The Analysis on Korean Sonorantization in Government Phonology*

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Park, Heeheon. 2006. The Analysis on Korean Sonorantization in Government Phonology. *The Linguistic Association of Korea Journal, 14*(1), 67-87. This paper aims to investigate how phonological processes of Korean Sonorantization can be analyzed within Government Phonology (Kaye, Lowenstamm & Vergnaud 1985, 1990, henceforth KLV). Sonority assimilation is one of the most peculiar phonological processes in Korean. Usually, syllable-final consonant is assimilated to syllable-initial consonant. This paper explores the phenomenon of Korean Sonorantization in Government approach, in which it is proposed that syllables are bound together in terms of a relation of government. The first part of the paper describes the processes of Korean sonority assimilation with relevant examples and centers on the theoretical background of Government Phonology. Noting some problems which arise within Government Theory, I propose to analyze the phenomenon of Korean Sonorantization in Extended Government Phonology (Park 1996, Park, H. & D. Michaels 1997), which extends lexical representations in the Government framework along the lines of the Markedness Theory in the Syllable Structure approach.

Key Words: Government Phonology, Segmental Complexity, Korean Sonorantization, Government Licensing, Extended Government Phonology, sonority assimilation

1. Introduction

Recent work in phonology has suggested that Phonological Form, like the other components of the grammar, is subject to certain fundamental

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principles. One line of this work is found in Government Phonology. This paper explores how the phenomenon of Korean Sonorantization can be analyzed in a principled way within Government Phonology. Describing the phenomenon of Korean sonority assimilation with relevant examples, I pursue the issue of whether there are universal principles that force the alternations for this phenomenon. Providing the theoretical background of Government Phonology, I focus on the investigation of the phenomenon of Korean Sonorantization in terms of Government. Pointing out some problems within Government Theory, I propose to adopt the conceptual structure of the Syllable Structure approach to extend the lexical representations in the Government framework. Finally, this paper closes by giving the proposed analysis for the phenomenon of Korean Sonorantization based on Extended Government Phonology.

2. The Phenomenon of Korean Sonorantization

In Korean, we can find one of the most common assimilation processes by which consonants assimilate their manner features to their neighboring consonants. The data for this phenomenon are as follows:

(1) a) <u>Stops + Nasals</u>
    /pap + mul/ → [pa<u>m</u>mul] 'water needed for rice'
      cf) /pap/ → [pap] 'rice'
    /kut + nin/ → [ku<u>nn</u>in] 'becoming solid'
      cf) /kut +in/ → [kutin] 'solid'
    /kuk + mul/ → [ku<u>n</u>mul] 'soup'
      cf) /kuk/ → [kuk] 'soup'
  b) <u>Stops + Liquids</u>
    /sip + li/ → [si<u>mn</u>i] 'a mile'
      cf) /sip/ → [sip] 'ten'
        /o + li/ → [oli] 'half a mile'

c) <u>Nasals + Liquids</u>

/čən + li/ → [čəlli] 'a long distance'

cf) /čən/ → [čən] 'one thousand'

d) <u>Liquids + Nasals</u>

/dal + nore/ → [dallore] 'song of the moon'

cf) /nore/ → [nore] 'a song'

We can frequently find that in the position of syllable-final consonant (C_1), consonants are reduced to implosive, or several consonants are neutralized and lose distinctive functions. But in the position of syllable-initial consonant (C_2), almost all the consonants maintain their distinctive properties. Usually the sonority of C_1 becomes equal to that of C_2, but there is an exception to this principle as in (1b) (Huh 1968). In this case, /l/ of C_2 is changed into the nasal and C_1 is assimilated to this nasal; e.g., /l/ in /sip+li/ is changed into /n/ and /p/ of /sip/ is assimilated to /m/. In (1c), nasals are assimilated to liquids creating geminates. Kim (1976) suggests that the phenomenon of Korean sonority assimilation happens because C_1 processes stronger acoustic value than C_2. According to him, the order of the degree of sonority of Korean consonants is as shown in (2), and Sonority Assimilation rule is stipulated by this order (see also Hong & Michaels 1985).

