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Coronal Specification and Licensing in Place Assimilation[1]

Seung-Hoon Shin
Indiana University
sshin@indiana.edu

Abstract

Based on unmarkedness of coronal cross-linguistically, coronal has been considered to be underspecified. Also, place assimilation where coronal tends to assimilate to the adjacent labial or velar by a feature-filling rule has been support the underspecification of coronals. I instead argue that coronal should be specified in Optimality Theory despite its unmarkedness, and place assimilation no longer provides evidence of underspecification of coronal. In addition, I maintain that place assimilation is a way of respecting licensing requirements and that a licensing hierarchy with respect to place feature of a coda empirically resolve current issues regarding coronal underspecification and place assimilation.

1. Introduction

The theory of Underspecification stipulates that either all unmarked (predicted) features (Kiparsky 1982, Archangeli 1988, Avery and Rice 1989, 1989, Pulleyblank 1988 among others) or redundant features (Steriade 1987, Archangeli 1988, Mester and Itô 1989) be not specified in underlying representation. Hence, given that coronal is cross-linguistically the most unmarked consonant, under Radical Underspecification theory, it was considered as underspecified (Kiparsky 1985, Goldsmith 1989, Avery and Rice 1989, Paradis and Prunet 1989 among others) unless the coronal consonant has a dependant feature, which depends on the language. For instance, as Paradis and Prunet (1989) observe, in some languages, vowel or tone spreading occurs through a transparent coronal.

In addition to its transparent property in some phonological processes, coronals in many languages are most likely to assimilated to the following labials or velars (Kiparsky 1985, Avery and Rice 1989, Steriade 1995, Gimson 1989). Based on such evidence, it has been argued that coronals do not have either a Place node (Paradis and Prunet 1989) which presumably is not opaque but is transparent to vowels and tones, or a Coronal node (Avery and Rice 1989), which forces it to be assimilated. Although the underspecified thing is different, both hypotheses agree in that coronals should be underspecified in some sense.

Nevertheless, it is still believed that underspecification of a feature hinges on the phonological property of a language. Also, there have been a number of phonologists who claim that coronal should be specified despite its unmarkedness (Clements 1987, Steriade 1987, Kim H.S. 1994, Itô and Mester 1989). They contend that all unmarked features should be fully specified and only a redundant

feature is underspecified; otherwise all features, although they are unmarked and predictable, are specified.

The goal of this paper is to solve problems raised in the traditional analyses regarding underspecification of coronal within the framework Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993). Hence, in this paper, I will argue based on place assimilation examples that unmarked coronal should be fully specified underlyingly, and that ranking of licensing constraints rather than coronal underspecification explains unmarkedness of coronal and typology of place assimilation.

In the following sections, we will review place assimilation of some languages which has been used to establish coronal underspecification.

2. Place Assimilation

It is well-documented that an underlying coronal coda tends to undergo place assimilation to an adjacent labial or velar onset. For example, in English casual speech (Bailey 1970, Gimson 1960, 1989, Jun 1995), coronal consonants assimilate to the following labial or velar consonants, but labial and velar consonants do not assimilate to the following coronals as illustrated in(1).

(1) English place assimilation over a word boundary (Gimson 1989:298)

a) Coronals assimilate to velars and labials

that pen	----->	thap pen
good boy	----->	goop boy
right corner	----->	righk corner

b) Labials and velars do not assimilate to coronals

plum tree	----->	*plun tree
thick tree	----->	*thit tree

Similarly as in English, Japanese and German also invoke similar patterns of place assimilation. For example, in Japanese, coronal /t/ assimilates to any following consonant, but noncoronal stops do not undergo place assimilation as illustrated in (2)[2].

(2) Sino-Japanese Place Assimilation

a) Coronals assimilate to labials and velars

bet + taku	----->	bettaku	'detached villa'
bet + kaku	----->	bekkaku	'different style'
bet + puu	----->	beppuu	'separate cover'
bet + situ	----->	bessitu	'separate room'

(data from Itô 1986)

b) Velars do not assimilate to labials and coronals

gak + see	----->	gakusee	'student'
gak + gyoo	----->	gakucyoo	'school president'
gak + mon	----->	gakumon	'learning'

Also, in German, coronals participate in place assimilation to following noncoronals but labials and velars do not undergo the assimilation as in (3).

