Nasal Gemination in Malayalam:

A phonological account with special reference to retroflex sounds

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Abstract

Cross- linguistically, marked segment in a phonological system is characterized to show resistance to phonological alternation (Rice (1999), de Lacy (2006). The paper analyzes nasal gemination phonological processes that involve retroflex sounds, a sound category usually considered as a marked segment, along with alveolar sounds in Malayalam. Malayalam retroflex sounds in fact conform to the universal notion that marked segments are triggers in a phonological process, where in the process when the euphonic retroflex nasal trigger the process forcing the dental to take its nasality and becomes a nasal geminate.

 Keywords: Nasal gemination, retroflex, alveolar, markedness

Introduction

Malayalam, spoken in Kerala, south India, belongs to the Dravidian language family originated from Middle Tamil in sixth century (Caldwell 1875, Asher and Kumari 1997). It is also claimed that Malayalam is originated as an independent outcome of the Proto-Dravidian language. It has incorporated the vocabulary of Sanskrit as a result majority of the Malayalam words are Sanskrit. This impact of Tamil and Sanskrit in the phonological system of Malayalam has resulted in 'sanskritized' and 'dravidianized' sounds.

In terms of place of articulation, retroflex sounds are more complex, for they exhibit five- way contrast among, stops, nasals, fricatives, laterals and glide. Besides the voiceless- voiced distinction, it has aspirated-unaspirated distinction too within stops excluding the alveolar stops. Some of the phonologists like Mohanan (1992) have listed another retroflex sound, a rhotic retroflex as in words like (1).

(1) ɻʂi   'saint'   ɻdu   'seasons'

While discussing the markedness question of retroflex sounds in Malayalam it is important to consider it with other coronal sounds and their status in the markedness property. The coronal inventory of Malayalam is given in Table (1).

	Dental	Alveolar	Palato-Alveolar	Retroflex
Stop	t̪ t̪ʰ d̪ d̪ʰ	n̪	c cʰ ɟ ɟʰ	ʈ ʈʰ ɖ ɖʰ
Nasal	n̪	N	ɲ	ɳ
Fricative		S	ɕ	ʂ
Lateral		L		ɭ
Tap		r ɾ		
Approximant				ɻ
Glide			j	

Table 1 Coronal inventory of Malayalam

The standard database of Malayalam verbs in Kunjan Pillai (1965)[1] include sixteen classes, where the classes are divided according to the different markers of past tense that which are phonologically conditioned. Two major groups of verbs separated by the difference in the surfacing of morpheme attached are proposed by Pillai (1965). Out of sixteen classes four of them include in the first group where a vowel /i/ is attached with stem, while the rest, twelve include in the second group where -ṭu is attached. According to Pillai (1965) when started with consonant, the marker is voiceless dental stop -t̪ and its variants (Quoted from Asher and Kumari 1997) underlyingly. These variants are [-ṭu, -ṭṭu, -ṇṭu, -ŋŋu, -ɲɲu, -ccu, -rru, -nnu and -t̪t̪u] see (2). The surfacing of variants of /t/ is, in reality, a matter of assimilation processes determined by the nature of the stem to the final segment of which the past tense marker is attached. But the presence of a nasal feature in these different realizations make it problematic in determining the motivation such alternations, whether it is phonological, phonetic or morphological. Valentine (1976) argues that except for the nasal in class 2, which is related to stem- final consonant; all other nasal is a "euphonic nasal which in the past tense forms follows the stem and precedes -ṭu". The euphonic nasal is introduced when the stem ends in [a, i, e, r, l, ḷ, ɻ, akk, j, v], therefore phonologically conditioned. In (3) the environment for the different realization of the past tense that involves retroflex and alveolar sounds is given.

