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Strength Asymmetry and Positional Licensing: An Optimality Theoretic Account of Assamese Regressive Voicing Assimilation

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Abstract

An attempt is made in this paper to examine whether strong or weak licensing capacity in a phonological domain is an inherent abstract property assigned by UG irrespective of languages or conditioned by phonetic factors. It is the normal case for languages to have homogeneous voice clusters, which are created by spreading both values of the [+/-voice] feature over the entire cluster, usually in a regressive fashion. Assamese exhibits the instance of regressive voicing assimilation, in which it is seen that the segment occurring in the coda position tends to agree in terms of feature [voice] with the following voiced obstruent in the onset position. But this regressive voicing assimilation is blocked by nasals and liquids. Since obstruent clusters agree in terms of sonority value they display assimilaton which is blocked among the segments of different class such as nasals, laterals and rhotics which are characterized by diverse sonority values. Voicing assimilation is functional among the segments of same sonority value and this is blocked between the segments of asymmetric sonority value. The data in this paper are collected from primary sources: ten native speakers of Assamese.

Keywords: Assimilation, Strength asymmetry, Sonority

1. Strength Relations, Positional Oddities and Assimilation

Strength is treated in literature either as a form of perceptual salience or intrinsic property embedded in a particular segment, as evident in the works of Steriades' (1997) 'Licensing by cue' model, Flemming and Kirchner's (1998) 'Integrated models of phonetics and phonology'. Irrespective of these approaches holding different viewpoints concerning strength relations a general consensus is made that strength difference can be shown as a reflection of the asymmetrical relations holding between units in a representation. It has been found cross linguistically that marked structures are unevenly distributed throughout language, with strong or privileged positions allowing a greater range of structures and positional neutralization (Steriade 1994; Jun 1995; Padgett 1995; Steriade 1997; Casali 1997; Beckman 1998; Lombardi 1999; Zhang 2002; Barnes 2002; Alderete 2003 etc). The notion of phonological strength is strengthened by the data on assimilation which further bring home the point that there is a correlation between phonological licensing of features and prosodic positions.

2. Assimilation from the Perspective of Positional Faithfulness Theory, Perceptual Account and P-Map Theory: Evidence from Assamese

Assimilation, a linguistic process, in which a particular segment takes on the feature from its neighboring segment, can be analyzed from various perspectives ranging from positional faithfulness theory to P-map theory in order to build a hypotheses concerning the representation and patterning of speech sounds. Nevertheless, the phenomenon of assimilation can throw ample light upon the physical motivation of phonological substitutions and thereby establishing the point that although phonological substitution is considered as mental operation and not a mere reflection of peripheral motor constraint, yet it is clearly motivated by the physical character of speech along with its neuro-physiological, morphological, mechanical, temporal and acoustic properties (Stampe, David. 1979). There lies a physically definable connection between a phonological substitute and its context. In the process of assimilation, the substitute takes on a feature of the context unlike dissimilation in which the substitute loses a feature of the context.

This present paper takes in to consideration the role played by position in a syllabic domain and the perception in triggering the process of assimilation. An attempt has been made in this study to investigate the process of assimilation from two perspectives that are, Beckman's positional view and Donca Steriade's perceptual account of P-map theory. Beckman (1998) has talked about positional privilege in phonology. There are some linguistic positions such as root initial syllables, stressed syllables, syllable onsets, roots, long vowels etc which enjoy special perceptual advantage in the processing system of the languages via psycholinguistic or phonetic prominence over the complement of non privileged positions which include non initial syllables, unstressed syllables, syllable codas, affixes, clitics, function words and short vowels etc. The privileged positions can be divided in to broader categories: psycholinguistic prominence and phonetic prominence. Whereas the former refers to those positions bearing the heaviest burden of lexical storage, lexical storage and retrieval, and processing: root initial syllables, roots and final syllables to a degree (Steraide, 1993). As far as the process of

assimilation is concerned it can be correlated with the positional domains in a syllable or in a word. Beckman (1998) claims that the phonological asymmetries, especially manifested in onset coda asymmetries constitute a random collection of positional oddities, but revolve around single generalization: segments in prominent positions resist alternation. The functional motivation for this resistance is vivid as phonological contrasts are preferentially maintained in prominent positions because these positions are exactly those which take priority in perception and processing. If we would like to support the parlance of prosodic licensing theories of featural distribution (Kingston 1985, Ito 1986, Goldsmith 1989, Lombardi 1981, Wiltshire 1992) onsets are found to be strong licensors whereas coda consonants display a pervasive pattern of unfaithfulness to underlying structure often undergoing assimilation to a following onset.