(2) Liquids > Nasals > Fricatives > Stops = Affricates

The Sonority Assimilation rule proposed by him is as follows:

(3) When C_1 and C_2 are connected in the reverse order of the figure (2), the sonority of C_1 is obligatorily assimilated to that of C_2.

We may consider this rule component of a phonology based on the Sonority Sequencing Principle proposed by Selkirk (1984) and the Coda Licensing Principle suggested by Kaye (1990). The version of the Sonority Sequencing Principle is that "in any syllable, there is a segment constituting a sonority peak which is preceded and/or followed

by a sequence of segments with progressively decreasing sonority values" (Selkirk 1984 p. 116). Thus, according to this principle, a syllable generally has only one sonority peak, and segments progressively decrease in sonority from the peak to the margins of the syllable. The sonority hierarchy proposed by Selkirk is as follows:

(4)   <u>Sounds</u>   <u>Sonority Index</u>
     a   10
     e, o   9
     i, u   8
     r   7
     l   6
     m, n   5
     s   4
     v, z, ð   3
     f, θ   2
     b, d, g   1
     p, t, k   .5

Based on this principle, Kaye (1990a) proposes the Coda Licensing Principle, which implies that a coda must have a certain qualitative relationship with the onset to its right, as follows (see also Kaye 1990b and Charette 1990):

(5) <u>Coda Licensing Principle</u>
    Post-nuclear rhymal positions must be licensed by a following
    onset.

According to him, a coda must have more "charm" than the onset to its right, in order for that onset to be able to license it. "Charm" in Kaye's system is roughly equivalent to sonority. Thus, if we apply these principles to the Korean Sonorantization, we may assume that when a syllable-final consonant (C_1) is less sonorous than a following syllable-initial consonant (C_2) in heterosyllabic constructions, the structure requires repair because C_2 cannot license C_1. Thus, this ill-formed relation is repaired by Sonorantization.

However, we cannot explain the case (1d) by these two principles, the Sonority Sequencing Principle and the Coda Licensing Principle. That is, (1d) shows well-formed sonority relation, because /l/ as C_1 is more sonorous than /n/ as C_2. Nevertheless, the structure is changed from /ln/ to /ll/. This phenomenon remains unanswered in this analysis.

So far, I have shown phonological processes of Korean Sonorantization, reviewing some explanation for the processes of that phenomenon. The issue here is whether there are universal principles that force the alternations in phonological processes of Korean sonority assimilation. Government Theory proposes that universal government relations among segments are the driving force for the distributional patterns that they conform to. The next section explores the phonological phenomenon in Korean described in section 2 within Government Theory. Before investigating the phenomenon of Korean sonority assimilation in terms of Government Theory, I set out the theoretical framework.
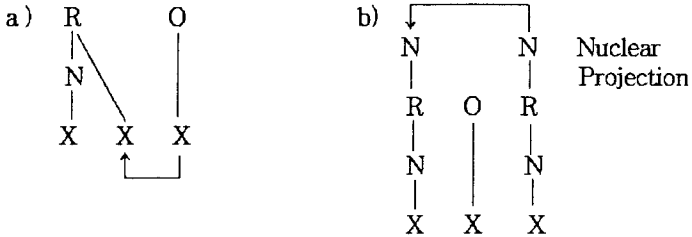
3. A Theory of Government in Phonology

3.1. Phonological government

Following KLV (1990), government in phonology is a universal relation holding between two positions. KLV define a governing domain as strictly local and strictly directional. The direction of government depends on whether it is constituent government or interconstituent government. In this paper, I focus only on the latter in which the direction of government between two points is from right to left, as illustrated in (6):

Governors and governees require certain types of segments in order to fulfill their government requirements. The governing properties of segments are defined by charm, a kind of sonority measure. Generally speaking, segments with negative charm such as stops and non-strident fricatives are potential governors and charmless segments such as sonorants are potential governees, as shown in (7) (see also Charette 1988)

(6)   Interconstituent Government: (O=Onset, N=Nucleus, R=Rhyme)

a)   R   O   b)

