively assimilate the preceding non-dorsal target consonant. The target, which is an unspecified nasal consonant /N/ becomes the dorsal nasal /ŋ/ at the surface representation. The adjacent dorsal consonants are /k/, /g/, and /k^{w}/. These consonants are the triggers as shown in (21).

(21)	UR	Fante	Asante	Akuapem	Gloss
a.	*asɛm + ka*	*asɛŋkã*	*asɛŋkã*	*asɛŋkã*	‘statement’
b.	*asɛm + kuw*	*aseŋkuw*	*aseŋkuo*	*aseŋkuw*	‘group of words’
c.	*N-akʊa*	*ŋ-k^{w}ʊwaa*	*ŋ-k^{w}ʊa*	*ŋ-k^{ɥ}ɪa*	‘servants/slaves’
d.	*ɔ-N-kɔ*	*ɔ-ŋ-kɔ*	*ɔ-ŋkɔ*	*ɔ-ŋ-kɔ*	‘s/he does not go’
e.	*ɔ-N-gʊw*	*ɔ-ŋ-g^{w}ʊw*	*ɔ-ŋ-ŋ^{w}ʊ*	*o-ŋ-ŋ^{w}ow*	‘he is not soft’
f.	*Nkɪrabɪa*	*ŋkrab^{j}ɪa*	*ŋkrab^{j}ɪa*	*ŋkrab^{j}ɪa*	‘destiny’
g.	*Nkwadʑɪ*	*ŋkwãdʑɪ*	*ŋkwãdʑɪɛ*	*ŋkwãdʑe*	‘salvation’

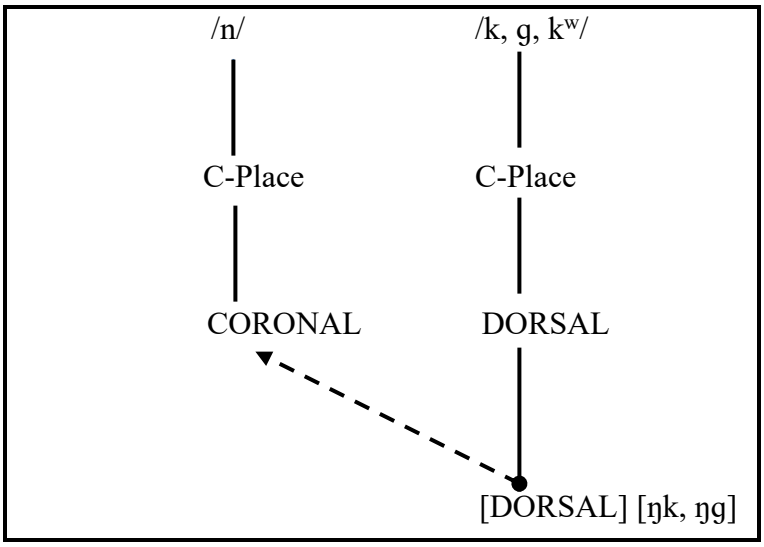
It can be seen from (21) that an unspecified nasal consonant /N/ has been assimilated to emerge as a dorsal nasal consonant in the environment of an adjacent dorsal consonant. The [dorsal] feature spreads from the trigger consonants [k, g, k^{w}] to the target consonants [m, n]. This makes the target and the trigger consonants have the same place feature value; that is [dorsal]. The dorsal assimilant nasal [ŋ] occurs in all the Akan dialects. This dorsal feature influences all the non-dorsal nasal sounds as illustrated in the FG below.

(22) Feature Geometry representation of assimilation of /m, n/ before /k, g/



In figure (22) above, a C-Place feature [Dorsal] spreads to the place node of the non-dorsal target consonant to have the same C-Place feature [Dorsal] at the surface representation. The C-Place feature [Dorsal] spreads from right to left to assimilate the preceding [Labial] nasal consonant to be realised as a dorsal nasal consonant. It is evident from the FG that the dorsal homorganic place assimilation is invariably partial, adjacent, and regressive (anticipatory). Thus, the two adjacent consonants have the same place of articulation. The same phenomenon also occurs in (21c-g), where a [Coronal] nasal assimilates to [Dorsal] in the environment of a dorsal consonant in Akan as illustrated in figure (23).

(23) Assimilation of /n/ after /k, g/ in Akan



It can be observed from figure (23) that when a coronal nasal consonant precedes a dorsal consonant in a word domain, the dorsal consonant regressively assimilates the preceding coronal nasal consonant to have the same C-Place feature value, which is [Dorsal].

5.2 Manner assimilation

Manner assimilation is a phonological process that focuses on the modification of the target sound in terms of the manner features so that the target sound becomes more identical to the trigger sound in terms of manner features. The features that specify the manner of articulation include [± continuant], [±nasal], [±lateral], and [±delayed release]. In Akan, the common manner feature emanating from the manner assimilation processes includes [±nasal].