In opposition to the Pure prominence model (1998) which tries to look at the strong or weak licensing capacity as an inherent abstract property of a given position supplied by UG, irrespective of language specific phonetic details, Steriade holds her argument that perceptual factors are responsible for assigning a particular position strong or weak. In other words, features are licensed in those positions in which phonetic conditions make then maximally robust and perceptually prominent. Steriade (2000) claims that the perception of phonological similarity is influenced by auditory factors such as the availability of cues to the relevant contrast: the terms of poorly cued contrasts being more similar than those of a better cued contrast. By comparing the major place and apical contrast Steriade draws the resolution that both contrasts are distinct on the ground that their perceptual correlates have a different contextual distribution. Steriade (2000) holds the view that assimilation for any feature F targets positions in which the F contrast, if realized, would be less salient. According to her, perceptual factors are responsible for determining not only the direction of assimilation but also the likelihood that it will occur, relying on her findings that different CC clusters give rise to considerably diverse rates of place assimilation, which again depend on the salience of place contrast in each one of the cluster's components. Assimilation is rare in those cases in which each C carries cues that allow reliable identification of its place category and in contrast, assimilation will occur if one C lacks its primary place correlates. The observation that regressive assimilatory direction in regard to placefeatures can be assigned to perceptual facotors can be traced back to the studies conducted by Fujimura, Macchi and Streeter (1978) Ohala (1990) and Jun (1995). Fujimura's experiments drive home the point that CV transitions cannot be assigned to asymmetry in coarticulation. This finding helps in justifying the hypothesis that major place articulation targets C_1 in VC_1 C_2 cluster simply because C_1's place cues are less well attended to and hence a place modified C_1 is a lesser departure from the input than an altered C_2. If we take in to our consideration only the major place assimilation, three interpretations concerning the directionality are possible, as outlined by Fujiama et al.(1978). The first interpretation claims that CV transitions are dominant in the perception of major place contrasts, but not necessarily for other contrasts. Another view is the standard syllable based theory (Beckman 1998, Jun 1995) which tries to argue that the direction of assimilation is regressive because the target C_1 is a coda and the target C_2 is an onset. According to this view syllabic positions control the perceptibility as the listeners pay more attention to onsets than to codas. The third interpretation is that the information

encoded in C_2 is dominant simply because C_2 is more recent. Nevertheless what can be observed is that the direction of place assimilation is contrast specific. Apical assimilation targets C_2 while major place assimilation targets C_1. In both cases the consonant undergoing F- assimilation for any F- possesses fewer or weaker F cues. of dissimilarity (cf. Casali 1997, Beckman 1998 and Steriade 1994, 1995). As, for instance, stricture differences ([+/- sonorant]), [+/-continuant], [+/- consonantal]) play a crucial role in generating dissimilarity judgements. Assimilation in VCiCjV is regressive for the features like voicing and for major place contrast, whose primary cues reside in the post release interval as CV transitions render such contrasts more distinctive in the prevocalic Cj. In pre V position voicing carries its primary cues and it is the position where voicing differences will be judged more dissimilar. However the analysis of regressive assimilation appears similar to the syllable based positional faithfulness solution presented in Lombardi (1999).

