

Harmonic Analysis of Consonant Cluster Reduction in Korean

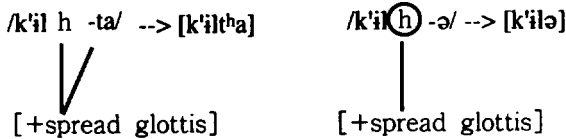
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Kim, Jong Shil (1994). **Harmonic analysis of consonant cluster reduction in Korean.** *Linguistics* vol. 2. Goldsmith(1990) presents a model of syllable licensing in which prosodic licensing is extended to features, thus enabling the syllable template to include phonotactic information. Harmonic Phonology (Goldsmith 1993, Lakoff 1993) treats phonological rules as repair processes which apply to maximize the wellformedness constraints. Based on these theoretical frameworks and universal generalization on sonority hierarchy, this paper analyzes seemingly random variations of [IC] cluster reduction in Korean. The syllabification in the case of [IC] clusters takes either first consonant [l] or the following consonant as coda. Furthermore, both [l] and the next consonant can be realized as codas. I posit two distinct syllable constraints which hold in W-level and P-level respectively and predicate tensing rule as applying between the two levels as a crosslevel phonological rule. The variations in the [IC] cluster reduction are then accounted for as the result of structural mismatch and speakers' attempt to harmonize with the constraints of each distinct level.

In this paper, I discuss coda consonant cluster reduction in Korean as shown in (1).

Meanwhile, when the second element of the cluster is [h], i.e., a segment with only [+spread glottis] feature without supralaryngeal features, the [h] spreads its feature to the following consonant and at the same time it drops regardless of whether a consonant or a vowel follows.

(3)



Clusters with [l] plus other obstruents exhibit different types of alternations which do not conform to the simple single coda syllabification of Korean. Instead, either [l] or the following obstruent can be realized as the syllable coda. On the other hand, the [lm] cluster does not show this optionality and it is always the case that the [m] remains as coda. To make things more uncertain, some speakers perceive and produce the both [l] and an obstruent sequences as codas.

(4) examples from (1.c) and (1.d)

[lp]~[l] or [p]: /palp/ [palp-a]~ [pal-ko] or [pap-ko]

[lp^h]~[l] or [p^h]: /ilp^h/ [ilp^h-\emptyset]~ [il-ko] or [ip-ko]

[lk]~[l] or [k]: /kilk/ [kilk-\emptyset]~ [kil-ta] or [kik-ta]

[lt^h]~[l] or [t^h]: /halt^h/ [halt^h-a]~ [hal-ko] or [hat^h-ko]

whereas,

[lm]~[m]: /kulm/ [kulm-\emptyset]~[kum-ta]

So far several analyses on the Korean consonant cluster reduction have been made. Among them, some studies have focused on the [lC] clusters. Ahn (1985) posits two hierarchical generalizations in which the second non-coronal obstruent or nasal takes precedence over the preceding [l] as coda. The ordering of the two rules is determined by Elsewhere Condition.

(5) Ahn's analysis (1985:62)

a. [-cont] > [+lateral]
[-cor]

b. C1 > C2

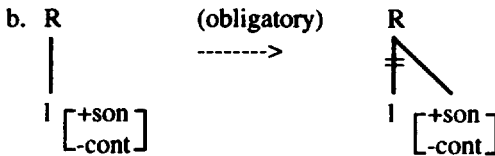
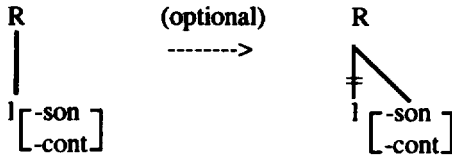
Coda realization

ks nc nh l^h ls lp^h lm lk

This analysis, however, excludes the case of [l] being syllabified as coda in the [lp^h] and [lk] clusters. Thus, it does not show the whole picture regarding the syllabification of [lC] clusters.

J.M. Kim (1986) analyzes the process as optional and obligatory coda linkings as in (6).

(6) a.