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    R        O              ┌──────────┐
    |\       |              ↓          │
    N \      |              N          N     Nuclear
    |   \    |              |          |     Projection
    X    X   X              R     O    R
    ↑_____|              |     |    |
                           N     |    N
                           |     |    |
                           X     X    X
```

(7) a) <u>Governors</u>: negatively charmed segments (obstruents or
           fricatives; e.g., p, t, k, f)
    b) <u>Governees</u>: charmless segments (sonorants; e.g., m, n, l)

3.2. Segmental Complexity and Phonological Government

KLV (1985) propose an additional determinant of governing capacity:
a segment's complexity. To assess segmental complexity, they represent
consonants internally by the unary elements given in (8).

(8) U^o labiality I^o palatality
     v^o velarity h^o noise
     $?^o$ constriction R^o coronality N^+ nasality
 H^- stiff vocal chords L^- slack vocal chords

Based on this complexity distinction, Harris (1990) proposes that all
segments in government configurations, irrespective of their charm
values, should satisfy the Complexity Condition in (9).

(9) <u>Complexity Condition</u>
    Let a and β be segments occupying the positions A and B
    respectively. Then, if A governs B, β must be no more
    complex than a.

According to this condition, the governing consonant must be more

complex than its governee, with complexity calculated by the number of elements in a given segment. For example, the reason the liquid [l] may govern [r], but not vice-versa, is that [l] is more complex than [r], as is illustrated in (10). In this paper, I skip the internal representation of each consonant. For details, please refer to Harris (1990).

(10)
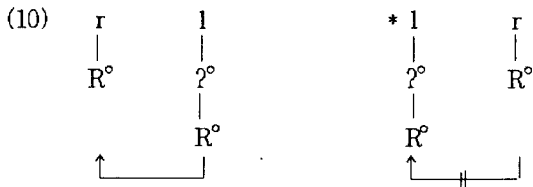
Harris proposes that certain phenomena are forced by the Complexity Condition (9), according to the two types of operations in (11).

(11) a) <u>composition</u>: elements spread from one consonant and
           fuse with elements contained in a neighboring consonant
      b) <u>decomposition</u>: elements are lost from the internal
           representation of a consonant

He argues that the change of /-cm-/ → /-ym-/ in Arbore can be explained by decomposition, forced by the necessity to steepen the complexity slope between the governing consonant and the governed consonant, as shown in (12) (see also Harris 1988).

(12)
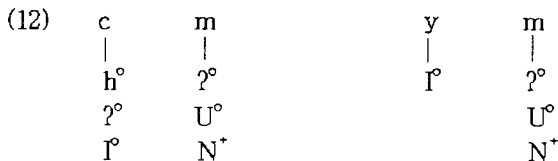
That is, (12) shows that /c/ loses $?^p$ (constriction) and h^o (aspiration) elements, conforming with the Complexity Condition in (9).
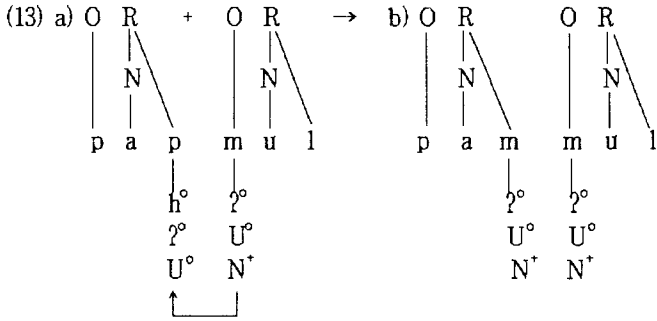
Such an analysis, however, does not explain why the decomposition of