The process of assimilation can also be analysed from the P-map approach advocated by Steriade. The rationale for P-map proposal is that attested phonological systems display less diversity than predicted versions of Optimality Theory (OT) in which correspondence and phonotactic constraints interact freely. The main function of P-map lies in guiding the speaker in search of the minimal input deformation that solves a phonotactic problem. P-map approach is influenced by the view that some positions are instrumental in the perception of dissimilarity (cf. Casali 1997, Beckman 1998 and Steriade 1994, 1995). The P-map hypothesis tries to articulate the view that it is the knowledge of similarity which is instrumental in controlling grammatical structure, by means of projecting correspondence constraints and determining their rankings. However the P-map theory advocated by Steriade(2001) holds the claim that the lacuna of positional faithfulness theory lies in the inability to identify the relevant factor distinguishing the salient from non salient positions: the availability of contrast specific perceptual correlates. As far as the hypotheses of P-map is concerned regarding the occurrence of assimilation, assimilation for any feature F will spare the positions in which F contrasts are more distinctive. It further claims that triggers of assimilation are segments bearing a better cued F value than that borne by the targets of assimilation.

3. The Process of Assimilation in Assamese

It is the normal case for languages to have homogeneous voice clusters, which are created by spreading both values of the [+/-voice] feature over the entire cluster, usually in a regressive fashion. Assamese exhibits the instances of regressive voicing assimilation, in which it is seen that the segment occurring in the coda position tends to agree in terms of feature [voice] with the following voiced obstruent in the onset position. But what is interesting to note here is that this regressive voicing assimilation is blocked by nasals and liquids.

3.1 Voicing assimilation in Assamese

(3/1)

t $\longrightarrow$ d /-d, b, g, d^h, g^h, z

xat din - xaddin (seven days)

hat digʰɒl- haddigʰɒl (powerful)

xat baɹ- xadbaɹ (seven days)

hat bilak – hadbilak (hands)

xat gʊn - xadgʊn (seven times)

pʰʊt gɔdʰʊli - pʰʊdgɔdʰʊli (bright evening)

pabɒt gɒza - pabɒdgɒza (baseless)

xat gʰɒɹ- xad gʰɒɹ (seven households)

xɒt zɒn - xɒdzɒn (the pious man)

ɟabɒt zibɒn - ɟabɒdzibɒn (life long)

hat bʰɔɹi – had bʰɔɹi (hands and feet)

hat dʰʊwa – had dʰʊwa (to wash hands)

But, what is interesting to note here is that /t/ does not assimilate in terms of feature [voice] whenever it is followed by a word beginning with nasals and liquids as exemplified from the following examples in (2/2)

(3/2)

p → b / - d, b, bʰ, dʰ, z, g

gap dija – gab dija (to hide something)

zap dilɛ - zab dilɛ (jumped)

bʰap bʊɹ - bʰab bʊɹ (feelings)

kap bʊɹ - kab bʊɹ (cups)

dʰʊp dʰʊna - dʰʊb dʰʊna (incandescent lamps)

ʊp zasi - ʊbzasi (at one's own will)

dʰʊp gʊɹi - dʰʊb gʊɹi (remaining of incandescent lights)

kap bʰɒɹa – kab bʰɒɹa (filled with cups)

(3/3)

k ⟶ g/- d, b, dʰ, z, g, gʰ

bak debi – bag debi (goddess saraswati)

xak bʊɹ - xag bʊɹ (leafy vegetables)

xak dʰʊwa – xag dʰʊwa (to wash the leafy vegetables)

dak gʰɒɹ - daggʰɒɹ (post office)

pak gʰɒɹ - paggʰɒɹ (kitchen)

madɒk dɹɒbjɒ - madɒg dɹɒbjɒ (intoxicated things)

hak dija – hag dija (to prevent)

xak bʰaɹ - xag bʰaɹ (weight of leafy vegetables)

ahɒk gɛ - ahɒggɛ (come)

bʰʊk zɒɹ - bʰg zɒɹ (fever caused by hunger)

(3/4)

s ⟶ z / - g, b, gʰ, bʰ, d, dʰ,z

bis gʊn – biz gʊn (twenty times)

bis baɹ - biz baɹ (twenty times)

bis dʊgʊn – biz dʊgʊn (twenty in to two)

bis gʰɒɹ - biz gʰɒɹ (twenty households)

mas dʰɒɹa – maz dʰɒɹa (to catch fish)

bis bʰaɹ - biz bʰaɹ (twenty weight)

bis zɒn – biz zɒn (twenty persons)