(3) German Place Assimilation (Benware 1985 and Jun 1995:42)

a) Coronals assimilate to velars and labials

mitbringen	----->	mipbringen	'to bring along'
mitmachen	----->	mipmachen	'to join'
anbringen	----->	ambringen	'to attach'
anmelden	----->	ammelden	'to register'

b) Labials and velars do not assimilate to coronals

Packpapier	----->	Packpapier	'wrapping paper'
rumkriegen	----->	rumkriegen	'to win over'
zurückmelden	----->	zurückmelden	'to report back'

More interesting data is found in Korean. That is, in Korean consonantal place assimilation, alveolar sounds in coda position assimilate to labial and velar consonants, but labial and velar consonants never assimilate to alveolar consonants. What makes the pattern of Korean place assimilation particularly interesting compared to other languages introduced above is that labial sounds assimilate to velars, but velars do not undergo place assimilation as in (4).

(4) Place assimilation in Korean (Lee, S.S 1994, Iverson and Kim 1987, Iverson and Lee 1994, Cho 1990)

a) Alveolars assimilate to labials and velars

/kotpalo/	----->	[kop.p'a.ro]	'straight'
/mut + ki/	----->	[muk.k'i]	'bury'
/sinpal/	----->	[sim.bal]	'shoes'
/hankuk/	----->	[haŋ.guk]	'Korea'

b) Labials and velars do not assimilate to alveolars

/bapto/	----->	[bap.t'o]	'meal also'
/kaŋto/	----->	[kaŋ.do]	'robber'

c) Labials assimilate to velars but velars do not undergo assimilation

/cup + ki/	----->	[cuk.k'i]	'pick up'
/kamki/	----->	[kaŋ.ki]	'a cold'
/kukmul/	----->	[kuŋ.mul]	'broth'
/akpo/	----->	[ak.p'o]	'music note'

As illustrated in the examples in (4), particularly in Korean, in addition to the assimilation of alveolar consonants to following labials and velars, labials also assimilate to following velars.

So far, we have seen types of place assimilation in English, Japanese, German and Korean. What is noteworthy in this phenomenon is that as has been noted, most languages display similar patterns of assimilation. That is, coronals are assimilated to noncoronals but noncoronals are not assimilated to coronals.

Under Feature Geometry framework with Underspecification Theory, this assimilation of coronals to the following non-coronals has been considered as the result of coronal underspecification. Consequently, the specified feature from noncoronals spreads to an underspecified node of coronal, thus filling an empty node of coronal. As for the pattern of place assimilation illustrated in (4c), where labial sounds assimilate to velar sounds, the phonological process, relying on Feature Geometry with Underspecification framework, has been explained by

means of the notion of so-called 'gravity' or 'peripherality' in Korean, which was first developed by Kim, C.W (1973) and is from the feature [grave]. Gravity means that peripheral sounds such as labials and velars consist of a natural unit and behave differently from central sounds such as alveolars and palatals. Hence, it has been generally assumed that labial consonants are underspecified within the peripheral node and are marked only for peripheral as Iverson and Lee (1994), Lee (1994) and Ahn (1994) argue.

I have shown so far that unmarkedness of coronal cross-linguistically establishes underspecification of the feature and that place assimilation with the hypothesis seems to work. In sum, as for the place assimilation such as English, Japanese and Korean where a coronal assimilates to the following labial and velar, an underspecified place feature for a coronal seems to be required, and also the underspecification of a coronal is consistent with the unmarkedness of a coronal.

Underspecification of the coronal, which has been the core part of the traditional analyses, is, however, still moot in a sense that there are some phonological phenomena that require specification of a coronal. For example, Korean coronal /t/ has been considered to be underlyingly underspecified and the underspecification of /t/, in fact, has successfully explained many Korean phonological phenomena such as /t/-epenthesis, coda-simplification where the coronal is always deleted (see Iverson and Kim 1987, Sohn 1987, Iverson and Lee 1994, Cho 1990, Ahn 1985 etc.) and place assimilation as mentioned. With an underspecified coronal, however, we will face a problem when we account for the opacity of coronal consonants in Korean umlaut.