5.2.1 Nasalisation

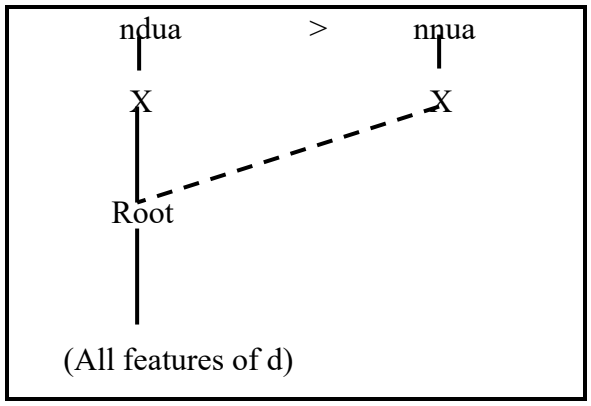
We define nasalisation as a phonological process where a non-nasal consonant sound, particularly, voiced plosives /b, d, g/ assimilates to the manner feature of the adjacent [nasal] consonant. That is, in the environment of [+nasal, -nasal], the [+nasal] influences the following adjacent [-nasal] consonant to be realised as [+nasal]. Nasal consonants are produced by forming an obstruction of the air current in the mouth and by lowering the velum to allow air to pass freely through the nasal cavity to come out into the atmosphere. A nasal consonant is one characterised by the escape of the airstream through the nasal passage, the oral passage being entirely blocked by the lips, by the tongue tip and velar ridge, or by the back of the tongue and velum (cf. Katamba 1989; Hayes

2009). The nasal consonants in Akan are [m, ɱ, n, ŋ, ɲ]. These consonants assimilate their adjacent non-nasal voiced plosive stops /b, d, g/ to become [+nasal] at the surface representations. In Akan, this process occurs mainly in the Asante and Akuapem dialects as shown in (24).

			Manner		
(24)	**UR**	**Place**	**Asante**	**Akuapem**	**Gloss**
a.	*N + dua*	*n-dua*	*n-nʲia*	*n-nʲia*	'trees'
b.	*N + (a)daka*	*n-daka*	*n-naka*	*n-naka*	'boxes'
c.	*N + da*	*n-da*	*n-na*	*n-na*	'days'
d.	*N + gʊ*	*ŋ-gʷʊ*	*ŋ-ŋʷʊ*	*ŋ-ŋʷo*	'red oil'
e.	*N + ʤɪʤɪɪ*	*ɲ-ʤɪʤɪɪ*	*ɲ-ɲɪʤɪɛ*	*ɲ-ɲiʤei*	'sounds'

From the above illustrations, the nasal consonants assimilate the adjacent non-nasal voiced plosive stops to be realised as a nasal at the surface form in Asante and Akuapem respectively as illustrated in FG in figure (25) below.

(25) Root node spreading



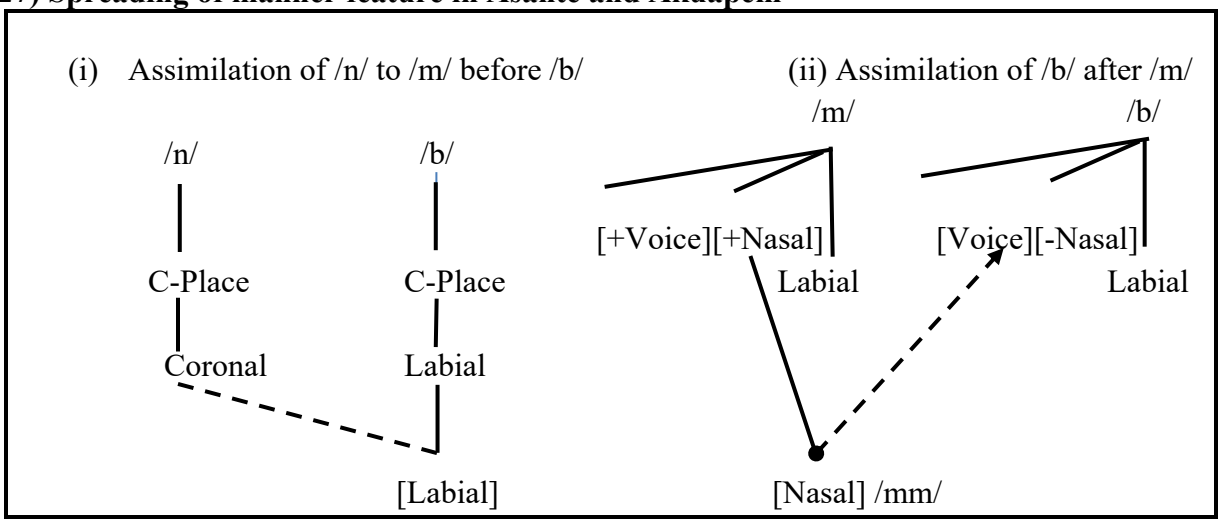
The spreading root node replaces the root node of [d], which is deleted by convention (Clements & Hume 1995). In most cases, these nasal consonants first agree in terms of the place feature, that is [coronal], [labial], [dorsal] before the nasal assimilant modifies its assimilee by its [nasal] manner feature as shown in (26).

