

# Licensing and Default Implication of Korean [lat] in OT

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In this paper, we show that different surface forms realized from underlying /l/ are positional variables which crucially depend on syllable structure. We will first demonstrate that [lateral] must be "non-crisply" right aligned with a syllable in the sense of Itô, Mester & Padgett (1994), as argued in Hong (1997a). However, we will further show that Alignment (Hong 1997a) and Syllable Contact (Davis & Shin 1997) are not enough for successful analysis of Nasal Lateralization in /nl/ and /ln/. For successful analysis, we stick to "non-crisp" Alignment constraint for [lateral] as in Hong (1997a), but we introduce the notion of Default implication in Optimality Theory. Itô, Mester and Padgett (1995) explain Voicing in Japanese NC clusters by implementing Licensing and Redundancy of the feature [voice] in OT. This paper demonstrates that a similar effect can be achieved in the analysis of Korean Nasal Lateralization by implementing a Licensing and Default implication of [lateral].

## 1. Introduction

Since Itô, Mester & Padgett (1995) (hereafter, IMP 1995), Licensing has been extensively implemented in the literature. For example, Itô & Mester (1994) extend the notion of Alignment to include Licensing. Lombardi (1995a, b) explain the appearance of [laryngeal] within syllable structure by appealing to Licensing and "non-crisp" Alignment (Itô & Mester 1994). Hong (1997a) also takes advantage of Licensing and Alignment to explain Primary /t/-Palatalization and surface realizations of /l/ in Korean.

IMP (1995) and Hong (1997a, c) implement Licensing and Redundancy implication to explain Voicing in Japanese NC clusters and Korean Primary /t/-Palatalization, respectively. In this paper, on the other hand, we will show

another case, implementation of Licensing and Default implication of [lat], for surface realizations of /l/ in Korean, which have been elusive for complete analysis in the literature on Korean phonology (Iverson & Sohn 1994, Iverson & Kim 1987, Davis & Shin 1997, Suh 1993 and others).

## 2. Licensing and Redundancy of [voice] in Itô, Mester & Padgett (1995)

Itô, Mester & Padgett (1995) implement the two notions Licensing and Redundancy in OT to explain voicing assimilation in a sequence of a nasal C and a voiceless obstruent in Yamato Japanese:

- (1) Observation: a nasal must share [voice] with a following consonant (IMP 1995)

a. /yom-te/	yon-de	'reading'
b. /šin-te/	šin-de	'dying'
c. tombo	'dragonfly'	*tompo
d. šindo-i	'tired'	*šinto-i

Note that [voice] in a nasal consonant is a redundant feature since a nasal consonant redundantly implies [voice]. However, the redundant feature [voice] of a nasal affects the voicing of a following obstruent.

From the observation that a nasal must share [voice] with a following consonant, IMP (1995) propose the following LICENSE [voice] and NasVoi constraints which appeal to the two notions Licensing and Redundancy of [voice], respectively:

- (2) a. LICENSE [voice]: [voice] is licensed when linked to an obstruent  
 b. NasVoi: [nasal]  $\supset$  [voice]  
           [nasal] implies [voice] redundantly.  
 c. Constraint ranking: LICENSE [voice]  $\gg$  NasVoi  
 d. Tableau

	LICENSE[voi]	NasVoi
☞ k a m i		*
k a m i   Voi	*!	

	LICENSE[voi]	NasVoi
t o m p o		*!
t o m p o   Voi	*!	
ᄒᄇ t o m p o ∨ Voi		

In the first tableau above, the second candidate violates high ranked LICENSE [voi]. On the other hand, the first candidate violates lower ranked NasVoi. As a result, the first candidate is optimal. In the second tableau, the last candidate does not violate any constraint and is optimal.

The upshot of this approach is that a redundant feature must be licensed. Otherwise, it would have to delete.

### 3. Licensing and Redundancy of [-ant] in Hong (1997a, 1997c)

In Korean, /t, t<sup>h</sup>/ become palatalized to [c, c<sup>h</sup>] before a front high vowel at a suffixal boundary (Primary Palatalization).

- (3) a. /mat-i/      mac-i      'the first son'      [Root-Suffix]  
       b. /tot-i/      toc-i      'rising'              [Root-Suffix]  
       c. /kat<sup>h</sup>-i/    kac<sup>h</sup>-i    'together'           [Root-Suffix]

Since palatal [c] is represented with [-ant] under the Coronal node, we may say that Primary Palatalization is represented by [-ant] shared by a coronal obstruent and a following front high vowel [i].

Hong (1997a and 1997c) show that the redundant feature [-ant] of a front high vowel in Korean patterns exactly together with [voice] in a nasal consonant in Yamato Japanese, and implement feature Licensing and Redundancy of [-ant]. A front high vowel redundantly implies [-ant]. This redundant feature of a front high vowel spreads to a preceding coronal obstruent /t/, in which [-ant] is a marked feature. The question is how a redundant feature of a segment spreads to a preceding segment in which the spread feature is marked. Hong (1997c) argues that [-ant] is a redundant feature of a front high vowel and provides the following constraint:

(4) FRONT-HI [-ant]: [V-pl/Cor, +high]  $\supset$  [-ant]<sup>1</sup>

A front high vowel implies [-ant] redundantly.