(2) Class	Example	Stem structure	Past tense	
1	uɻuka	(C) Vɻ (C) Vjj / CVr	-t̪-	'plough'
2	iṭuka	(C) Vṭ / (C) Vr	-ṭṭ- / -rr-	'drop'
3	uṇṇuka	Vṇṇ / CVṇ/ CVr	-ṇḍ-	'eat'
4	vi:ɻuka	-ɻ	-ŋŋ-	'fall'
5	karaḷuka	-ḷ	-ṇḍ-	'gnaw'
6	keḷkkuka	- ḷkk / - lkk	-ṭṭ- / -rr	'hear'
7	aṭajuka	-aj/ -aaj/ -i/ -ee	-ɲɲ	'close'
8	akaluka	-l/ -r	-nn	'separate'
9	o:rkkuka	-akk/ -ukk/ -rkk	-t̪t̪-	'remember'
10	ajakkuka	-ikk/ -aykk/ -a:jkk	-cc-	'send'

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[1] Kunjan Pillai, Suranad. (1965). Kriyaka.Ju.te ganavibhligam ('Classification of verbs'). Appendix, separately paginated (105 pp.), to Kunjan Pillai (ed.), Vol. I.

| 11 | a:ɾambʰikkuka –ikk | -cc- | 'begin' |
| 12 | ampaɾakkuka -akk/ -lkk | -nn- | 'be confused' |

(From Asher and Kumari 1997)

(3) a. -ʈʈ-   stem- final ʈ + t̪   →   ʈʈu

b. -ʈʈ-   stem- final ɭkk + t̪u   →   ʈʈu

c. -ɳɖ-   stem- final ɳɳ + t̪u   →   ɳɖu

d. -ɳɖ   stem- final ɭ + N + t̪u   →   ɳɖu

e. -ɳɳ-   stem- final ɻ + N + t̪u   →   ɳɳu

f. -n̪n̪-   stem- final –l/ -r + t̪u   →   n̪n̪u

g. -tt-   stem- final -lkk   →   ttu

h. -n̪n̪-   stem- final -lkk   → nnu

(From Asher and Kumari 1997)

Nasal Gemination of Past- tense marker in Malayalam

Among the five environments for the different realization as shown in (2 and 3) of the past tense that involves retroflex, there is a gemination process as stated in (4) and (5).

(4)

Class	Example	Stem structure	Past tense	
4	vi:ɻuka	-ɻ	-ɳɳ-	'fall'
8	akaluka	-l/ -r	-nn	'separate'
12	n̪ilkkuka	-l-	-n̪n̪-	'stand'

(5)
-ɳɳ- stem- final ɻ + N + t̪u   →   ɳɳu
-n̪n̪-   stem- final –l/ -r + t̪u   →   n̪n̪u
-n̪n̪- stem- final -lkk   → nnu

Each of these processes is analyzed in the below sub sections.

Nasal Gemination of Class 4 Past- tense marker

Class 4 according to Pillai (1965) is one variant of the past tense marker (-t̪u) in Malayalam. Here when the stem structure ends in -ɻ, the surfacing past tense marker is -ɳɳu. Class 4 past- tense marker that undergoes assimilation is when a stem ends in /ɻ/. When the stem ends in an approximant retroflex sound, [viɻ-] for example (viɻuga 'fall'), the dental stop in past tense marker -t̪u gets assimilated to a retroflex nasal as shown in (4). For this to occur, we postulate that there occurs an epenthesis of a euphonic nasal to the stem of the

word. Though, a sequence of approximant- nasal is allowed[2] word- internally, approximant- retroflex nasal do not occur word- internally or otherwise. Therefore the approximant retroflex gets deleted. The base of the verb becomes [viŋ- , where the past tense marker is suffixed. The nasal- consonant combination in this case is reduced to nasal- nasal combination. Here it takes the nasality itself and becoming a nasal geminate, in the current case a nasal retroflex geminate [-ɳɳ-].

(6)   root   Verb- INFIN   verb- PAST

    a. viɻ   viɻuga   viɳɳu   'fall'

The constraints in OT are invoked to address germination process

(7) INSERT]stem nasal

Insert a nasal at the end of stem of a word

This constraint will conflict against the faithfulness constraint DEP- BA, which ban any epenthesis in the

base of the verb.