H.Y. Kim (1994) points out that this analysis misses the fact that [lC] cluster reduction is quite productive in Korean and that viewing the [lC] cluster as a kind of special case is against the generalization that the [lC] clusters are more common than other consonant clusters. Furthermore, he raises the problem that J.M. Kim had to posit an additional obligatory rule which takes the second consonant [m] in [lm] cluster as in (6.b).

In this paper, I will treat the variations in [lC] clusters as the result of different types of syllable constraints in different levels of Korean. I base my analysis on the theories of Harmonic Phonology (Goldsmith 1993, Lakoff 1993) and Feature Licensing in Syllable Structure (Goldsmith, 1990). In the following section, I will briefly present the two theories.

1.2. Theoretical Background

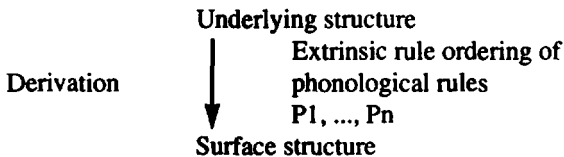
1.2.1. Harmonic Phonology

In the generative phonology of *The Sound Pattern of English* (Chomsky

and Halle, 1968), phonological processes are viewed as applying a series of phonological rules to the underlying phonological strings to come up with the surface phonetic forms. This rule-based theory had its focus on the derivational aspect. To derive the final surface form, any number of phonological rules were assumed to apply in an extrinsic order. At the same time, it has been noted that underlying forms are subject to constraints, i.e., morpheme structure condition (Stanley 1967). Along with these morpheme structure constraints, the phonological literature has explored the tendency that there are certain generalizations about what a language permits in terms of segments, clusters, and syllables.

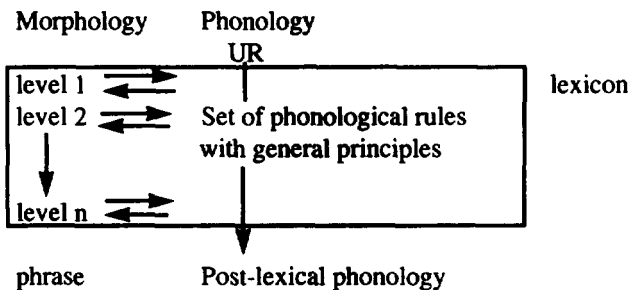
(7)

Derivational model



Lexical phonology (Kiparsky 1982, Mohanan 1982) tried to capture the tendency that rules apply in a general manner when morphemes are concatenated. Rather than ordering individual rules extrinsically, the theory attempted to have rules apply according to the general principles such as strict cyclicity, structure preservation with the notion of underspecification, and strong domain hypothesis. Rule ordering was intended to be the result of elsewhere condition which makes a specific rule take precedence over a general rule when the two rules share portions of structural descriptions.

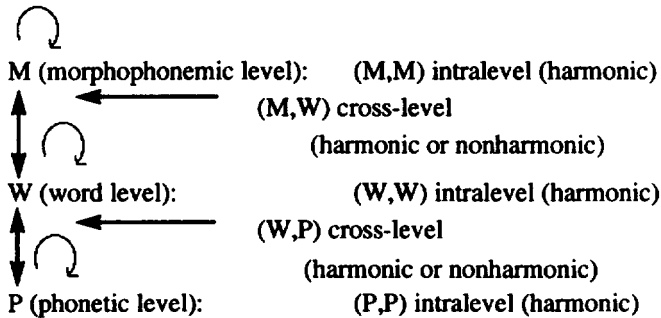
(8) Organization of lexical phonology



In this frame, emphasis has been still on the phonological rules and their interaction with morphology.

Unlike the aforementioned two theories, Harmonic Phonology (Goldsmith 1993, Lakoff 1993) attempts to directly capture the phonological generalizations by presenting three level analysis in which constraints play major roles. Levels are posited as morphophonemic, word, and phonetic levels. The constraints prevail in each distinct level and rules apply in order to maximize or harmonize the constraints of the language. Thus, the phonological rules are in most cases byproducts of repair strategy to satisfy the well-formedness constraints of each level.