			Manner		
(26)	**UR**	**Place**	**Asante**	**Akuapem**	**Gloss**
a.	*anan(ɪ) + bɔn*	*anambɔn*	*anammɔ̃ɔ̃*	*anammɔ̃ŋ*	'footstep'
b.	*akwan(ɪ) + bɔ*	*akwambɔ*	*akʷammɔ*	*akʷammɔ*	'path clearing'
c.	*asɛm(ʊ) + di*	*asɛndi*	*asennie*	*asenni*	'settling dispute'

We can see that in (26a-b), the labial consonant in the second stem spreads its [labial] feature to modify the non-labial final sonorant of the first stem word to have the same place feature value, [labial]. In (26c), too, the stem of two initial coronal consonants-/d/, regressively spreads its [coronal] feature to change its adjacent non-coronal consonant to become [coronal] at the output level. This process together with the one in (26) shows that complete or total nasal assimilation occurs in Asante and Akuapem.

In complete or total assimilation, the spread starts from the root node (cf. Clements 1985; Broe 1992). The spreading of the root node implies the spreading of all the features dominated by the root node, which involves the entire set of features as illustrated in FG in figure (27).

(27) Spreading of manner feature in Asante and Akuapem



The schemas in (27) indicate the essence of complete or total assimilation in Twi (Asante and Akuapem). The FG illustrates bidirectional reciprocal spreading of place and manner features. The trigger and the target first agree on the place feature as illustrated in (27i). The trigger has a C-Place feature labial and the target consonant has a C-Place feature coronal. Thus, the [labial] feature, which is the trigger, spreads regressively to modify the preceding coronal nasal to surface as a labial nasal /m/. The assimilant labial nasal [m] and its assimilator (the trigger) do not harmonise in terms of manner features. Therefore, the assimilant labial nasal [m] becomes a trigger and concurrently changes its assimilator in a rightward direction as illustrated in (27ii). This process is what we have termed 'bidirectional reciprocal assimilation' or 'place-to-manner assimilation'. Thus, nasalisation and nasal assimilation in Akan are sometimes bidirectional, that is, they involve both regressive and progressive, particularly for voiced plosives in Asante and Akuapem Twi. In other words, a consonant spreads to the place node of the preceding nasal consonant to have the same place feature which could be either [labial] or [coronal]. The assimilant nasal progressively spreads to the manner node of the following [labial] or [coronal] consonant to have the same manner feature, which is nasal.

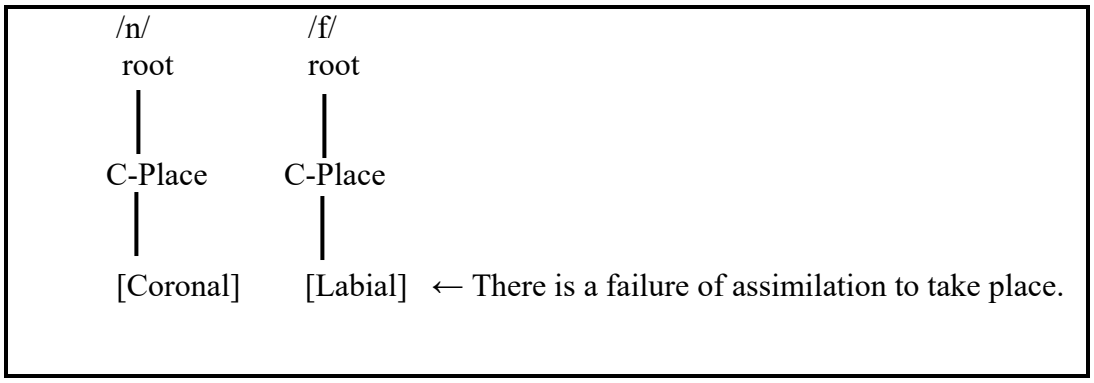
6.0 Exceptions to the nasalisation and nasal assimilation in Akan

There are a few cases in Akan where different consonant features co-occur at the systematic phonetic level of representation. In such words, the two successive adjacent consonants do not exert influence on each other. Neither the preceding consonant nor the following adjacent consonant regressively or progressively spreads to assimilate the other. The homorganic nasal consonant assimilation could either be coronal and labial (alveolar and labial-dental), or labial and coronal (bilabial and alveolar). Consider the examples that follow in (28).