INSERT]stem nasal is higher ranked, because it is the insertion of the euphonic nasal that make possible the whole process of gemination and change to past tense. Further the insertion of a euphonic nasal is very productive in Malayalam[3].

(8) *COMPLEX

   'No complex syllable margins' (Prince and Smolensky 1993)

The *COMPLEX constraint is due to Malayalam's general tendency to avoid tauto- syllabic cluster. Both complex onsets and codas are disliked in Malayalam.

(9) *NC (Vl)

   'No nasal plus voiceless obstruent cluster.'

This is a repair strategy that employs on nasals + voiceless obstruent cluster, and not confine to retroflex. The restriction has an impact on every lexical domain, non- derived and derived.

(10) AGREE (Place)[4]

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[2] t̪aɻn̪n̪a 'low'   t̪aɻma 'humility'

However it does not occur outside a word.

[3] Valentine (1976) demonstrates that a euphonic nasal is introduced when the stem ends: [a, i, e, l, ḷ, ɻ, akk, y, v]. The euphonic nasal insertion occurs in five classes of Kunjan Pillai's twelve classes of past tense. Apart from the current class that are discussed; class 6, where stem ends in /ɻ/ the past tense marker changes to a retroflex nasal, e.g., vi:ɻuga 'viɳɳu' 'fall'; class 7, where the stem ends in / –l or -r /, the past tense marker changes to a ental geminate nasal, e.g., agaluga 'agan̪u' 'separate'; and class 12, where the stem ends in / -akk/ -lkk /, the past tense marker assimilates to dental geminate nasal, e. g., ambaɾakkuga 'ambaɾan̪n̪u' 'be confused'.

Adjacent output segments have the same value of the feature place

The markedness constraint for the analysis of gemination in the past- tense marker in Malayalam is AGREE (Place) from the family of AGREE constraint (Pulleyblank 2004, Lombardi 2001) where it posts a adjacent consonants to agree in its feature as a requirement, here in AGREE (Place) constraint insist adjacent consonants to be identical in place of articulation.

(11) IDENT - IO Lar

The specification for the laryngeal feature of an input segment must be preserved in its output correspondent.

The IDENT- IO Lar constraint is from the IDENT family of constraints that prevent any kind of change from a voiced to a voiceless or vice versa in the input- output representations.

(12) DEP- IO

Output segments must have input correspondents.

(13) IDENT- IO (root)

Penalize any unfaithful mapping of a segment in the root.

IDENT- IO (root) (McCarthy and Prince 1995, Beckman 1998) constraint is another faithfulness constraint that stipulate restriction of any change in the root.

(14) IDENT- IO (Place)

The specification for place of articulation of an input segment must be preserved in its output correspondent.

(15) DEP- BA

Every segment in the base after affixation has a correspondent in the base.

The current assimilatory process invokes three other constraints in order to explain the nasal – nasal combination in the output:

(16) MAX [ɻ]

Segment [ɻ] in the base of the input must have an output correspondent in the base.

MAX [ɻ] a faithfulness MAXIMALITY constraint militate against the deletion of the [ɻ] segment, since in the Malayalam the approximant retroflex is deleted, it is likely to be lower ranked.

(17) *Nasal + Obstruent (*N-Obs)

‘No nasal plus obstruent sequence’

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⁴ Before going into the analysis two major points with regard to the AGREE (Place) constraint has to be made in relation with the Malayalam syllable structure. The syllable structure that we are following in the current book is close to the universal syllabification. Intervocalic consonant sequences are assigned to the onset, where AGREE (Place) is applied, only if a particular consonant sequence is allowed as an initial onset consonant sequence. Thus in a few cases the language demands restriction applied more than just agreeing in place feature in a consonant cluster.