Hong further argues that the consonantal feature [-anterior] must be licensed by the feature [-son].

(5) LICENSE [-anterior]

[-anterior] is licensed by [-son].

(6) Constraint ranking

LICENSE [-anterior]  $\gg$  FRONT-HI [-ant]

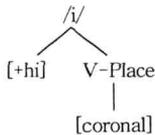
The Licensing constraint LICENSE [-anterior] is probable since [-anterior] is a typical (coronal) consonantal place feature. Furthermore, only coronal obstruent /t/ undergoes Primary Palatalization (i.e., sharing [-ant] by a coronal obstruent and a following front high vocoid) excluding sonorant coronal /l/ and /n/. As a result, any [-anterior] which is associated with a front high vocoid must be licensed by being additionally linked to an obstruent.

The following tableau illustrates how the two constraints interact with each other in Primary Palatalization<sup>2</sup>:

(7) /mat-i/      mac-i      ‘first son’

/mat-i/	LICENSE [-ant]	FRONT-HI [-ant]
a m a t - i   V-pl   Cor Cor		*!

<sup>1</sup> Hong (1997a) assumes (following from Clements & Hume 1995) that a front high vocoid is represented by [+high] and a V-Place node with a [cor] dependent:



<sup>2</sup> Hong (1997a) argues that underapplication of Primary Palatalization in /mat-i/ ‘branch’, in which a morpheme boundary is not involved, results from prespecification of [+ant] in /t/ in /mat-i/ (in the sense of Kiparsky 1993). For detailed discussion, see Hong (1997a) and Kiparsky (1993).

/mat-i/	LICENSE [-ant]	FRONT-HI [-ant]
<p>b</p> <pre>       m a t - i                           V-pl                         Cor Cor                           [-ant]           </pre>	*!	
<p>c</p> <pre>       m a c - i                           V-pl                         Cor Cor                           [-ant]           </pre>		

Candidate (7a) violates FRONT-HI [-ant] since [i] does not carry [-ant] under the V-pl node. Candidate (7b) violates LICENSE [-ant] since [-ant] is not licensed. However, candidate (7c) does not violate any constraint and is therefore optimal.

#### 4. Licensing and Redundancy of [+cont] in Hong (1998b)

Korean has [s]-Onset Neutralization in which Noun Root-final coronal obstruents /t, t<sup>h</sup>, t', c, c<sup>h</sup>, c'/ optionally neutralize to [s] when they are syllabified in Onset before a vowel at a suffixal boundary (M. Oh 1995).<sup>3</sup>

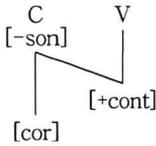
##### (8) [s]-Onset Neutralization in Noun Root-final coronal obstruents

- |                             |                                  |              |
|-----------------------------|----------------------------------|--------------|
| a. /pat <sup>h</sup> -e/    | pas-e, pat <sup>h</sup> -e       | 'field-at'   |
| b. /k'oc <sup>h</sup> -il/  | k'os-il, k'oc <sup>h</sup> -il   | 'flower-Acc' |
| c. /pat <sup>h</sup> -ilaŋ/ | pas-ilaŋ, pac <sup>h</sup> -ilaŋ | 'field-and'  |
| cf. /pan-e/                 | *pas-e, pan-e                    | 'class-at'   |
| cf. /pap-e/                 | *pas-e, pap-e                    | 'rice-at'    |

M. Oh (1995) argues that [+cont] in a vowel spreads to a preceding coronal obstruent in as follows:

<sup>3</sup> /t<sup>h</sup>/ palatalizes to [c<sup>h</sup>] before an /i/-initial suffix/clitic.

## (9) [s]-Onset Neutralization



Hong (1998b) points out that the spreading of [+cont] in a vowel to a preceding coronal obstruent is problematic. [+cont] is a redundant feature in a vowel since all vowels are continuants. However, [+cont] of a vowel spreads to a preceding coronal obstruent in which [+cont], in turn, is a marked feature. Hence, [+cont] in [s]-Onset Neutralization in Korean exactly patterns together with [voice] in Voicing Assimilation in NC clusters in Japanese.

Hong (1998b) proposes the following two constraints to implement Licensing and Redundancy implication of [+cont]:

## (10) Constraints and ranking

- a. LICENSE [+cont]: [+cont] should be licensed by [-son] (i.e. the Root node with [-son] in it)<sup>4</sup>
- b. VOWEL [+cont]: [+son, +vocalic]  $\supset$  [+cont]  
A vowel redundantly implies [+cont]
- c. Ranking: LICENSE [+cont]  $\gg$  VOWEL [+cont]<sup>5</sup>

[+cont] is a redundant feature of a vowel. A vowel redundantly implies [+cont]. However, [+cont] in a vowel needs to be licensed by a coronal obstruent. If

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<sup>4</sup> Hong's (1998b) proposal is actually more complex than what is described in this section. For example, [s]-Onset Neutralization is not observed in a Verb Root-final coronal obstruent before a vowel:

/ət-il/                      ət-il, \*əs-il                      'to get for free'

We ignore such complication since it does not serve our current interest. See details for [s]-Onset Neutralization in Hong (1998b).