Umlaut in Korean is a type of vowel fronting process in which a vowel is fronted when followed by an underlyingly specified front vowel as illustrated in (5).

(5) Umlaut in Korean

a) nampi	~	næmpi	'kettle'
b) aki	~	æki	'baby'
c) turumaki	~	turumæki	'traditional coat'
d) paŋmaŋi	~	paŋmæŋi	'bat'

As Shim (1986), Kang (1991) and Shin (to appear) have noted, however, coronal consonants between two vowels block the harmony as shown in (6).

(6) Disharmony by alveolar consonants

a) masita	~	*mæsita	'to drink'
b) candi	~	*cændi	'grass'
c) mati	~	*mæti	'knot'

In addition to the coronal obstruents, a coronal nasal also blocks the vowel fronting process as illustrated in (7).

(7) Disharmony by alveolar nasals

a) əməni	~	*əmæni	'mother'
b) cuməni	~	*cumæni	'pocket'
c) halməni	~	*halmæni	'grandmother'
e) acuməni	~	*acumæni	'aunt'
f) əkɨmni	~	*əkimni	'back tooth'

An intervening nasal, couched within Feature Geometry framework, should be considered as a coronal-dependent feature in order to have a specified coronal node and to block umlaut. The problem of stipulating a coronal-dependent nasal is that the feature nasal in Korean cannot be dominated by a coronal since the feature nasal spreads independently without being governed by its host coronal node (Rice and Avery 1991, Shin 1994).

Another problem of coronal underspecification is found in Axininca Campa where the only possible coda is nasal (underlyingly unspecified nasal N) and the coda must not have a place feature, thus being place-linked with a following onset consonant (Black 1991). Regarding the restriction of a coda in Axininca Campa, Itô (1986) proposes a Coda Condition as in (8).

(8) Axininca Campa Coda Condition by Itô (1986, 1989)

$$*C]_{\sigma}$$
$$|$$
$$[place]$$

The problem of the Coda Condition is that we cannot rule out a coda [n] which is not place-linked with a following onset. That is, [n] has an underspecified coronal and does not violate the coda condition in (8). Nonetheless, [n] is not an eligible coda in the language unless it is followed by a coronal onset.

On the other hand, the coronal-specification hypothesis in Korean, however, contradicts other well-known Korean phonological phenomena that I have mentioned as evidence of coronal underspecification such as place assimilation, coda-simplification and /t/-epenthesis. In fact, it is not easy to handle all the phenomena with a single analysis within the framework of the Underspecification Theory.

In section 2, in order to resolve such conflicts, I will argue, couched within the Optimality Theory framework, that all features are underlyingly specified. I will also argue that unmarkedness of a coronal results from constraint hierarchy rather than feature underspecification, and place assimilation does not support coronal underspecification.

2. Underspecification in Optimality Theory

In Optimality Theory, underspecification still remains an open issue. In the following section, I will posit the hypothesis that all features are fully specified.

2.1. Coronals in Optimality Theory

In this section, we will try to answer the question: is a coronal underspecified in Optimality phonology? Unfortunately, however, we have not had many decisive cases of feature specification or underspecification, yet because the issue has not been widely attested. However, Inkelas (1995), within the framework of Optimality Theory, argues that underspecification is still necessary in Optimality Theory, but the scope should be very limited to certain alternations, such as Turkish voicing alternation (Inkelas 1995) which illustrate a three-way contrast.

Kirchner (1995), on the other hand, claims all features of an underlying representation including even predictable features such as [+voice] for vowels and

nasals. In his analysis, unmarkedness of predictability results from the interaction of low ranking Parse with regard to a predictable feature and high-ranking Parse[feature] with regard to an unpredictable and a marked feature.

In this paper, following the basic idea of Optimality Theory which forbids underspecification of unmarked or predictable features (Smolensky 1993, Inkelas 1995, Kirchner 1995), I will stipulate that all features are fully specified both in underlying representation and in surface representation[3]. Hence, a coronal despite its unmarkedness, is also specified.

