Transparency and Node Generation Convention*

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0. It has been assumed that in Underspecification Theory (UT) coronals are most underspecified consonants and thus none of the features of coronals are specified underlyingly (Sohn, H-S. 1987, Kim, K-H. 1987). In Feature Geometry (FG), structure of coronal consonant is represented as the absence of nodes or features under root node (RN) (Paradis and Prunet 1989) or place node (PN) (Kim, K-H. 1987). This internal structure of coronals enables us to represent such phonological processes as neutralization, consonantal assimilation, and transparency of coronals with simplicity.

First, neutralization in Korean, where alveo-palatals (/c/,/c^h/, and /c'/) are neutralized to alveolar /t/ in the syllable-final position, can be described as delinking of association lines under PN.

Second, in Korean, coronals are ready to assimilate to the following velars and labials whileas the reverse process does not occur. This can be explained by the absence of place features under PN which can be the landing site of neighboring place feature.

Third, coronals have no nodes under RN or PN and they are transparent to spreading of features under them. It is borne out since there is no association line crossing.

This paper deals with transparency issue with respect to the absence of nodes. Specifically, I claim that mere absence of nodes does not guarantee transparency of segments and propose that language-specific C(onfiguration)-constraints (Archangeli and Pulleyblank 1986) be supplemented.

In the next section, I will discuss two mutually complementary conventions: transparency and Node Generation Convention (NGC) (Archangeli and Pulleyblank 1986). Then transparency phenomena in two languages, Fula and Korean, will be explored to see in what way c-constraints are needed to support the above two conventions.

1.1. In this section, the relation of transparency and NGC is discussed and it will be shown that we cannot say that a segment is transparent simply because there are no nodes or features which cause line crossing.

Trasparency and NGC are complementary since the former is endorsed by the absence of nodes (or features) while the latter generates nodes between terminal features and higher nodes.

First, let's see how transparency is ratified by the absence of nodes. Suppose that there is a phonological rule which spreads feature [+F] in /A/ to the following segment /C/ as in the following.

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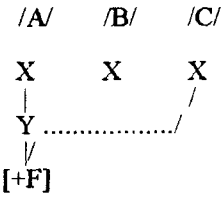
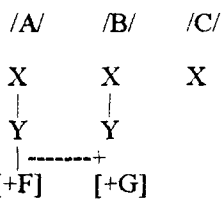
(1)



Here, if the segment /B/ has a feature [+G] under Y node, then it is not possible for [+F] to spread to /C/ since it will generate crossing of association lines like the following.

(2)

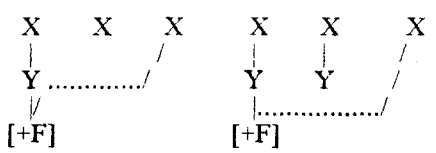


Therefore, for the phonological rule (1) to be possible, it is necessary that FG of /B/ should be either of the followings.

(3) a. /B/ b. /B/

Since both structures in (3) have no feature under Y node ((3a) does not have even Y node), there is no crossing of association lines even if [+F] spreads to X node of /C/ as shown below.

(4) a. /A/ /B/ /C/ b. /A/ /B/ /C/



In (4), we can say that the segment /B/ is transparent with respect to phonological rule (1) in that it does not block the spreading of [+F] in preceding segment /A/ to following segment /C/ and this can be explained by the internal structure of /B/, in which there is no feature under Y node which can result in the ill-formed line crossing.

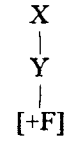
Second, since in (C) there is no Y node, which is the immediately dominating node of the feature [+F], we need to invoke NGC.

(5) Node Generation Convention
(Archangeli and Pulleyblank 1986:75)

A rule or convention assigning some feature or node α to some node β creates a path from α to β.

By NGC, Y node of /C/ is generated after the phonological rule (1) applies, resulting in the following structure.

(6) /C/



However, a couple of problems can be pointed out here. First, in (4), there is no explanation for why the spreading feature [+F] cannot land on the following segment /B/. In (4a), the feature [+F] can land on the X node of /B/ and the intermediate node Y is generated by NGC later. Thus we cannot say that the absence of landing node causes transparency of a segment. In (4b), there is a landing site Y in /B/ and so unless there is special reason, we should assume that [+F] can land on it.

Second, if we assume that transparency of /B/ is caused by the absence of nodes which may result in crossing line, we also should expect the segment /C/ to be transparent to the spreading of [+F] since it also does not have Y node. Note here that the absence of nodes does not guarantee transparency since the intermediate node Y can be generated by NGC. To overcome these drawbacks, I propose some constraints on contents of FG, which will be explained in the next section.