<sup>5</sup> For the optional output, pat<sup>h</sup>-e 'field-at', it is suggested in Hong (1998b) that LICENSE[cont] and VOWEL[cont] are ranked lower than other constraints such as IDENT-IO[cont]/[laryn]/[-ant] and NO-CODA[cont]/[laryn]/[-ant]. Through such constraint reranking, the former two constraints have no effect on the interaction of other higher ranked constraints. Hong (1997b) analyzes Coda Neutralization through NO-CODA[cont]/[laryn]/[-ant]  $\gg$  IDENT-IO[cont]/[laryn]/[-ant]:

/pat<sup>h</sup>-e/                      pat<sup>h</sup>-e (or pas-e)                      'field-at'

it is not licensed, it should delete. [s]-Onset Neutralization is a phenomenon in which [+cont] is shared by a coronal obstruent and a following vowel, satisfying both LICENSE [+cont] and VOWEL [+cont].

- (11) a. /pat<sup>h</sup>-e/            pas-e            ‘field-at’
- b. /k’oc<sup>h</sup>-il/        k’os-il          ‘flower-Acc’
- c. /os-e/              os-e             ‘clothes-at’

a. /pat <sup>h</sup> -e/	LICENSE [+cont]	VOWEL [+cont]	b. /k’oc <sup>h</sup> -il/	LICENSE [+cont]	VOWEL [+cont]
pa.t <sup>h</sup> -e   [+cont]	*!		k’oc <sup>h</sup> -il   [+cont]	*!	
pat <sup>h</sup> -e		*!	k’oc <sup>h</sup> -il		*!
ㅍㅅ pa.s-e ∨ [+cont]			ㅍㅅ k’o.s-il ∨ [+cont]		

In the two tableau above, the last candidate in which a coronal obstruent and a following vowel share [+cont], becomes optimal. The upshot is that this analysis explains why redundant [+cont] of a vowel spreads to a preceding segment in which the spread [+cont] is a marked feature.

### 5. Different Surface Realizations of Korean Underlying /l/

In Sino-Korean two-Root compounds, *n*, *l* and *ø* are contrastive Root-initially:

- (12) Minimal Pairs in Sino-Korean Words (allophonic variations are ignored below for simplicity.)
- a. /ko-ip/            ko-ip            ‘high school admission’
- cf. /ip-si/          ip-s’i           ‘admission exam’

	NO-CODA[cont]	IDENT-IO[laryn]	IDENT-IO[cont]
ㅍㅅ pa.t <sup>h</sup> -e			
pa.t-e		*!	
pa.s-e		*!	*

b.	/ko-lip/	ko-lip	'isolation'
	cf. /lip-caŋ/	ip-c'aŋ	'position'
c.	/tæ-lo/	tæ-lo	'big road'
	cf. /lo-pyən/	no-pyən	'road side'
d.	/tæ-no/	tæ-no	'great anger'
	cf. /no-ki/	no-ki	'anger'
e.	/o-nyən/	o-nyən	'five years'
	cf. /nyən-to/	yən-to	'year'
f.	/o-yən/	o-yən	'name'

The data above show that the contrast among *n*, *l* and  $\emptyset$ , must be retained in the UR of some Sino-Korean Roots.

First of all, consider the following three sets of data, in which underlying /l/ is realized differently:

(13) a.	/ili/	iri	'wolf'
	b. /kəli/	kəri	'street'
(14) a.	/lo-in/	no-in	'old people'
	b. /la-saŋ/	na-saŋ	'nude statue'
(15) a.	/əlkul/	əlkul	'face'
	b. /kəul/	kəul	'mirror'
	c. /məl-li/	məl-'li	'far-ADVL'

According to the first set of data above, we observe that /l/ is realized as flapped [r] between vowels. When we assume that a flap is ambisyllabic (following from Kahn 1976 and others), we may say that flapped [r] is syllabified as ambisyllabic. In the second set of data, initial /l/ is realized as [n] before a non-i/y vocoid (/l/-Nasalization)<sup>6</sup>. Finally, the third set of data show that [l] surfaces only when it is either linked to unique Coda or doubly linked to Coda and following Onset. In both cases, Coda syllabification of [l] is always involved, though additional Onset syllabification is optional.

From the data above, we draw the following generalizations as to surface

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<sup>6</sup> In Sino-Korean, initial /l/ deletes before a front high vocoid.