Once the nasal retroflex in the final position of the base interact with the dental stop of the initial segment of the suffix, there is a chance for the output to be a voiced obstruent (e. g., -ɳɖ-) due to the impact of the *NC [vl] constraint which is higher ranked in the language. In order to achieve the desired result, the grammar invokes a universal markedness constraint that which disfavors the evolving of a nasal- voiced obstruent sequence. *N-Obs constraint serves this purpose.

(18) *Nasal- Nasal (*NN)

'No nasal plus nasal sequence'

The impact of *NC [Vl] constraint which is higher ranked in the Malayalam results in a nasal- voiced obstruent consonant sequence, which implies that the resultant output of the *NC [Vl] constraint in Malayalam can either be a nasal- voiced obstruent consonant sequence or a nasal- nasal consonant sequence as in current case. Thus we need a constraint that invoke against a nasal – nasal consonant sequence. *NN markedness constraint serves this purpose.

Since the insertion of a euphonic nasal is very productive in Malayalam, INSERT]stem nasal is higher ranked. *COMPLEX, *NC, DEP – IO, *N-Obs is ranked next. These constraints are unsuperseded in the constraint hierarchy. The ranking of the two constraints that plays important role in repair strategy of *NC [vl] constraint is *N- Obs >> *NN. Therefore *NN constraint is lower ranked un-dominated by the two IDENT constraints. Thus, the complete ranking relation of the constraints for Class 4 of Malayalam past- tense marker is:

(19) ranking: Nasal gemination of Past- tense marker in Malayalam Class 4
    INSERT]s nasal >> *COMPLEX, *NC [vl], DEP – IO, *N-Obs >> AGREE (Place) >> MAX [ɻ] >> *NN >> IDENT - IO (root), IDENT IO Place

This ranking holds in Malayalam as shown in Tableau (1).

vi̤] -tu	INSERT]s nasal	*COMPLEX	*NC [Vl]	DEP – IO	*N-Obs	AGREE (Place)	MAX [ɻ]	*NN	IDENT -IO (root)	IDENT IO Place
a. vi̤ʈu	*									
b. vi̤ɖu	*									
c. vi̤ɳɖu		*		*			*			
d. viɳɖu					*		*		*	
e. ☞ viɳɳu							*	*	*	
f. viɳʈu			*			*	*		*	

Tableau 1: Nasal gemination of Past- tense marker in Malayalam (Class 4)

In Tableau (1) candidate (e) is the optimal output for it does not violate any of the higher   ranked constraints. Both the candidate (a) and (b) violates INSERT]s nasal constraint for the reason that it fails to add an nasal. Candidate (c) violates *COMPLEX constraint, due to the ɳɖ- cluster in onset of the second syllable. The syllabification is vi̤.ɳɖu. The presence of an obstruent along with the nasal in candidate (d) violates *N-Obs, thus failing to be the optimal output. Whereas candidate (f) violates the higher ranked *NC [vl]   constraint   because   of   the   nasal   voiceless   stop   cluster.

Nasal gemination of Class 8 Past- tense marker

Class 8 according to Pillai (1965) is one variant of the past tense marker (-ṯu) in Malayalam. Here when the stem structure ends in – l or r, the surfacing past tense marker is -nnu. In class 8, the past tense marker assimilates to the final consonant of the stem which, like in the above process, a euphonic nasal, a alveolar nasal here, is added to the stem after the lateral alveolar here as shown in (20).

(20)　akaluka

akal] + ṯu → akaln] + ṯu

Malayalam does not allow alveolar lateral clustering with alveolar nasal; therefore the alveolar lateral gets deleted. The past- tense marker here is interacting with the euphonic nasal after the deletion of the alveolar lateral. The dental nasal in Malayalam is a 'derived nasal' and occurs as geminate in the language. Further there exists an allophonic relation between the alveolar and dental nasal in the language, though they do not establish any contrastive relation, nor they are free variation. That is to say that dental nasal occurs only morpheme initially and the alveolar nasal occurs medially and finally. The geminate [ṉṉ] is likely derived from [nṯ], which is an expansion of the allophony relation in terms of the geminate. Both a nasal and place assimilation takes place in order to surface as a geminate dental nasal. Thus there exist an indifference towards the dental nasal in Malayalam and is suggested to be a marked element in the language. This applies to all [+ant, + dist] featured nasal in Malayalam as well.