(9) Harmonic model (Goldsmith 1993:33)



In this model, since intralevel rules always apply harmonically, we can do without a great deal of extrinsic rule ordering. Rather, most phonological rules are intralevel rules which apply to satisfy the well-formedness constraint of each level, restricting the rule ordering to the interlevel phonological rules. Thus, constraints not rules function as the major force to produce ultimate grammatical forms. Therefore, this model eliminates the unnecessary and problematic overlap between the phonological rules and constraints along with the extrinsic rule ordering.

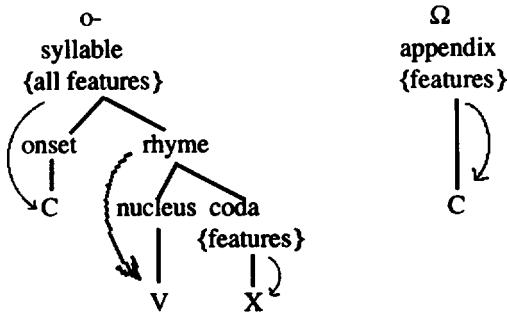
1.2.2. Feature Licensing in Syllable

Extending the prosodic licensing theory of Itô (1988), Goldsmith (1990) tried to capture the phonotactic generalizations in terms of syllable licensing. In his theory, the syllable template is defined as structure of both segmental and featural licensing information. The autosegmental licensing constituents

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are syllable, coda, appendix, and morphological licenser. Each licenser allows the segmental slot which it dominates to associate to a set of features. To make sure exactly one occurrence, the theory requires that the licenser (syllable, coda, appendix, etc.) has a non-branching path to the licensee (segment). This requirement ensures that the onset and nucleus, which are not licensers themselves but both on paths from the syllable licenser, cannot share a contrastive feature. On the other hand, the coda which often takes a less variety of consonants of the language licenses its own features. This is illustrated (10).

(10) Feature licensing²



Goldsmith presents coda contrasts into four types, ranging from the most restrictive in (11.a) to the least in (11.d).

(11) Coda contrasts (Goldsmith 1990:128)

- a. CV(V) languages prohibiting consonants from the coda henceforth 'no coda' languages
- b. CVX[-poa] where X is a nasal or obstruent without its own point of articulation
- c. CVX[son] where X may also be a glide or liquid
- d. CVX where the coda may have anything the onset can-- 'full coda'

Besides these two major theories, I follow the universal observation regarding sonority hierarchy among different types of segments as presented in (12).

(12) Sonority Hierarchy

stop < fricative < nasal < liquid < glide < vowel

2. Analysis

2.1. Consonant Inventory of Korean

The consonant inventory of Korean is as in (13).

(13) Korean Consonant

<u>Bilabial</u>	<u>Alveolar</u>	<u>Alveo-palatal</u>	<u>Velar</u>	<u>Other</u>
p p' p ^h	t t' t ^h s s'	c c' c ^h	k k' k ^h	
m	n l		ŋ	
				h

(14) Features for the consonants

	<u>son</u>	<u>cont</u> ³	<u>place</u>	<u>asp</u>	<u>tense</u>	<u>nasal</u>
stops	-	-	+	+/-	+/-	
fric	-	+	+		+/-	
affr	-	-	+	+/-	+/-	
nas	+		+			+
liquid	+					

2.2. Evidence for CVCC Syllable Template

Now, it is necessary to point out two facts. First, as I mentioned earlier in section 1.1, some Korean speakers do perceive and produce both [l] and the following obstruent as codas. Second, even when they take [l] as coda, the suffix initial obstruent becomes tense by the rule of predicate tensing as in (15.a). Compare the forms like [palt'a] in (15.a) and [kalda] in (15.b).

- (15) a. /kilk-ta/ --> [kilt'a], [kikt'a] 'scratch'
 /palp-ta/ --> [palt'a], [papt'a] 'step on'
- b. /kal-ta/ --> [kalda] 'grind'
 /mul-ta/ --> [mulda] 'bite'
- c. /an-ta/ --> [ant'a] 'embrace'
- d. /mæk-ta/ --> [mækt'a] 'eat'

Predicate tensing is a rule which applies when verb stem is concatenated with inflectional suffixes. The predicate tensing is often analyzed to apply between stem-final nasal and suffix-initial obstruent as in (15.c) since obstruent to obstruent tensing is a general process that applies post-lexically without exception. The segmental rule is given in (16).