/lyə-hæŋ/	yə-hæŋ	'trip'
/lyək-ki/	yək-k'i	'babel'

/l/-deletion is an independent phenomenon from Lateral Nasalization, the latter of which is the topic of our interest in this paper. For /l/-deletion, refer to Hong (1997a).

realizations of /l/:

(16) Generalization as to Surface Realizations of /l/

- a. Flapped [r] is realized in ambisyllabic position
- b. [l] is realized when it is syllabified in a unique Coda or when it is a geminate (i.e. it is doubly (but non-ambisyllabically) associated with Coda and Onset across a syllable juncture.)
- c. Elsewhere: [n]

The generalizations in (16) strongly suggest that positional variables play an important role in different realizations of /l/.

When /l/ is realized as flapped [r] in ambisyllabic position (16a), [+cont] is retained, as input /l/ and output [r] are both continuants. When /l/ is realized as [n] (in Word-initial position), however, it loses [+cont]. The [n] realized from the input /l/ would have to be penalized in favor of another potential output [r].

(17) IDENT[+cont]

[+cont] in the input should be realized in the output.

Korean has high-ranked constraint ONSET, which forces an intervocalic consonant to be syllabified as Onset (see Hong 1996, 1997b for detailed discussion with respect to Coda Neutralization):

(18) ONSET: A syllable has an onset.

ONSET forces an intervocalic consonant to be syllabified as Onset.

From the generalization in (16b), we observe that Coda is always involved whenever [lat] is realized on the surface. In other words, underlying /l/ is realized as [l] when it is linked to unique Coda or when it is doubly linked to Coda and following Onset across a syllable juncture. From this observation, Hong (1997b) proposes that [lat] is right-aligned with a syllable under the Alignment definition of Itô and Mester (1994)<sup>7</sup>: ALIGN-R([lat], σ)<sup>8</sup>.

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<sup>7</sup> Itô & Mester (1994) introduce the concept of “non-crisp” edge Alignment by proposing that the concept of Alignment should subsume not only “crisp” edge Alignment defined in McCarthy & Prince (1993b) but also Alignment of edges of the two categories where a segment is doubly linked to two prosodic units (“non-crisp” edge Alignment):

Dfn. Align (Cat1, Edge1, Cat2, Edge2)

(Itô & Mester 1994)

- (19) ALIGN-R [lat]: Align-R ([lat],  $\sigma$ )  
 [lat] is right-aligned with a syllable.

ALIGN-R [lat], which is assumed to be undominated in Korean, may explain why underlying /l/ is allowed to surface:

- (20) a. /əlkul/                      əlkul                      ‘face’
- |          |       |          |       |
|----------|-------|----------|-------|
| $\sigma$ |       | $\sigma$ |       |
| / \      |       | /   \    |       |
| ə        | l     | k        | u l   |
|          |       |          |       |
|          | [lat] |          | [lat] |
- b. /kal-li-/                      kal-li                      ‘to replace-Pass-’
- |          |   |          |   |
|----------|---|----------|---|
| $\sigma$ |   | $\sigma$ |   |
| /   \    |   | / \      |   |
| k        | a | l - l    | i |
|          |   | \ /      |   |
|          |   | Root     |   |
|          |   |          |   |
|          |   | [lat]    |   |

In (20a), [lat] is “crisply” right-aligned with a syllable as it is associated with Coda of a syllable. In (20b), on the other hand, [lat] is “non-crisply” right-aligned with a syllable as it is linked to Coda of a syllable as well as to Onset of a following syllable. Hence, [lat] in both cases satisfies ALIGN-R [lat].

ALIGN-R [lat] can explain why [lateral] is not allowed in word-initial position:

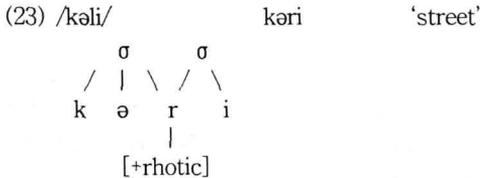
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Let Edge1, Edge2 be either L or R. Let S be any string. Then, for any substring A of S that *is-the-content-of-a* Cat1, there is [a] substring B of S that *is-the-content-of-a* Cat2, such that there is a decomposition D(A) of A and a decomposition D(B) of B, both sub-decomposition of a decomposition D(S) of S, such that Edge1(D(A))=Edge2(D(B)). Refer to Hong (1997b) for further discussions as to Alignment.

<sup>8</sup>Or we may say the [lat] is licensed only in Coda (\*[lat] unless it is in Coda) instead of ALIGNR([lat],  $\sigma$ ). This is because the occurrence of [lat] always involves Coda position. The effects of ALIGNR([lat],  $\sigma$ ) and LICENSE [lat] seem to be identical, if we adopt the hypothesis (in Itô & Mester 1994) that all Licensing constraints may be replaced by Alignment constraints.

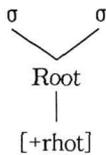


\*AMBI-[lat] is introduced to motivate the delinking of [lat] in ambisyllabic position. \*AMBI-[lat] is assumed to be undominated due to its unviolable nature in Korean.



Finally, we propose that [+rhotic] is licensed in ambisyllabic position, which allows flapped [r]:

- (24) LICENSE [+rhot]: [+rhotic] is licensed only in ambisyllabic position  
 (\*[+rhotic] unless it is ambisyllabic.)