the first consonant applies rather than composition of the second if all that is at stake is achieving a government relation. In addition, we cannot predict how many internal elements are dropped for decomposition. This analysis also does not explain why only specific element(s) are affected and not some other element(s). In order to clarify these problems, Park (1996) and Park & Michaels (1997) extend the Government Theory, adopting the Markedness Theory in the Syllable Structure approach. In the section 5, I will present the Theory of Extended Government Phonology in details. Now, let us move on to the analysis of the phenomenon of Korean Sonorantization in Government Phonology. To save space in this paper, I will examine the analysis for some examples such as /pap+mul/→[pammul], /sip+li/→ [simni] and /čən+li/→[čəlli] within Government framework, and point out some problems within that theory.

4. The Analysis of Korean Sonorantization in GP

In the theory of segmental complexity in phonological government, where a segment occupying a governed position should be no more complex than its governor, the extreme case of segmental complexity is that of geminates, in which the governed stem-final position is of zero complexity having the same number of elements with the governing segments. The examples of Korean sonorantization show exactly the same case, since the governed stem-final consonants have the same number of elements with the governing segments.
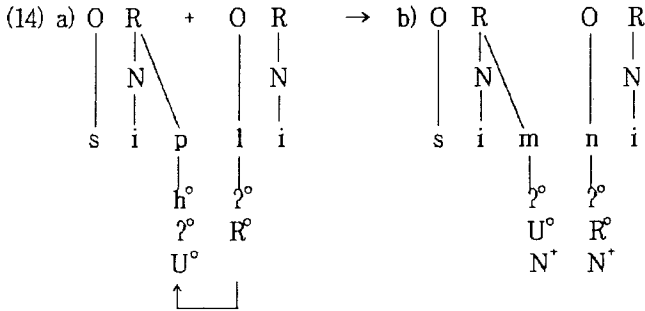
Given this, let us consider the case of /pap+mul/→[pammul], in which sonority assimilation occurs between stop and nasal. We can analyze it as in (13):

(13) a) O R   +   O R   →   b) O R   O R
         | |\ | |\ | |\ | |\
         | N\ | N\ | N\ | N\
         | | \ | | \ | | \ | | \
         p a p   m u l   p a m   m u l
               | | | |
               h^o $?^o$ $?^o$ $?^o$
               $?^o$ U^o U^o U^o
               U^o N^+ N^+ N^+
               └____┘

Here, the segments /p/ and /m/ are represented as shown in (13a) respectively, based on the elements of the internal representation of segments. The segment /p/ of /pap/ loses the h^o element under the assumption of one operation (i.e., decomposition) shown in (11b), and it gets N^+ element from the following segment /m/ by the operation of spreading and fusing (i.e., composition), thereby becoming m as shown in (13b).

This analysis, however, raises the question of why only peculiar elements are affected, and not some other elements. Specifically, it does not address why only h^o element is lost, nor does it explain why only N^+ element of the segment m of /mul/ is spread to the neighboring segment.

In the case of /sip+li/→[simni], on the other hand, we have another problem. According to Government Theory, it is not possible to replace an element in a consonant by another element not already present in the representation (Harris 1990: 256). The case of (14), however, is exactly such a case:

(14) a) O R   +   O R   → b) O R   O R
      | |\\ | | | |\\ | |
      | N \\ | N | N \\ | N
      | | \\ | |
      s i p l i   s i m n i

The diagrams (14a) and (14b) show autosegmental/element-geometry representations:

(14a): under p: h^o, $ʔ^o$, U^o; under l: $ʔ^o$, $Ʀ^o$; with a linking arrow from U^o

(14b): under m: $ʔ^o$, U^o, N^+; under n: $ʔ^o$, $Ʀ^o$, N^+