In order to explain the assimilatory processes of class 8 the following constraints are required.

(21) INSERT]stem nasal

Insert a nasal at the end of stem of a word

(22) *COMPLEX

　'No complex syllable margins' (Prince and Smolensky 1993)

(23) *NC (Vl)

　'No nasal plus voiceless obstruent cluster.'

(24) AGREE (Place)

　　Adjacent output segments have the same value of the feature place

(25) IDENT - IO Lar

The specification for the laryngeal feature of an input segment must be preserved in its output correspondent.

(26) DEP- IO

　　Output segments must have input correspondents.

(27) IDENT- IO (root)

　　Penalize any unfaithful mapping of a segment in the root.

(28) IDENT- IO (Place)

> The specification for place of articulation of an input segment must be preserved in its output correspondent.

(29) DEP- BA

Every segment in the base after affixation has a correspondent in the base.

(30) *Nasal + Obstruent (*N-Obs)

'No nasal plus obstruent sequence'

(31) *Nasal- Nasal (*NN)

'No nasal plus nasal sequence'

The current assimilatory process invokes five other constraints in order to explain the nasal – nasal combination in the output:

(32) MAX [l]

Segment [l] in the base of the input must have an output correspondent in the base.

MAX [l] a faithfulness MAXIMALITY constraint militate against the deletion of the [l] segment, since in the Malayalam the lateral alveolar is deleted, it is likely to be lower ranked.

(33) *Nasal [+dist]/ [+back]

'No n̪, ɲ, ŋ'

This constraint establishes the markedness of derived nasals, while the next constraint is related with the underived nasals in the language, where the in Malayalam the above constraint will be more marked than the next constraint.

(34) * Nasal [lab] / [+/- ant]

'No m, n, ɳ'

In the nasal alveolar –stop dental combination, it from the following dental stop that the nasal takes the place feature resulting in a dental nasal and later the nasality is spread to the stop. But why the nasal take the place feature is an interesting phenomenon. It has to do with the syllabification in the language. AGREE Place constraint could not account for this kind of feature spreading. The language prefers the onset of a syllable than the coda of the syllable. Here in the alveolar- dental (-nt̪-) combination alveolar nasal is the coda of a syllable following by the dental stop as the onset of the next syllable. Thus the place feature of the dental is preserved over the coda.

(35) IDENT ONSET PLACE (IDENT On Pl)

'Specification of the place feature of an onset consonant is identical to that of its input.'

(36) IDENT CODA PLACE (IDENT Co Pl)

'Specification of the place feature of a coda consonant is identical to that of its input.'

The preference of onset over coda can be seen in clusters, thus only the derived nasal surface in context of clusters.

We have the constraint interaction of the sort of constraint ranking of class 4 shown in (16), except that the position where MAX [ɹ] is situated is replaced by MAX [l] and the inclusion of the new constraints (33), (34), (35) and (36). The complete ranking of the nasal germination will be as shown in (37).

(37) ranking: Nasal gemination of Past- tense marker in Malayalam Class 8[5]

INSERT]$_s$ nasal >> *COMPLEX, *NC [vl], DEP – IO, *N-Obs >> AGREE (Place) >> MAX [l] >> IDENT On Pl >> IDENT Co Pl >> IDENT IO Place, *Nasal [+dist]/ [+back] >> * Nasal [lab] / [+/- ant], *NN >> IDENT - IO (root)

This ranking holds in Malayalam as shown in Tableau (2).