LICENSE [+rhot] is assumed to be undominated in Korean due to its unviolable nature.

We propose the following constraint ranking:

- (25) Constraint Ranking  
 ALIGN-R[lat], \*AMBI-[lat], LICENSE [+rhot] >> ONSET >> IDENT  
 [+cont]

The observation that [l] is realized when it is linked to unique Coda or doubly linked to Coda and following Onset (16b) is explained by the following tableau:

(26) a. /kəul/      kəul      'mirror'

/kəul/   [lat]	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	ONSET	IDENT [+cont]
ːkə.ul   [lat]				*	
kə.ur.   [+rhot]			*!	*	
kə.un.   [nas]				*	*!

b. /məl-li/      məl-li      'far-ADVL'  
("R" = Root node)

/məl-li/ R R [+cont] ↑ [↑+cont] [lat] [lat]	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	ONSET	IDENT [+cont]
ːm ə l - l i ∨ R [+cont] ↑ [lat]					
m ə l - l i R R [+cont] ↑ [↑+cont] [lat] [lat]	*!				
m ə l - r i R R [+cont] ↑ [↑+cont] [lat] [+rhot]			*!		
m ə r - r i ∨ R [+cont] ↑ [+rhot]			*!		

$\begin{array}{c} /m\ \partial\ l - l\ i/ \\ R\ R \\ [+cont] \uparrow \uparrow [+cont] \\ [lat] \quad [lat] \end{array}$	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	ONSET	IDENT [+cont]
$\begin{array}{c} m\ \partial\ l - n\ i \\ R\ R \\ [+cont] \uparrow \quad   \\ [lat] \quad [nas] \end{array}$					*!
$\begin{array}{c} m\ \partial\ n - l\ i \\ R\ R \\   \quad \uparrow [+cont] \\ [nas] \quad [lat] \end{array}$	*!				*
$\begin{array}{c} m\ \partial\ n - n\ i \\ \quad \quad \quad \diagdown \\ \quad \quad \quad R \\ \quad \quad \quad   \\ \quad \quad \quad [nas] \end{array}$					*!

In (26a), all candidates violate ONSET. However, the second candidate fatally violates undominated LICENSE [+rhot] and the third, IDENT [+cont]. Hence, the first candidate in which /l/ surfaces in Coda, becomes optimal. In (26b), the first candidate does not violate any constraint whereas others, at least one constraint. The last candidate needs some explanation. In the input, each /l/ has a distinct Root node, since each /l/ belongs to two distinct morphemes. In the last candidate, however, the geminate [n] has a unique Root node (under the One-Root Theory of Length<sup>10</sup>: Hyman 1985, McCarthy & Prince 1986, Hayes 1989). This candidate receives two violation marks for IDENT [+cont] since the two distinct Root nodes of input /l-l/ which are both continuants, are realized as a single Root node of a coronal nasal stop geminate which has lost [+cont]. Hence it receives two violation marks for IDENT [+cont] in terms of input-output correspondence. The first candidate is optimal since it does not violate any constraint.

/l/ is realized as flapped [r] when it is syllabified as ambisyllabic (16a)

<sup>10</sup> In this paper, we assume the One-Root Theory of Length in which a geminate is represented with one Root node with a mora. However, the alternative Two-Root Theory of Length (Selkirk 1990, Hong 1997a, 71-12) in which a geminate is represented with two Root nodes, does not affect the analysis in this paper in evaluating IDENT [+cont]. For consistency, we assume the former theory in this paper.

and this is explained in the tableau below:

- (27) /ili/            iri            'wolf'  
 ("C." = ambisyllabic)

	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	ONSET	IDENT [+cont]
i.li   [lat]	*!				
i.li   [lat]		*!			
<sup>0.5P</sup> i.ri   [+rhot]					
ir.i   [+rhot]			*!	*	
i.ni   [nas]					*!

[n] realized from /l/ in word-initial position (16c) is explained in the following tableau:

- (28) /lo-in/            no-in            'old people'

	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	ONSET	IDENT [+cont]
lo.-in.   [lat]	*!			*	
ro.-in.   [+rhot]			*!	*	
<sup>0.5P</sup> no.-in.   [nas]				*	*

## 6. Nasal Lateralization

When /n/ is preceded by /l/, it becomes a lateral, forming a geminate with the preceding /l/: Nasal Lateralization.

- |                   |         |                |
|-------------------|---------|----------------|
| (29) a. /il-nyən/ | il-lyən | 'one year'     |
| b. /il-nyə/       | il-lyə  | 'one daughter' |
| c. /sil-næ/       | sil-læ  | 'in-house'     |
| d. /il-nam/       | il-lam  | 'one son'      |

The observation is that coronal [n] is not allowed after lateral [l] which is also a coronal. We further observe that the underlying /nl/ sequence is not allowed to appear on the surface:

- |                   |         |                      |
|-------------------|---------|----------------------|
| (30) a. /cʰən-li/ | cʰəl-li | 'one thousand miles' |
| b. /cin-li/       | cil-li  | 'truth'              |
| c. /san-lim/      | sal-lim | 'forest'             |
| d. /sən-lo/       | səl-lo  | 'track'              |

(30) shows that Nasal-Lateralization also takes place in /nl/ sequence.