(28)	UR	Fante	Asante	Akuapem	Ill-formed	Gloss
a.	*akan*	*aka**nf**ʊ*[1]	*aka**nf**ʊɔ*	*aka**nf**ʊ*	**akaŋfʊ*	'Akan people'
b.	*a- di-kan+fʊ*	*edzika**nf**ʊ*	*ædika**nf**ʊɔ*	*ædika**nf**ʊ*	** ædika**ŋf**ʊ*	'pioneers'
c.	*a-hʊ-ɔ-dɪn+fʊ*	*ahõɔdzɪ**nf**ʊ*	*ahõɔdɪ**nf**ʊɔ*	*ahõɔdɪ**nf**ʊ*	**hõɔdɪ**ŋf**ʊ*	'strongmen'
d.	*nim + adɪ*	*ɲĩ**md**zɪɪ*	*nĩ**md**ɪɛ*	*nĩ**md**ɪɛ*	**nĩ**nd**ɪɛ*	'knowledge'
e.	*akʊma + tu*	*akʊ**mt**u*	*akʊ**mt**uo*	*akʊ**mt**u*	** akʊ**nt**u*	'fear/panic'
f.	*asʊm + kawa*	*asʊmkawa*	*asʊmkaa*	*asʊmkaa*	** asʊŋkaa'*	'ear ring'

The examples in (28a-c) can be represented in FG as follows:

(29) Representation of exception to nasalisation in FG.



It can be seen from (27) that a sequence of two different place features, that is [coronal], [labial] in [nf], [labial], [coronal] in [mdz~md, mt], and [labial], [dorsal] surfaces in Akan. Though Akan possesses a robust homorganic nasal and manner consonant assimilation, these few exceptional cases show that assimilatory processes (either long; distal or short; proximal) are subject to some degree of exceptions (see Dolphyne 2006; Katamba 1989; Clements & Hume 1995; Mahanta 2007).

7.0 Conclusion

In this paper, we discussed nasalisation and nasal assimilation in Akan within the model of Feature Geometry. We demonstrated in this study that nasalisation and nasal assimilation occur in the domains of stems, compound words, negations, imperative/optative verbs, plural formation, and reduplications. The trigger and the target segments could be partial and complete based on the degree of the similarity between the assimilant to the assimilator. Partial nasal consonant assimilations are homorganic. We also established that nasalisation and nasal consonant assimilation in Akan are either regressive or reciprocal. The paper categorised nasalisation and nasal consonant assimilation in Akan under two main types: namely place assimilation and manner

[1] The morphological composition of the examples in (28) is given as follows: (a) suffix morpheme *-fʊ(ɔ)* is a kinship plural nominaliser. (b) is a compound with two stems *di*, literally 'to eat' and *kan* literally 'first' together with a nominal plural markers *a-fʊ(ɔ)*. (c) shows a complex compound with three stems *-hõ* literaly 'body', *jɛ* is a copular verb 'to be', and *dɪn* literary 'hard/strong' conjoin with a nominal plural markers *a-fʊ(ɔ)*. Here, the *jɛ* is reduced to a vowel that takes the lip-position of the preceding vowel. (d) the stem *nim* literary 'to know' and the second stem *adɪ* literally 'a thing' join together to form *nimdeɛ* or *ɲimdzee* meaning 'knowledge'. (e) *akʊma* 'heart' and *tu* literary 'to fly' become *akʊmatu* 'fear/panic'. (f) *asʊm* 'ear' and *kawa* 'ring' become *asʊmkaa* 'ear-ring'

assimilation. While labialisation, coronalisation, and dorsalisation were categorised as nasal consonant place assimilation, nasalisation was captured under manner assimilation. We also showed that, often, before manner assimilation can take place, the trigger has to first harmonise with the target consonant in terms of place feature before the assimilant, which has a manner feature [+nasal] can spread progressively to modify its assimilator to have the same manner feature value. The trigger and the target spread reciprocally to each other. We therefore conclude that Akan demonstrates a robust nasalisation and nasal consonant assimilation process.

Abbreviations used

ATR	Advanced Tongue Root	FG	Feature Geometry
ANT	Anterior	PFT	Place feature theory
Cons	Consonants	RED	Reduplicant;
COR	Coronal;	Son.	Sonorant
C-C	Consonant-consonant	V-C	Vowel-consonant
C-Place	Consonant-Place	UR	Underlying form
C-V	Consonant-vowel	V-V	Vowel-vowel
DOR	Dorsal		

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