(16) Predicate tensing (W,P)

C --> [+tense] / [+nasal]]_{Verb} _____

On the surface, verb stem final consonants, with the only exception of [l] in [l]-irregular verbs as in (15.b), trigger tensing to the following suffix initial obstruent. The verbs ending in [l] are labeled as one of Korean irregular verbs in terms of other morphophonemic rules. However, this notion is somewhat misleading, considering that other Korean irregular verbs have regular counterparts while the verbs with final [l] do not. It is not clear whether the predicate tensing is a specific rule as in (16) which applies after the stem final nasal or is rather a general rule that includes obstruents as its triggering elements. Nor does it seem certain whether the [l] does not result in tensing since verbs with final [l] are irregular verbs or the [l] in Korean should be regarded as special and marked to avoid the predicate tensing.

In J.S. Kim (1992), I have claimed that Korean verbs should be analyzed to have compound structure morphologically just like other compounds in Korean. And the predicate tensing is analyzed as one of the tensing rules which can often be characterized as phonological processes sensitive to compound structure in Korean. The predicate tensing is thus argued to be a general process which applies between stem final and suffix initial consonants. The [l]-irregular verbs are then analyzed to be regular and do not trigger predicate tensing due to the special quality of [l], namely, the lack of true consonantality.⁴

However, verbs with [lC] cluster in their stems end up with tensing in the following suffix-initial obstruent as in (15.a). That is, what is relevant but often overlooked is that both consonants of the cluster are present at the same time when the predicate tensing applies while [l]-final verb never triggers the tensing. Thus, I propose more generalized predicate tensing rule which applies between stem final consonant and suffix initial consonant as in (17).⁵

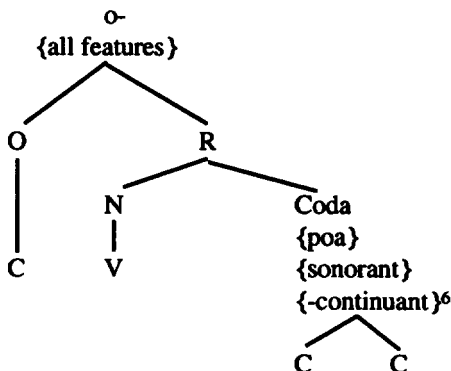
(17) Generalized Predicate Tensing (W, P)

C --> [+tense] / C]_{Vstem} [_____

2.3. Main Analysis

We have observed that the soon-to-be erased consonant triggers the tensing to the next obstruent and that some speakers have both consonants as syllable codas. Based on these observations, I posit two syllable constraints of Korean at W-level and P-level following the theory of Harmonic Phonology. I argue that at the W-level Korean has both clusters as codas in the syllable constraint.

(18) W-level syllable constraint



According to the constraint (18), only [p, t, k, m, n, ŋ, l] can be syllabified as coda since other features cannot license the coda consonant. Point of articulation features will license plain obstruents such as bilabial, alveolar, alveo-palatal⁷, and velar consonant.

On the other hand, the sonorant feature licenses either nasal or lateral but not both since [+sonorant] feature cannot branch in licensing. This point is illustrated in (19).

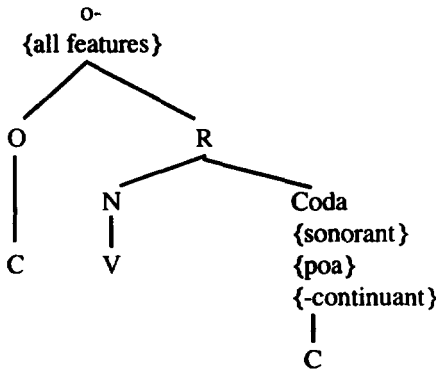
(19) The case of [lm] cluster and failure of coda licensing to both segments



Thus, in the case of [lm] cluster, the [m] is realized as coda. Since [m] is less sonorant segment than [l], [m] beats [l] in coda position to maximize the sonority distance between the nucleus and the coda.⁸ This is why, I claim, [lm] cluster obligatorily takes [m] not [l] as coda.⁹ Other [lC] clusters, however, will not have that kind of distributional restriction since they consist of a sonorant consonant plus an obstruent.