David & Shin (1997) tries to explain Nasal Lateralization by appealing to the Similarity constraint along with the Syllable Contact constraint, which is independently motivated (Vennemann 1988, Bat-El to appear, David & Shin 1997, Beckman 1997, Hong 1997b for the motivation of the Syllable Contact constraint):

- (31) SIMILARITY (David & Shin 1997)

If a sequence of sonorant consonants shares a place node, the consonants must share other features as well.

- (32) Syllable Contact (Bat-El to appear)

Avoid rising sonority over a syllable boundary.

However, Syllable Contact and Similarity fail to explain why word-initial /l/ is realized as [n] and why intervocalic /l/ is realized as flapped [ɾ], as is pointed out in David & Shin (1997) themselves:

(33) a. /lo-in/                      no-in                      'old people'

/lo-in/	SyllCon	SIMILARITY	MAX [lat]	MAX [nas]
* <sub>LS</sub> lo-in				
ro-in			*!	
<sub>LS</sub> no-in			*!	

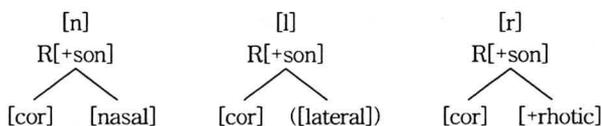
b. /kæli/                      kəri                      'street'

/kæli/	SyllCon	SIMILARITY	MAX [lat]	MAX [nas]
* <sub>LS</sub> kæli				
<sub>LS</sub> kəri			*!	
kəni			*!	

## 7. Licensing and Default Implication

In this section, we will propose that implementation of the Default implication of [lat] with Alignment (in the sense of Itô & Mester 1994) can achieve a similar effect in Korean Nasal Lateralization as implementation of Redundancy implication with Alignment (actually, Licensing in IMP 1995<sup>11</sup>) in Japanese Voicing in NC clusters (IMP 1995). However, IMP (1995) does appeal to Licensing and Redundancy implication whereas we are going to appeal to Licensing and Default implication in this section.

First of all, we assume that Sonorants are represented as follows:

(34) Representations for Korean Sonorants (where "R" is the Root node)<sup>12</sup>

where ([lateral]) is a default feature of a coronal sonorant consonant and is specified only when necessary (or licensed).

<sup>11</sup> IMP (1995) actually implement Redundancy and Licensing. Itô and Mester (1994), however, argue that Licensing may be replaced by Alignment.

<sup>12</sup> Throughout this paper, we assume that [coronal] is underlyingly specified, following Smolensky (1993) and Lombardi (1997).

As for the representation of /l/, we assume that [lateral] is a default feature of a coronal sonorant (cf. Iverson & Sohn 1994<sup>13</sup>) under the assumption that R[+son] implies [lateral] by Default when the Root node which is encoded with [+sonorant], has a [coronal] dependent under the assumption that [coronal], though unmarked, is specified. As a result, we propose the following Default implication, which says that a sonorant with a [coronal] dependent implies a default [lateral] feature:

- (35) Default Implication of a Coronal Sonorant (hereafter, DEFAULT [lat])  
 [+son, cor]  $\supset$  [lat]

DEFAULT [lat] forces R[+son] with a [coronal] dependent to have [lateral] dependent. However, it also forces [+son, cor, nas] (i.e. [n]) and [+son, cor, +rhot] (i.e. flapped [r]) to have [lateral]. If they were assigned [lat], [+son, cor, nas, lat] and [+son, cor, +rhot, lat] would result. However, as [nas], [+rhot] and [lat] are incompatible with one another across languages, we propose that the following feature pairs are strictly disallowed:

- (36) a. \*[nas, lat],  
 b. \*[+rhot, lat]

However, we will assume that the two feature pairs in (36) are part of GEN due to their unviolable nature.

The constraint DEFAULT [lat] is evaluated in the following way ("R" indicates the Root node):

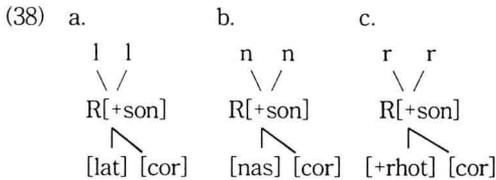
- (37) a. [n]                      b. [r]                      c. [l]                      d. [l]  
           R[+son]                R[+son]                R[+son]                R[+son]  
           | \                    | \                    | \                    | \  
           [nas][cor]        [+rhot][cor]        [lat][cor]             $\emptyset$  [cor]

<sup>13</sup> Iverson & Sohn (1994) assumes that a coronal nasal is a default sonorant. Hong (1997a), on the other hand, argues that [n] is a default consonant in Korean /n/-insertion and shows that [n] is inserted between a C and a front high vocoid at an native Korean inner compound boundary only because [t] and other less marked coronal consonants are not qualified for position before a front high vocoid.