Here, this example shows that Korean sonorantization conforms with the Complexity Condition in (9). That is, in the lexical form of (14a), the segment /l/ cannot govern the preceding segment /p/, since /l/ is less complex than its governee /p/. Thus, to repair this ill-formed sequence, the segment /l/ gets N^+ element, thereby being realized as *n*, in the surface representation, as shown in (14b). The segment /p/ of /sip/ also is realized as *m*, losing h^o element and getting N^+ element. However, this case does not address how the segments /l/ and /p/ can have the N^+ element in the surface form in spite of the absence of that element in the neighboring segment.

Moreover, for the case of /čən+li/→[čəlli], we cannot explain why the decomposition applies rather than composition, differently from other cases of Korean sonorantization shown above.

(15) a) O R   +   O R   → b) O R   O R
      | |\\ | | | |\\ | |
      | N \\ | N | N \\ | N
      č ə n l i   č ə l l i

The diagrams (15a) and (15b):

(15a): under n: $ʔ^o$, $Ʀ^o$, N^+; under l: $ʔ^o$, $Ʀ^o$; with a linking arrow

(15b): under l: $ʔ^o$, $Ʀ^o$; under l: $ʔ^o$, $Ʀ^o$
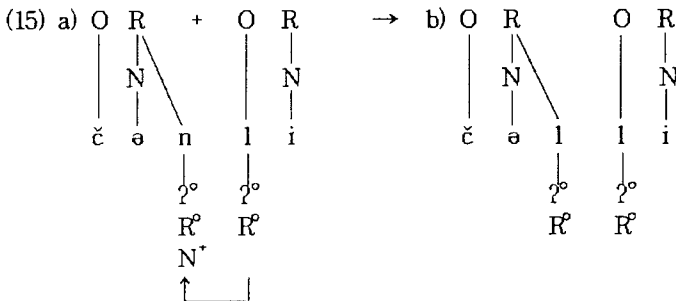
That is, in (15), the segment /n/ of /čən/ loses N^+ element under the operation of decomposition, giving l in the surface form. This process is exactly opposite from the case shown in (13), in which the preceding segment gets N^+ element from the following segment by the operation of spreading and fusing.

Thus, though composition and decomposition in (11) under the complexity theory of government in (9) provide a mechanism for deriving surface forms, they do not determine which elements of the segments are spread in composition or deleted in decomposition. Also, no mechanism provides for insertion of elements.

So far, I have presented the analysis for the phenomenon of Korean sonority assimilation in the Government Theory and I have pointed out some problems within this theory. Now let us turn to the proposed analysis to solve these problems.

5. The Proposed Analysis in the Extended Theory of GP

To address the problems surrounding segmental complexity, composition and decomposition outlined above, I propose to adopt Park & Michaels (1997)'s proposal which extended Government Phonology. Park & Michaels extend the lexical representations in Government Phonology along the lines of the Markedness account in Michaels (1989a, 1989b). According to them, alternating segments are represented by having unmarked or marked elements for the elements which alternate, while lexical representations of nonalternating segments are given having concrete elements (see also Michaels and Tiedeman 1986). This alternating segment is called a Pro-segment, which is similar to archisegments in earlier markedness approaches (Trubetzkoy 1969, Chomsky & Halle 1968). The unmarked and marked elements can be interpreted in two ways: by default interpretation (16) or structural interpretation (17) which are determined by governing relations, as shown in the following.
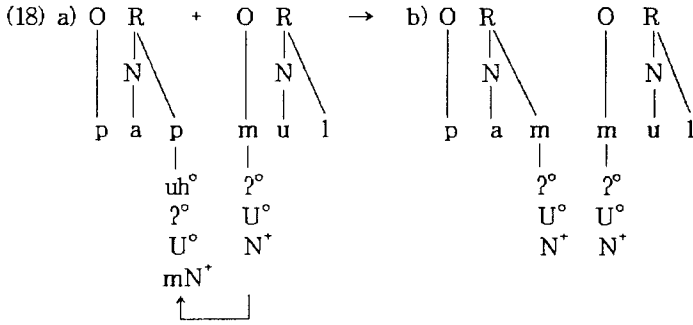
(16)   Default Interpretation
    a) A *marked* element can be realized phonetically by default
      if and only if it is in a governing position or governed position.
    b) An *unmarked* element can be realized phonetically by default
      if and only if it is <u>not</u> in a governing or governed position.

(17)   Structural Interpretation of u/m Element Values
    a) <[uE], [E]> = [E]