At the P-level, however, we have a different syllable structure as in (20).

(20) P-level Syllable constraint



Note that the maximum [CVCC] syllable template has been reduced to [CVC]. In this level, [lC] clusters which remained as such will have to be reduced to one to most Korean speakers.

The syllable constraint in (20) has information in both feature licensing in coda and the maximum segmental number in syllable template. Different languages exhibit different effects to accommodate (or match) the distinct syllable constraints with repair rules. A language can have epenthesis and others can have deletion or assimilation sometimes. In Korean, the featural licensing information appears to compete with the segmental information. Thus, some Korean speakers take the positional preference and [l] is syllabified. Others take the featural preference and the second obstruent is realized as coda because the second consonant (in this case, an obstruent) is less sonorant than [l] as in the case of [lm] clusters in W-level.¹⁰

Meanwhile, the predicate tensing (17) applies between W-level and P-level, making the suffix initial obstruent [+tense]. The predicate tensing

applies as (W,P) interlevel rule to ensure that the following suffix-initial obstruent gets tense before one of the two consonant cluster drops at P-level. In the case of those speakers who pronounce both [l] and obstruent cluster, the P-level constraint will remain the same as the W-level constraint.

3. Conclusion

In this paper, I have analyzed the Korean consonant cluster reduction, especially focusing on the [IC] clusters. By positing the mismatch between two distinct syllable constraints in W-level and P-level and considering the predicate tensing as interlevel (cross-level) phonological rule, I have shown that variations in the alternations of the [IC] clusters can be accounted for as the result of structural mismatch and speakers' attempt to harmonize with the constraints of each distinct level. The theories of harmonic phonology and feature licensing contributed to the understanding of this somewhat obscure phenomena of Korean.

Notes

1. Here, to illustrate the point of cluster reduction, I omitted other alternations on purpose.
2. Here, we mark the licensing features in braces { }.
3. This feature can be replaced by A-position feature as in Steriade (1991).

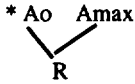
Stops:	AoAmax
Fricatives:	Af
Affricates:	AoAf
4. See J.S. Kim (1992) for further reference.
5. With the assumption that the inflectional suffixes form an inflectional stem morphologically. For details, refer to J.S. Kim (1992).
6. Or alternatively Ao in Steriade's Framework (1991) which can be characterized as closure as in unreleased stops.
7. Although the alveo-palatal segments are not licensed since they are not [-continuant] or they are segments of AoAf.
8. Again, the nasal seems to be the threshold segment which is to be recognized as true consonant in terms of sonority hierarchy. Thus, even though I characterized the sonority hierarchy as evenly sequential in (12), there appears to be a main division which can group the obstruents and nasals from the rest as pointed out in the case of verb stem final [l] and predicate tensing.
9. Occasionally, speakers are aware of both [l] and [m] as codas as in the case of [salm] 'life' which comes from the verb [sal-] 'to live' plus nominal suffix [im]. Unlike other nominal forms like [kalim] 'grinding', [culim] 'shrinking', etc., [salm] is

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a derived noun and fossilized as such, which is reflected in the orthography. I assume that the limited number of speakers are influenced by this orthography and try to keep both [l] and [m] while most speakers take [m] as coda.

10. Of course, this is not the only repair process that applies in the P-level. Single aspirated and tense stops, fricatives and affricates will be neutralized to plain stops in order to be realized as syllable coda of Korean according to the following constraint.

No released stops in rime (Steriade 1991:181)



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김 형업. (H. Y. Kim) 1994. "한국어에서의 접받침 줄임에 대한
재고: 최적선별이론을 중심으로 하여," 어문연구, 제 2집.

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