1.2. In this section, I will introduce a device of constraining contents of FG. They are called C(onfiguration)-constraints and there are two types, positive and negative, which were formalized as follows: (Archangeli and Pulleyblank 1986:64)

(7) Configuration Constraint

a. c-Constraints: $\{ \alpha : \beta : \gamma \}$
Domain: X^o/X^{max}

b. $\bar{c}$-Constraints: $*\{ \alpha : \beta : \gamma \}$
Domain: X^o/X^{max}

(7a) is a positive constraint and is read as `there can be a path from $\alpha$ to $\beta$ only if $\beta$ is connected to $\gamma$' while (7b) is a negative constraint and is interpreted as `there cannot be a path from α to β if β is connected to γ.'

C-Constraints like the above restrict the content of FG in the following way. Suppose that there is a negative c-constraint which says that there cannot be a path

from X to Y if Y is connected to Z. This constraint is formalized as (8a) and disallows FG like (8b).

(8) a. $\bar{c}$-Constraint: *{ X : Y : Z }

b. * X
|
Y
|
Z

2.0. In this section, transparency phenomena in two languages will be explored: coronals in Fula and neutral vowels in Korean. First, I will briefly summarize the phenomena in question and will point out some problems of previous analaysis. Then, I will show that they cannot be explained without language-specific c-Constraints which I propose in this paper.

2.1. In Paradis and Prunet (1989), it is claimed that universally coronals lack a PN under RN by the following principle.

(9) Coronal Underspecification Principle (CUP)
(Paradis and Prunet 1989:319)

Unmarked coronals universally lack a Place node.

By CUP and UT, which eliminates all the redundant feature in underlying representation, coronals in Fula are represented as follows: (ibid:321)

(10) coronals in Fula

X
|
RN
|
[+cons]

The segmental structure of coronals like (10) is claimed to be responsible for the following data in Fula, in which only coronals are transparent for vowel spreading. In Fula, there are three voices, active, middle, and passive and two aspects, perfect and imperfect, which cover seven sub-aspects (Cf. Paradis and Prunet:324 for more details).

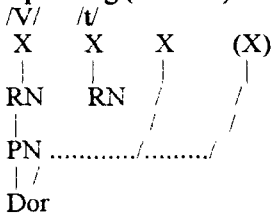
(11)

Perfect	Active	Middle	Passive
P_1	-	i	a
P_2	i	ii	aa
P_3	ii	iima	aama

Imperfect			
I_1	-	o	e
I_2	a	oo	ee
I_3	at	oto	ete
I_4	ata	otoo	etee

In (11), what is noteworthy is that identical vowels are shown only on both sides of coronals (e.g. oto, otoo, ete, etee, ata, but iima).1 The same vowels are generated by V-spreading and it spreads across only coronals, since other consonants like velars or labials will create a crossing line.

(12) V-spreading (ibid:329)2



This formulation, however, has a couple of problems. First, there is no way to explain why PN does not land on RN of following /t/ by spreading. RN is a perfect landing site of spreading PN in the sense that it is an immediate dominating node of PN. Second, if transparency is a matter of absence of nodes, then we cannot explain why the third and fourth X-slots are not transparent also despite the fact that they have no nodes under the skeletal tier. In fact, they should be more transparent than coronals in that they do not have RN, landing site of PN.

To overcome these problems, I propose the following c-constraint, which says that `there cannot be a path from PN to a node if that node is connected to [+consonantal].'

(13) *{PN : (node) : [+consonantal]}

By (13), PN in (12) cannot land RN of /t/ by spreading, because RN in /t/ is connected to [+consonantal]. We can also explain why X-slots in (12) are not transparent by the fact that they are not connected to [+consonantal], thus not violating c-constraint (13).

2.2. In Korean, two vowels, /i/ and /i/, in the non-initial syllable position are not affected by Vowel Harmony (VH). (14) shows some examples.3

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1 In Passive P3, `the presence of the same vowel on both sides of m is simply an artifact of amma containing two suffixes (aa-ma) which happen to have the same vowel.' (Paradis and Prunet 1989: 324)

2 If we assume that V-spreading spreads Dorsal node instead of PN, then we should expect that all consonants are transparent. (cf. Steriade 1987, Paradis and Prunet 1987)

3 For typographical reasons, I adopt the following notations. N: velar nasal ê: schewa

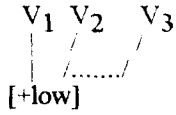
(14) a. $c^hulêN$ ~ c^holaN ~ c^halaN `slopping'
mulêN ~ molaN ~ malaN `soft'
cuNêl ~ coNal ~ caNal `murmuring'
nulên ~ nolan ~ *nalan `yellowish'
$p^huNtêN$ ~ p^hoNtaN ~ *p^haNtaN `with a plop'

b. pusil ~ posil `drizzling'
pisil ~ pæsil `staggering'
pusisi ~ posisi `gently rising'

c. pusilêk ~ posilak ~ pasilak `rustling'
pucilên ~ *pocilan ~ pacilan `diligent'
k'umcilêk ~ k'omcilak ~ *k'amcilak `sluggishly'

In Sohn, H-S. (1986), morpheme-sized feature [+low] is said to be responsible for the harmonizing characteristics of Korean ideophones.