    b) <[mE], [E]> = [E]
   c) <[uE], [mE]> = [mE]

Here, for the operation in (17), the way of "move E(lement)" is used, borrowing the conception of movement rules from syntax (Chomsky 1991, Chomsky & Lasnik 1991). Movement rules account for the relation between the two positions. In phonology, movement is quite local, that is, between adjacent syllables, adjacent consonants or a consonant-vowel sequence where a property of a vowel in the lexical representation is interpreted on the adjacent consonant in the phonetic representation. When a specified element is moved into a structural relationship with an unmarked/marked element, we get the interpretation illustrated in (17), since u/m values are non-distinct from specified values.

    Given this, to address the question of how phonological processes of Korean Sonorantization occurs, elements that alternate in the examples in (1) are represented as unmarked or marked lexically in extended Government Phonology. Specifically, in the example of /pap+mul/ $\rightarrow$ [pammul] shown in (1a), the element h^o of the segment /p/ in /pap/ is represented as unmarked (i.e., uh^o), since the segment /p/ alternates with h^o. The segment /p/ is also represented as having the marked mN^* element, since /p/ becomes m in the surface form. It is illustrated in (18):

(18) a)

b)

In (18), the element uh^o of /p/ is not realized phonetically in the surface form under default interpretation (16b), since it is unmarked and is in a governed position. On the other hand, the element mN^+ of /p/ is realized as N^+ element phonetically under structural interpretation (17b), since /m/ of /mul/ moves the specified N^+ element to the marked mN^+ element of /p/. Thus /p/ of /pap/ is realized as m in the surface form, having $?^o$, U^o and N^+ elements.

When this segment /p/ is not in a governing relation as shown in (19), the unmarked uh^o element of /p/ is realized phonetically by default interpretation (16b), while its marked mN^+ element is not realized by (16a), thereby giving the well-formed surface form, *pap*, as follows:

(19) a)

b)
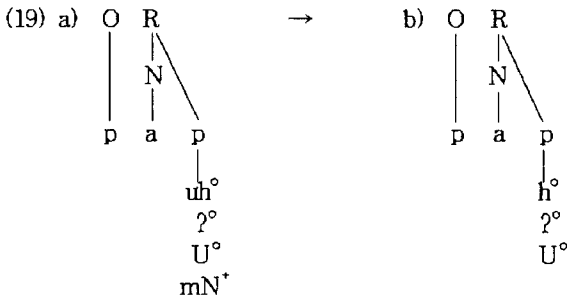
For other examples such as /kut+nin/ → [kunnin] and /kuk+mul/ → [kuŋmul] in (1a), where sonority assimilation occurs between stops and

nasals, the unmarked uh^o element and the marked mN^+ element are posited in the lexical forms as follows:

(20) a)
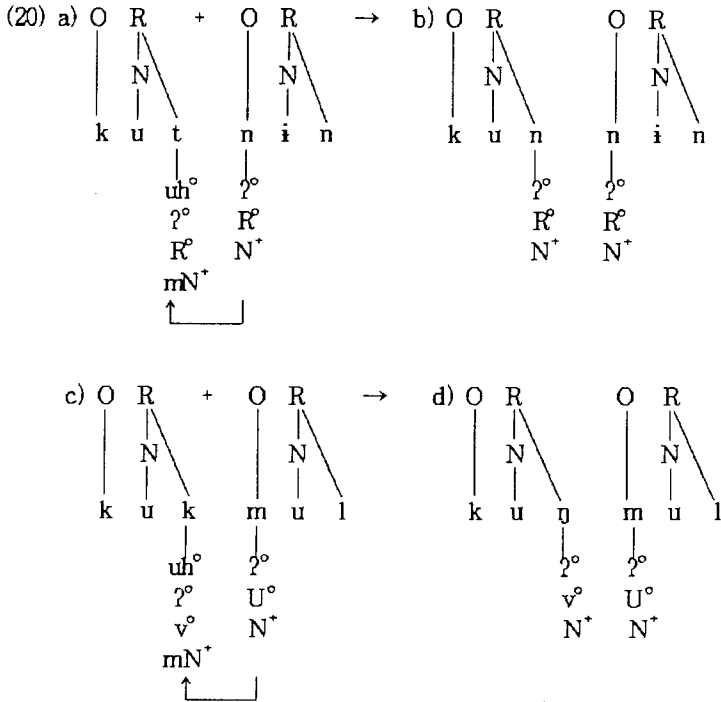
In governing relation between the two segments /t/ and /n/ of /kut+nin/ in (20a), the unmarked uh^o element of /t/ is not realized in the surface form by default interpretation (16b), whereas the marked mN^+ element of /t/ is realized as N^+ under structural interpretation (17b) with the specified element N^+ of the following segment n, thereby giving a well-formed surface form, [kənnin] in (20b). Likewise, in (20c), the unmarked uh^o element of /k/ is not realized phonetically by (16b), while its marked mN^+ element is realized as N^+ element by structural interpretation (17b), giving $ŋ$ in the surface form. The unmarked uh^o element of /t/ and /k/, on the other hand, is realized as h^o element in the surface form under no governing relation, as shown in (21):

(21) a)