Based on this assumption, I argue that unmarkedness is characterized by constraint hierarchy rather than underspecification of a feature.

3. Place Assimilation in Correspondence Theory

Given the fact that two consonants over a syllable boundary when assimilated share the same features with respect to [place] and that the direction of the assimilation is regressive, Rhee (1996) proposes the constraint SHARE[place].

(9) SHARE[place]: Place feature is shared in $C_1 + C_2$.

He further argues that domination of IDENT[pl(Am)] ('Am' stands for a released segment, which means an onset in Korean) over IDENT[pl] (unreleased segment, which refers to a coda in Korean) forces a consonant segment over a syllable boundary to undergo regressive assimilation as in (10).

(10) Analysis of Place Assimilation by Rhee (1996)

/ət-ko/ 'get and'	IDENT (Place(Am))	SHARE (Place)	IDENT (Place)
a. ə t. k o A_o A_oA_m | | [cor] [dor]		*!	
☞b. ə k. k o A_o A_oA_m \ | [dor]			
c. ə t. t o A_o A_oA_m | / [cor]	*!		

The table illustrates that the candidate most faithful to its input [ət.ko] is ruled out since two consonants over a syllable boundary do not share the place feature, thus violating share[place]. Candidate (c), on the other hand, is also eliminated from consideration since the two constraints share the place feature of the coda consonant which has A_o. As a consequence, the table suggests that the two

consonants over a syllable boundary should share the place feature, and that the place feature should come from an onset (released) consonant.

The only problem with this analysis, however, is that the constraint hierarchy cannot account for the patten shown in (4b). That is, his analysis will incorrectly predicts the output of /apto/ to be the hypothetical [at.t'o] rather than the correct output [ap.t'o] since the consonants in the sequence /pt/ do not share the place feature and the coronal [t] in the output is a released segment. Nevertheless, the input does not undergo assimilation.

Based on the assumption that a coda position is much weaker than an onset (see Onset/Coda Licensing Asymmetry in Prince and Smolensky (1993) and 'Ident-Onset' and 'positional faithfulness' in Lombardi (1995)) and given the coda-neutralization discussed above and the place assimilation examples in (1), (2), (3) and (4), I propose that a segment as a coda must be licensed by means of the place feature and that the constraint License[place]-Coda[4] formalized as in (11) is responsible for the phenomenon.

(11) License-Coda[place]: Coda should be licensed by [place].

As I mentioned above, I argue that all features are specified in Optimality theory. This suggests that this constraint set may be decomposed into the following constraints.

(12) a) License-Coda[labial]: Coda should be licensed by [labial].
b) License-Coda[coronal]: Coda should be licensed by [coronal].
c) License-Coda[velar]: Coda should be licensed by [velar].

This constraint is opposed to the general assumption regarding a coda. Earlier works regarding a coda takes the view that a coda must not have a place feature. This view, however, fails to show what triggers place assimilation. The constraint, Share[place] shown in the table in (10) which seems to be the only possible trigger for the assimilation forces even a velar coda to undergo assimilation to the following labials or alveolars. Therefore, I instead maintain that a coda consonant must be licensed by its place feature, and constraint ranking of the License[place]-Coda forces a coda consonant to satisfy the requirement as maximally as possible.

Correspondence Theory (McCarthy and Prince 1995, McCarthy 1996) is the recent revised version of Optimality Theory, and other constraints that I am going to use within Correspondence Theory framework are as follows.

(13) Constraint families on correspondent elements (McCarthy and Prince 1995:264)
a) MAX: Every segment of S_1 has a correspondent in S_2.
b) DEP: Every segment of S_2 has a correspondent in S_1.
c) IDENT [F]: Correspondent segments are identical in feature [F].

The table in (14) accounts for place assimilation illustrated by the pattern in (3a).