(3/5)

f → bʰ / b, bʰ, g, gʰ, d, dʰ, z

bɒɹɒf bʊɹ - bɒɹɒbʰ bʊɹ (ices)

bɒɹɒf bʰaɹ - bɒɹɒbʰ bʰaɹ (weight of ice)

kɒf bilak - kɒbʰ bilak (phlegm)

sɒf gʊti - sɒbʰ gʊti (spices)

bɒɹɒf gʰʊla - bɒɹɒbʰ gʰʊla (mixed with ice)

bɒɹɒf dʰɒka - bɒɹɒbʰ dʰɒka (to cover ice)

bɒɹɒf dɹɒbjɒ - bɒɹɒbʰ dɹɒbjɒ (substance of ice)

But /x/ never assimilates in terms of feature [voice] when followed by any voiced segment

(3/6)

*x → ɣ

bɒx gɔl - bɒx gɔl (to obey)

bax gɹihɒ - bax gɹihɒ (home)

bix bʊɹ - bix bʊɹ (pains)

ax dija – ax dija (to give chance)

bax bʰʊmi – bax bʰʊmi (living place)

sax gʰʊɹʊwa – sax gʰʊɹʊwa (to get back one's own breathe)

sax ɹʊddʰɒ - sax ɹʊddʰɒ (suffocating)

bɒx lɔlɛ - bɒx lɔlɛ (to obey)

ɹɒx nai - ɹɒx nai (no interest)

What is observed in the above data is that the obstruent appearing in the onset position retains its feature [voice] but the coda obstruent assimilates to the following onset thereby losing its feature. Here the process of assimilation proceeds from the onsets to the preceding codas.

The data set presented above brings home the point that segment appearing in the onset position triggers the process of assimilation and the features associated with the non onset consonants are lost. This process is applicable to the principle of obstruent obstruent clusters which display voicie assimilation (Lombardi 1991, 1995a, 1996a,c) and place assimilation or gemination. Processes exclusively driven by elements present in non prominent position, such as voice or place assimilation by coda, without functional motivation, are rarely attested in the phonological systems of the world languages. As seen in the data of Assamese regressive assimilation the feature [voice] is maintained in the onset position, not in the coda position which assimilate to the feature of the following onset. The asymmetry of affectedness as displayed by onset and coda are best demonstrated by voice and place of assimilation. Secondly, the assimilation in the heterosyllabic cluster as displayed in the data is regressive. By using OT analysis a justification can be provided in favour of regressive assimilation. Assimilation is regressive in heterosyllabic cluster in order to preserve the onset features, by virtue of high ranking IDENT-ONSET (F) constraints (This point is discussed in Lombardi 1995a, 1996 a,c, Padgett 1995b.).

As, for instance consider the following example of voicing assimilation in Assamese:

Direction of voicing assimilation in Assamese:

/bakdebi/	Agree	IDOns	IDLar
a. bak.debi	*!		
b.☞ bag. Debi			*
c. bak. Tebi		*!	

Table No 3/a: Direction of voicing assimilation in Assamese in OT framework

From this tableau the ranking of the constraints in Assamese can be arranged in the following fashion:

(3/7)

Agree>> IDOns>> ID Lar

This ranking drives home the point that clusters that are homogeneous for [voice] will be preferred over clusters that do not agree in voicing. In other words, AGREE prefers homogeneous clusters. In Assamese, obstruent sequences are homogeneous for voice in such a manner that the right most obstruent determines the voice value of the entire cluster. In Assamese one can account for regressive [+voice] spreading where

What is observed in the process of assimilation is that it mainly affects the coda consonants, leaving the position of the onset intact in a syllable. The contrast between voiced and voiceless obstruent is neutralised in coda position, not in onset position. In cases of assimilation it is the consonant in onset position which triggers spreading of laryngeal features as for instance, voice. And most importantly crosslinguistically it is the coda consonant, not the onset, which undergo assimilation.