/pat<sup>h</sup>-ilap/                      paŋ-ŋiran                      'field edge'

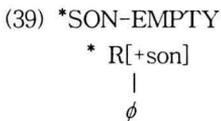
It is not clear at this stage whether /n/-insertion may be reanalyzed under the assumption that [l] is a default sonorant in Korean. This is an open question which cannot be answered in this paper.

DEFAULT [lat] is violated in (37a), (37b) and (37d) due to lack of [lat] whereas it is not in (37c). Let us consider more cases of evaluation of DEFAULT[lat] in which a geminate is involved:



Under the assumption that a geminate has only one Root, (38b) and (38c) receive one violation mark for DEFAULT [lat] due to lack of [lat] whereas (38a) satisfies DEFAULT [lat].

We further propose that a Root node with no “subsonorant” feature below such as [nasal], [lateral] or [+rhotic] is strictly disallowed on the surface:



Undominated \*SON-EMPTY requires that an “empty” R[+son] node be specified for either of [nasal], [lat] and [+rhotic].

We argue that ALIGN-R[lat] and \*SON-EMPTY are higher ranked than DEFAULT [lat], which in turn is ranked higher than IDENT [+cont].

(40) Constraint ranking

- ALIGN-R [lat], \*AMBI-[lat], LICENSE [+rhot], \*SON-EMPTY
- >> ONSET
- >> DEFAULT [lat]
- >> IDENT [+cont]

When delinking of underlying [lat] occurs in word-initial /l/ (/lo-in/ no-in ‘old people’) to avoid violation of undominated ALIGN-R [lat], the “empty” R[+son] after delinking will be strictly disallowed due to undominated \*SON-EMPTY. Then [nasal] insertion in word-initial position (i.e. [n]: violation of lower ranked IDENT [+cont]) will be preferred over [+rhotic] insertion (i.e. [r]: violation of undominated LICENSE [+rhot]). In other words, word-initial /l/ can not be realized as [r] since [+rhotic] is licensed only in

ambisyllabic position. We need not worry about [lat] insertion (to avoid violation of DEFAULT [lat]) after delinking of [lat] in word-initial position since [lat] is allowed only in Coda or position doubly linked to Coda and Onset. [lat] insertion in word-initial position would result in violation of undominated ALIGN-R [lat]. As a result, word-initial /l/ must be realized as [n] at the expense of violating lower ranked DEFAULT [lat] and IDENT [+cont]:

(41) /lo-in/            no-in            'old people'

	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	*SON- EMPTY	DEFAULT [lat]	IDENT [+cont]
lo.-in.     [lat] [nas]	*!				*	
lo.-in     ∅ [nas]				*!	**	
ro.-in.     [+rhot][nas]			*!		**	
no.-in.     [nas] [nas]					**	*

The upshot of this proposal is that [l] is a default sonorant among sonorants. However, the appearance of [lateral] in a sonorant consonant is severely constrained depending upon syllable position as ALIGN-R[lat] and \*AMBI-[lat] are ranked above DEFAULT[lat].

On the other hand, when [lateral] is realized in Coda or in position doubly linked to Coda and Onset, it is allowed to surface:

(42) a. /kal-ma/            kal-ma            'brown horse'

	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	*SON- EMPTY	DEFAULT [lat]	IDENT [+cont]
kal - ma   [lat]						
kal - ma   ∅				*!	*	

	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	*SON- EMPTY	DEFAULT [lat]	IDENT [+cont]
kar - ma   [+rhot]			*!		*	
kan - ma   [nas]					*!	*

b. /al-li-/                      al-li                      'to report-Cau'

/al - li -/     [lat] [lat]	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	*SON- EMPTY	DEFAULT [lat]	IDENT [+cont]
al-li- ∨ [lat]						
al-li ∨ ∅				*!	*	
ar-ri ∨ [+rhot]			*!		*	
an-ni ∨ [nas]					*!	**

In the two tableau above, only the first candidate in which underlying /l/ surfaces, does not violate any constraint and becomes optimal.

Undominated \*SON-EMPTY forces the Root node with [+son] node to have a subsonorant dependent. If the Root node loses either of those subsonorant dependents (i.e. delinking either of [nasal], [lateral] and [+rhotic]) it must be provided with either of them. However, DEFAULT [lat] forces the "empty" R [+son] to acquire [lateral]. Since DEFAULT [lat] is lower ranked than undominated ALIGN-R [lat], the defaulted [lateral] must not violate ALIGN-R [lat] and hence will be allowed only in unique Coda or in position doubly linked to Coda and Onset.