(15) Harmony Spreading (Sohn, H-S. 1986:167)4



where [+low] is morphophoneme.

As we see in (14b), however, /i/ and /ɨ/ in non-initial position are unaffected by this rule.5 How can we explain this?

In Ahn, S-C. (1985), this is ascribed to the `peripherity' of these vowels in his diagonal distinction for VH.

(16)

i	ü	ɨ	u
e	ö	ê	o
æ		a	

However, this explanation gives us nothing but a sort of speculation without specific answer. Still it is not clear why spreading of [+low] is not applicable to these vowels. Moreover, the fact that /ɨ/ in initial position alternates with /æ/ as in (14b) cannot be explained.

Sohn, H-S. (1986) tries to explain this by introducing the notion of `Tier Conflation' (McCarthy 1986). First, she assumes that consonant and vowel tiers are separate in Korean and that after the application of Universal Association Convention (UAC), which connects [+low] to the first vowel, two tiers conflate into one while blocking the spreading of [+low].

This solution, however, also has a couple of problems. First, it can only explain the `opaqueness' of these vowels as in (14b) where spreading of [+low]

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4 As for / u -> o /, the following phonetic implementation rule is assumed (Sohn H-S. 1986:168)

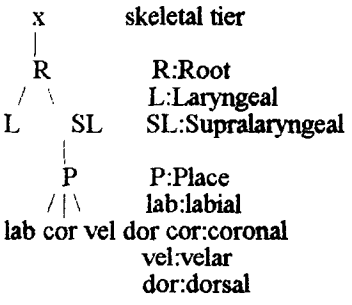
[+low] -> [-low] / [____, +round]

5 These vowels are called `neutral' in this sense in Ahn, S-C. (1985) and Sohn, H-S. (1986)

does not occur. It does not give any answer for the `transparency' of those vowels in (14c) in which [+low]-spreading takes place across /i/ and /ɨ/.

Second, if we assume the FG of Steriade (1987) in which vowels are independently represented under dorsal node, the idea of distinct tiers for consonants and vowels is not necessary.

(17) Feature Geometry of Steriade (1987)



In (17), we can explain how consonants are transparent to VH. Since all vowel features are under dorsal node, consonants which do not have dorsal node cannot be a landing site of spreading of vowel features.

Transparency of two vowels, /i/ and /ɨ/, however, cannot be explained by (17) only since these vowels also have a landing site of spreading [+low], i.e. dorsal node.

We may think that the absence of node can be a solution since /ɨ/ is regarded as the most underspecified vowel in Korean (Sohn 1987). Then what about the case of /i/ which should have a [-back] under dorsal node by UT in Korean? Besides as we saw in the previous section, mere absence of node (or landing site) cannot motivate transparency of a segment, because intermediate nodes can be generated by NGC.

In order to explain transparent property of these vowels, I propose a language-specific c-constraint like the following, which says that `there cannot be a path from [+low] to a node which is connected to [+high, -round].'6

(18) *{[+low] : (node) : [+high, -round]}

(18) prevents [+low] from spreading to /ɨ/ and /i/, which are [+high, -round]. This language-specific constraint can explain the data (14b) and (14c) alike. In (14b), [+low] which was connected to the word-initial syllable by UAC cannot spread to the following vowels since they are connected to [+high, -round]. By the same reason, in (14c) [+low] cannot land on the following vowel but can spread to the third vowel because it is not [+high, -round].

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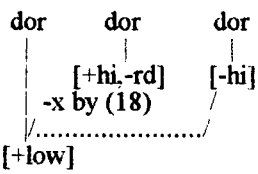
6 Here I assume this constraint applies only to spreading of a feature because word-initial syllabel which is connected with [+low] by UAC is not affected by this constraint.
(cf. /i/ ~ /æ/ in pisil ~ pæsil)

(19) /p/ /u/ /s/ /i/ /l/ /ê/ /k/



Transparency of consonants in (19) is explained by the distinct tiers of them under PN and by (18) [+low] does not spread to the second vowel /i/.

3.0. In this paper, I dealt with two mutually complementary notions: transparency and NGC. The former refers to the absence of nodes and the latter, generation of nodes. I showed that mere absence of nodes is not enough to motivate the transparency of a segment since those absent nodes can be generated by NGC. We cannot dispense with NGC since it is independently necessary to explain some phonological processes which connect the terminal feature to the upper node. To solve this, I proposed language-specific c-constraints which can prevent spreading from landing to any upper node.

This was illustrated with two languages: Fula and Korean. In Fula, coronals are said to be transparent while in Korean two vowels, /i/ and /i/, are transparent to VH. These examples show that without language-specific c-constraints it is impossible to prevent spreading from `honoring' absent nodes nor from `ignoring' them. It is argued that language specific c-constraints guarantee a proper interplay between transparency and NGC.

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