Assimilation as blocked by nasals and liquids: an investigation:

But what is interesting to note here is that this regressive voicing assimilation is blocked by nasals and liquids. Consider the following examples:

(3/8)

xat mah – xatmah *xadmah (seven months)

xat nɔdi – xat nɔdi *xad nɔdi (seven rivers)

xat ɹati – xat ɹati *xad ɹati (seven nights)

xat ɹɒkɒm – xat ɹɒkɒm *xad ɹɒkɒm (seven varieties)

hat lɒɹ - hat lɒɹ *had lɒɹ (nature of a thief)

xap nɔsʊa manʊh – xap nɔsua manuh *xab nɔsua manʊh (snake charmer)

bap mɔɹil – bap mɔɹil *bab mɔɹil (father died)

kap lɒɹa – kap lɒɹa *kab lɒɹa (shaking of the cups)

sap ɹɔl – sap ɹɔl *sab ɹɔl (leaving the mark)

kak lʊa – kak lʊa *kag lʊa (whom do you take?)

bʰʊk ɹɔi gɔl - bʰʊk ɹɔi gol *bʰʊg ɹɔi gol (still feeling hungry)

kak nɔkɔm – kak nɔkɔm *kag nɔkɔm (whom should not be told?)

bʰʊk mʊɹ - bʰʊk mʊɹ *bʰʊg mʊɹ (my hunger)

bas nai – bas nai *baz nai (no restriction)

bis manɛ - bis manɛ *biz manɛ (twenty means)

mas lʊwa – mas lʊwa *mas lʊwa (to take fish)

bis ɹɒkɒm – bis ɹɒkɒm *biz ɹɒkɒm (twenty varieties)

kɒf nai - kɒf nai *kɒv nai (no phlegm)

bɒɹɒf ɹʊwa - bɒɹɒf ɹʊa *bɒɹɒv ɹʊa (remaining of ice)

bɒɹɒf lʊa - bɒɹɒf lʊa *bɒɹɒv lʊa (to take ice)

bɒɹɒf manɛ - bɒɹɒf manɛ *bɒɹɒf manɛ (meaning of ice)

In order to represent this phenoman in OT model we need to rerank the constraints in a different fashion:

Consider the example: (3/9)

xat nɔdi – xat nɔdi *xad nɔdi (seven rivers)

This blocking of assimilation can be explained in the light of the sonority values assigned to a particular segment. In literature it has been found that the syllable is a complex constituent, which is constrained both in linear and hierarchical terms with sonority playing a pivotal role in its internal organization, especially in the sequencing and patterning of the segments. Sonority can be defined as a concept through the medium of which we can define the characterization of segment sequencing within syllables including characterization of both peaks and margins. It is observed crosslinguistically that languages typically impose quite severe restrictions on the ability of the speech sounds to follow one another in phonological settings. This patterned phonotactic patterning can be attributed to sequencing restrictions imposed by sonority. The sonority value assigned to a segment can be better represented on a scale ranging from vowels to voiceless obstruents in a descending manner. In the analysis of the Assamese data on regressive voicing assimilation it is realized that the assimilation occurs between the segments which share the same sonority value. In the data under consideration, the phenomenon of assimilation in terms of feature [voice] is confined to the class of obstruents. So within OT framework AGREE constraint is ranked higher only in the case of onstruent clusters. When the members of an input cluster disagree in voicing the only way to satisfy the AGREE will be for the coda to assimilate to the voicing of the onset not vice versa. But this constraint is not satisfied in the case of clusters comprising of obstruents and liquids, obstruents and nasals etc. When AGREE is not relevant in obstruent + Sonorant cluster as cited above, the obstruents must devoice in languages where such clusters are heterosyllabic. This asymmetry in assimilation behaviour in terms of feature [voice] can be justified by taking in to consideration the sonority value of the segments. Since obstruent clusters agree in terms of sonority value they display assimilaton which is blocked among the segments of different class such as nasals, laterals and rhotics which are characterized by diverse sonority values. So from this interpretation some generalizations can be established:

Sonority plays a significant role in the patterning of segments in a syllable string.