(43) /sil-næ/                      sil-læ                      'in-house'

/sil - næ/     [lat] [nas]	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	*SON- EMPTY	DEFAULT [lat]	IDENT [+cont]
sil - næ     [lat] [nas]					*!	
sil - næ     ϕ [nas]				*!	**	
sil-l æ ∨ ϕ				*!	*	*
sil-l æ ∨ [lat]						*
sin-næ ∨ [nas]					*!	*

In the tableau above, the first candidate fatally violates DEFAULT[lat] since [n] is a coronal sonorant but does not retain [lat]. The second and third candidate fatally violate \*SON-EMPTY since the Root node of [l] and [ll] does not dominate a subsonorant feature, respectively. The fifth candidate fatally violates DEFAULT[lat] since the coronal sonorant geminate does not have [lat]. Hence, the fourth candidate becomes optimal.

The following is another case of Nasal Lateralization in the /nl/ sequence:

(44) /cin-li/                      cil-li                      'truth'

/cin - li/     [nas] [lat]	ALIGN-R [lat]	*AMBI- [lat]	LICENSE [+rhot]	*SON- EMPTY	DEFAULT [lat]	IDENT [+cont]
cin - li     [nas] [lat]	*!				*	
cin - li     [nas] ϕ				*!	**	

/cin- li/     [nas] [lat]	ALIGN-R: [lat]	*AMBI- [lat]	LICENSE: [+rhot]	*SON- EMPTY	DEFAULT [lat]	IDENT [+cont]
cin-ni ∨ [nas]					*!	*
cil-li ∨ [lat]						*
cil-li ∨ ∅				*!	*	*

However, when /l/ is preceded by a non-coronal consonant, it is realized as [n]

- (45) a. /siŋ-lak/      siŋ-nak      'permission'  
 b. /kim-li/        kim-ni        'bank interest'  
 c. /pak-lam/      paŋ-nam      'exhibition'

In the case of /l/ preceded by a non-coronal consonant, if [lateral] spreads to a preceding consonant with a marked place (i.e. [lab] or [dor]), the result would become either (46a) or (46b). We need to explain why (46d) is preferred over (46a), (46b) and (46c).

- (46) a. \*σ      σ      b. \*σ      σ      c. \*σ      σ      d. σ      σ
- |             |             |            |            |
|-------------|-------------|------------|------------|
| \    /      | \    /      | \    /     | \    /     |
| m   l       | m   l       | m   l      | m   n      |
| /   \       | /   \       |            | \          |
| [lab] [lat] | [lab] [lat] | [lab][lat] | [lab][nas] |

We need not worry about (46a) since \*[lab, lat] is not a compatible set of features: [lab] and [lat] are incompatible and \*[lab, lat] is part of GEN due to its unviolable nature. On the other hand, deletion of the feature [lab] in (46b) (or [dor]) must be penalized more due to its highly marked nature. Hence, we will assume that MAX-[lab] (and MAX-[dor]) are ranked very high (perhaps, undominated) in the constraint ranking. (46c) fatally violates undominated ALIGN-R [lat]. The candidate in (46d), which turns out to be optimal, violates only lower ranked DEFAULT [lat] and IDENT [+cont]. However, we will skip evaluation of them in tableau due to lack of space.

When /l/ is followed by a consonant other than a coronal sonorant (e.g. /l/ or /n/), [l] surfaces:

- (47) a. /kal-ma/      kal-ma      ‘brown horse’
- b. /kal-ta/      kal-ta      ‘to plow-suffix’
- c. /səl-pʰa/    səl-pʰa    ‘confutation’

- (48) /kal-ta/                      kal-ta                      ‘to plow-suffix’

/kal-ta/   [lat]	ALIGN-R: [lat]	*AMBI- [lat]	LICENSE [+rhot]	*SON- EMPTY	DEFAULT [lat]	IDENT [+cont]
☞ kal-ta   [lat]						
kal-ta   ∅				*!	*	
kar-ta   [+rhot]			*!		*	
kan-ta   [nas]					*!	*
kal-la ∨ [lat]						*!

### 9. Conclusion

We first argued that the surface realizations ([l], [r] or [n]) of underlying /l/ are positional variables. Namely, either realization of /l/ is crucially dependent on position within syllable structure. We demonstrated how Default implication and Alignment constraint have a similar effect on surface realizations of Korean /l/ as do Redundant implication and Licensing (or Alignment if Licensing can be replaced by Alignment (Itô & Mester 1994)) on Japanese Voicing in NC clusters.

Korean [lateral] is required to be linked to Coda. [lateral] is not allowed in unique Onset. This is quite abnormal given the fact that Onset is more privileged position than Coda. Namely, the consonant inventory in Coda is a less-marked subset of the full consonant inventory in Onset across languages (Beckman 1997 for discussion of positional faithfulness and Selkirk 1994).

We argued that [lat] is a default coronal sonorant feature in Korean and it is defaulted when the Root node with [+son] in it has a [coronal] dependent, regardless of whether a Root node has a subsonorant feature (such as [nasal] or [+rhotic]) or no subsonorant feature below. However, this Default implication should not violate the requirement of undominated Align-R[lat]. When the Default implication violates Align-R[lat], /l/ will have to be realized either as flapped [r] if ambisyllabic syllabification of /l/ is allowed, or as [n] elsewhere.

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