Any candidate with a voiceless sound following nasal violates the higher ranked constraint *NC [vl], thus candidate e is deleted. Candidate c violates *N-Obs constraint with / d / following the nasal. AGREE (Place) takes out candidate a and b for they both do not agree in place. Candidate d violates the IDENT On Pl constraint by having a alveolar nasal in the onset position rather than dental. Thus candidate f, akaṇṇu is the optimal candidate. It is violated by constraints * Nasal [lab] / [+/- ant] and *NN which are lower ranked.

akal] -ṭu akan] -ṭu	*NC [Vl]	DEP – IO	*N-Obs	AGREE (Place)	MAX [l]	IDENT Onset Place	IDENT Coda Place	IDENT IO Place	*Nasal [+dist] [+back]	* Nasal [lab] / [+/- ant]	*NN	IDENT - IO (root)
a. akalṭu				*!								
b. akalḍu				*!								
c. akandu		*!						**	*			*
d. akannu						*!		**!		**	*	*
e. akanṭu	*!		*	*				*	*			*
f. ☞ akaṇṇu						*	*			**	*	*

Tableau 2 : Nasal gemination of Past- tense marker in Malayalam Class

Nasal gemination of Class 12 Past- tense marker

Class 2 according to Pillai (1965) is one variant of the past tense marker (-ṭu) in Malayalam. Here when the stem structure ends in –akk or -lkk, the surfacing past tense marker is -u. The nasal gemination process of class 12 past- tense marker where the root ends in an alveolar lateral after joined by a euphonic nasal, here a alveolar nasal, gets deleted and when the suffix is added to stem gets geminated by the nasal and place assimilation. The stem form is with a geminate -kk- following the lateral alveolar. However the root of the verb is without the geminate velar stop after Pillai (1965). Thus the root ends in a lateral alveolar (38).

(39) nil   nilkk   nilkkuka 'stand'

The suffix of the past tense marker (-ṭu) is added to the root of the verb (nil- + -ṭu here) and the ends up in a geminated dental nasal. It is to the root of the verb the euphonic nasal is epenthesized resulting in [niln-] to which the suffix of the past tense marker interacts. The lateral gets deleted and the -nṭ- consonant cluster interaction results in a -ṇṇ- geminated form because of the *Nasal [+dist]/ [+back] >> * Nasal [lab] / [+/-

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[5] Since INSERT]$_s$ nasal, *COMPLEX, constraints are omitted from the Tableau, thus it will be *NC [vl],

DEP – IO, *N-Obs >> AGREE (Place) >> MAX [l] >> IDENT On Pl >> IDENT Co Pl >> IDENT IO

Place, *Nasal [+dist]/ [+back] >> * Nasal [lab] / [+/- ant], *NN >> IDENT - IO (root)

ant] constraint hierarchy as we seen with class 8. For the OT analysis of the process at hand we need the same constraint ranking of class 8 ranking which is restated in (40)

(40) ranking: Nasal gemination of Past- tense marker in Malayalam Class 12

*NC [vl], DEP – IO, *N-Obs >> AGREE (Place) >> MAX [l] >> IDENT On Pl >> IDENT Co Pl >> IDENT IO Place, *Nasal [+dist]/ [+back] >> * Nasal [lab] / [+/- ant], *NN >> IDENT - IO (root)

The ranking in Malayalam will hold in the tableau 3

nill] -t̪u nin] - t̪u	*NC [Vl]	DEP – IO	*N-Obs	AGREE (Place)	MAX [l]	IDENT Onset Place	IDENT Coda Place	IDENT IO Place	*Nasal [+dist] [+back]	* Nasal [lab] / [+/- ant]	*NN	IDENT - IO (root)
a. ninnu						*!			*		*!	
b. niṉṉu							*			*	*!	

Tableau 4. 2 : Nasal gemination of Past- tense marker in Malayalam Class

Candidate (b) is the optimal candidate for it s the least violated.

Nasal Gemination in mono-morphic words

Malayalam exhibit two major phonological process with regards to mono- morphic words; the process of post- nasal voicing assimilation and nasal germination. In mono- morphemic words as shown in (41), the nasal- voiceless obstruent consonant sequence restriction is maintained.