Voicing assimilation between adjacent segments can be confined to obstruent cluster only, not other segmental class having different sonority values. The constraint AGREE is applicable while analyzing the instances of voicing assimilation in obstruent clusters. It can not capture the blocking effect of assimilation in obstruent liquid or nasal clusters. So in order to have an explanation for the non occurrence of regressive voicing assimilation in a cluster comprising of a plosive followed by segments other than plosives, reference is made of sonority values although a well established objection to sonority is that it lacks a consistent phonetic correlate.

Voicing assimilation is not applicable in the case of obstruent and sonorant cluster. Further it can be argued that only stops agree in terms of voicing and assimilate to the following onset when the segment in the onset position is also plosive, not any other segment of different class. Hence, a generalization can be established that less sonorous segments resist

assimilation to the more sonorous segments. For voicing assimilation to take place the segments must share their sonority values. If there lies an asymmetry in terms of sonority value regressive voicing assimilation is blocked. Hence, the reason behind the asymmetric phonological behavior can be assigned to a particular patterning responsible for the organization of the sounds in a string. In the Assamese data on regressive voicing assimilation sonority can be cited as a reason. Voicing assimilation is functional among the segments of same sonority value and this is blocked between the segments of asymmetric sonority value. However the redundant [+voice] feature of a sonorant consonant never triggers voice dissimilation.

From the above discussion a conclusion can be drawn in the following way using optimality theoretic framework:

(3/10)

AGREE is stronger between similar constituents having same sonority value

[son] [son] > [son] [+son]

4. Conclusion

This paper addresses the instance of regressive voicing assimilation as evident in Assamese in the light of assimilatory asymmetry in terms of segment sequencing. An attempt is also made here to examine whether strong or weak licensing capacity in a phonological domain is an inherent abstract property assigned by UG irrespective of languages or conditioned by phonetic factors. It is the normal case for languages to have homogeneous voice clusters, which are created by spreading both values of the [+/ voice] feature over the entire cluster, usually in a regressive fashion. Both Assamese and Hindi exhibit the instances of regressive voicing assimilation, in which it is seen that the segment occurring in the coda position tends to agree in terms of feature [voice] with the following voiced obstruent in the onset position thereby strengthening the claim that positional asymmetry is instrumental in the functioning of the segmental distribution. It further proves the hypothesis that onsets are stronger than codas because the onsets resist assimilation whereas the codas are prone to assimilation. In addition to onset coda asymmetry in relation to phonological licensing, what is interesting to observe in this chapter is that the regressive voicing assimilation is blocked by nasals and liquids. This asymmetry in assimilation behavior in terms of feature [voice] can be justified by taking in to consideration the sonority value of the segments. Since obstruent clusters agree in terms of sonority value they display assimilaton which is blocked among the segments of different class such as nasals, laterals and rhotics which are characterized by diverse sonority values. Thus sonority comes in to play an important role in the phenomenon of segmental speech sounds. Voicing assimilation is functional among the segments of same sonority value and this is blocked between the segments of asymmetric sonority value. However the redundant [+voice] feature of a sonorant consonant never triggers voice dissimilation. Hence, I propose a constraint using Optimality theoretic module that drives home the point that AGREE is stronger between similar constituents having similar sonority value. This paper also bears ample testimony to the fact that the phenomenon of assimilation can be correlated with the notion of strength. In the data of Assamese under consideration it

is found that stops act as the trigger of assimilation whereas the nasals undergo assimilation but not vice versa. So from this patterning a conclusion is drawn that segments with less sonority value resist assimilation to segments having high sonority value. This study has not been able to address the issue of strength relations pertaining to assimilation from phonetic parameters. The possibility of addressing the issue of onset coda debate in relation to the process of assimilation and the acoustic cues pertaining to segments in different prosodic contexts can be a topic of inquiry for further research in this area of strength relations in phonology.

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