(14) Place Assimilation in German

/mit brin gen/ | | [cor] [lab]	DEP- velar	Ident- Onset [place]	License -Coda [velar]	License -Coda [labial]	License -Coda [cor]	Ident- Coda [place]
a. mit brin gen | | [cor] [lab]			*	*!		
b. mit trin gen \/ [cor]		*!	*	*		
☞c. mib brin gen \/ [lab]			*		*	*
d. mik krin gen \/ [vel]	*!	*		*	*	*

In the table in (14), the place feature of the coda in candidate (a) is licensed by lower-ranking License[coronal]-Coda at the expense of violating higher-ranking constraints License[velar]-Coda and License[labial]-Coda. The coda in candidate (d) is licensed by high-ranking License[velar]-Coda. The candidate is also eliminated from consideration since the [velar] feature is inserted, thus violating Max (more precisely Max-[velar]). Candidate (b), on the other hand, is ruled out because onset of the second syllable has a different place feature from its correspondent, thus crucially violating high-ranking Ident-Onset[place]. Hence, even though candidate (c) violates a correspondence constraint, Ident-Coda[place], it becomes the optimal output since the coda of the first syllable becomes licensed by the feature [+labial] from the following onset, thus respecting the higher-ranking constraints, License[labial]-Coda and MAX.

As for the Korean data where a labial is assimilated to a velar, I maintain that higher-ranking of license[velar]-Coda than License[labial]-Coda gives rise to the labial-velar place assimilation, and that unmarked labials with respect to velars result from the ranking of relevant constraints as illustrated in (15).

(15) Labial assimilation to the following velar

/kamki/	MAX	Ident-Onset [place]	License -Coda [velar]	License -Coda [labial]	License -Coda [cor]	Ident-Coda [place]
a. k a m. k i | | [lab] [vel]			*!		*	
b. k a m .p i |/ [labial]		*!	*		*	
☞c. k a ŋ .k i \\\| [velar]				*	*	*
d. k a. k i	*!					

In the table in (15), coda in candidate (b) is licensed by the feature [velar], thus respecting high-ranking constraint, License[velar]-Coda. The candidate, however, crucially violates Ident-Onset[place] which is higher-ranked than Ident-Coda[place]. In candidate (d), the underlying /m/ does not have its correspondent in its output, thus crucially violating MAX. Both candidates (a) and (c) respect all correspondence constraints. They differ only in that candidate (a) violates License-Coda[velar], and candidate (c) violates License-Coda[labial]. Given velars are more marked than labials in Korean, License-Coda[velar] is higher-ranked, thus candidate (c) emerges as the winner. Hence, the constraint hierarchy where License-Coda[velar] dominates License-Coda[labial], a sequence of a labial coda preceding a velar onset is assimilated to velar and is fully licensed.

We have seen that License-Coda[coronal] is ranked low in the languages we have considered. This constraint hierarchy, nevertheless, does not necessary mean that words tend to end in noncoronals in surface forms. What is more important than the License constraint is correspondence relation which produces faithfulness. That is, as McCarthy mentions, an optimal output may violate high-ranking (not undominated) constraints in order to be faithful to its input, which makes an output look like its input. Consequently, as for monosyllabic words ending in a coronal consonant, I argue that they do violate the coda licensing constraint in order to avoid violating the higher-ranking constraint DEP.

In sum, I conclude that the typology of place assimilation is derived from the following universal constraint hierarchy in Optimality Theory rather than from underspecification of a coronal as in (16).

(16) Universal Constraint Hierarchy in Place Assimilation (revised)
a) License-Coda[vel], License-Coda[lab] >> License-Coda[cor]
: Japanese, German, English, etc.
b) License-Coda[vel] >> License-Coda[lab] >> License-Coda[cor]
: Korean

Notes

1. I am especially grateful to Stuart Davis for his many helpful comments.
2. In Japanese, the coronal /t/ is assimilated to the following coronal /s/ as illustrated in (d). This may be result of high-ranking License[+continuant]-Co da which licenses [+continuant] feature of a coda (see Shin (in preparation) for more discussion of Coda Condition and the constraint License[f]-Coda).
3. The only underspecified feature that I assume is [voice] for sonorants which is virtually redundant (see Shin (in preparation)).
4. See Shin (in preparation) for more about the constraint familiy, License-Coda.

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