(41)

a. vaɳɖi   *vaɳʈi   'cart'

b. vara:ɳɖa   * vara:ɳʈa   'dry'

The existence of nasal gemination (42) in the same context seems little problematic. In order to understand this phenomenon, the seven- way contrast of nasals in Malayalam have to be explored. Here, the nasals detailed in Mohanan and Mohanan (1984) is relevant. Mohanan and Mohanan (1984) proposes that there are three underlying nasals including /m, n, ɲ/ and the other four are derived ones /ṉ, ŋ, ɲ, ṉ/, apico- alveolar, dorso- velar, lamino- palatal and lamino- dental respectively. While the underlying nasals occur freely in the language derived nasals are restricted to geminates and homorganic clusters. Since the *NC (vl) effect is dominant in the language, thus, I assume that the consonantal slot after the nasal is only marked for place. Therefore the constraint that prohibits nasal- nasal (43) to occur will be minimally marked and the prohibition of the nasal-obstruent constraint will be marked above the nasal- nasal banning constraint. Thus the complete ranking for nasal gemination will be (44)

(42)

t̪unnuga 'to sew'   eɳɳa 'oil'

t̪innuga 'to eat'   t̪iɳɳa 'veranda'

maɳɳə 'soil'

(43) *NN

Penalize occurrence of nasal geminate

Apart from this constraints a constraint that prohibit deletion from the input should be available, thus we incur the faithfulness constraint MAX- IO, which will be ranked after the higher ranked constraint. Further, two other constraints are utilized in order to explain the gemination process; i. e., the process and grammar insist on the onset to be preserved in place. An IDENT constraint demanding the onset of input to be identical to output in terms of place and the IDENT constraint that which demand the coda of input to be identical to output opposing it is incurred, where due to the preservation characteristic of the language IDENT Onset Place higher ranked than the IDENT Coda Place. Thus the complete constraint ranking for nasal gemination in mono-morphic words would be (41).

(44) Nasal Gemination in mono-morphic words

*NC [vl], IDENT – IO [±sonorant], MAX- IO >> AGREE (Place) **>>** IDENT Onset Place, *N-Obs >> IDENT Coda Place >> *NN

This ranking is illustrated in the following tableau (4).

In Tableau (4) in input one candidate (1a) is the optimal candidate as it is least marked and in input 2 candidate 2b is the optimal candidate for the same reason.

1. Input: ṯuN*[6]uga	*NC [vl]	IDENT–IO [±sonorant]	MAX-IO	AGREE (Place)	IDENT On Pl	*N-Obs	IDENT Co Pl	*NN
a. ☞ ṯunnuga						*!		
b. ṯunuga			*			*		
c. ṯuṇṇuga								*
2. Input eN*a								
a. eṇa			*					
b. ☞ eṇṇa								*
c. enna					*!			*

Tableau 4.: Nasal Gemination in mono-morphic words

Conclusion

The above cases of gemination demonstrate that the alveolar sounds are the target of the phonological processes, while retroflex sounds are the trigger of phonological process. In Class 8 And Class 12 of the past tense marker where the stem ends in alveolar sound interacting with the past tense marker [ṯu] takes the place of the first consonant of past tense marker surfacing in the language as a geminate dental consonant sequence in past tense. Whereas retroflex sounds explained in class 4 past- tense marker, where the stem ends in a retroflex and a euphonic nasal is added; a retroflex nasal in this case, is the trigger of phonological process. In the process when the euphonic retroflex nasal trigger the process forcing the dental to take its nasality and becomes a nasal geminate.

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[6] * [high]

Trubetzkoy (1939) suggested that markedness relation can be predicted with reference to asymmetrical patterning of features, sounds in phonological processes and inventories. Rice (1999) explains this aspect with evidence. He argues while unmarked features and sounds are prompt to alternations, marked features and sounds resist change (Rice 1999). The above study demonstrates that Malayalam retroflex sounds in fact conform to the universal notion that marked segments are triggers in a phonological process (Rice 2007).

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