```
    O   R   O    +    R         →      b)  O   R   O   R
    |   |   |         |\                    |   |   |   |\
    |   N   |         N \                   |   N   |   N \
    |   |   |         |   \                 |   |   |   |   \
    k   u   t         ɨ    n                k   u   t   ɨ    n
            |                                          |
            uhᵒ                                        hᵒ
            ʔᵒ                                         ʔᵒ
            Rᵒ                                         Rᵒ
            mN⁺
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```
 c)  O   R              →      d)  O   R
     |   |\                         |   |\
     |   N \                        |   N \
     |   |   \                      |   |   \
     k   u   k                      k   u   k
             |                              |
             uhᵒ                            hᵒ
             ʔᵒ                             ʔᵒ
             vᵒ                             vᵒ
             mN⁺
```
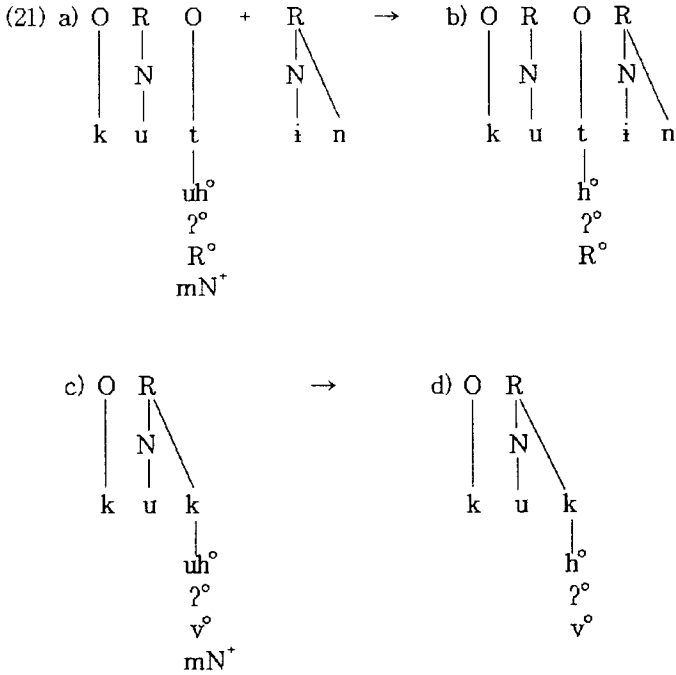
That is, since segments /t/ and /k/ are not in a governing or governed position in (21a) and (21c), the unmarked uh^o element is realized as h^o element by default interpretation (16b). On the other hand, the marked mN^+ element for those two segments is not realized phonetically by (16a), since there is no governing relation. Thus, we have well-formed surface forms, *kutin* and *kuk*, in this case.

Now, let us move on the case of sonority assimilation between stop and liquid. For /sip+li/ → [simni], the unmarked $uh^o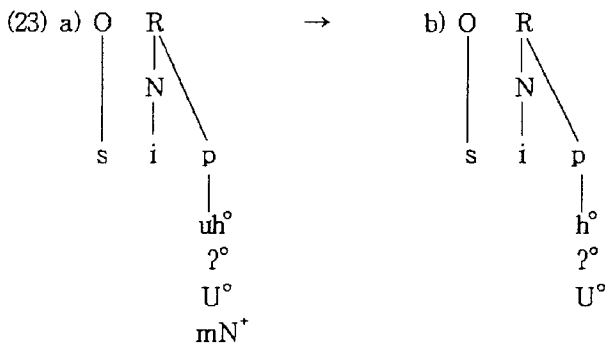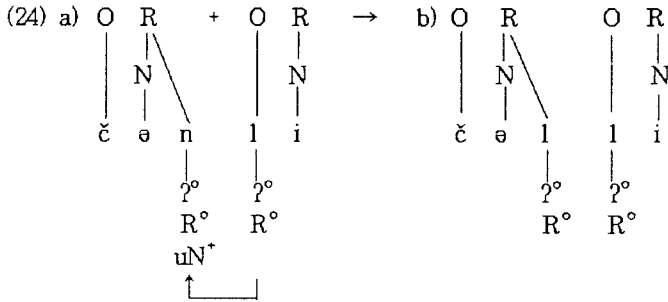$ element and the marked mN^+ element are posited in the segment /p/ lexically, since /p/ alternates with m in the surface form. For the segment /l/ of /li/, the marked mN^+ element is posited, as shown in (22):
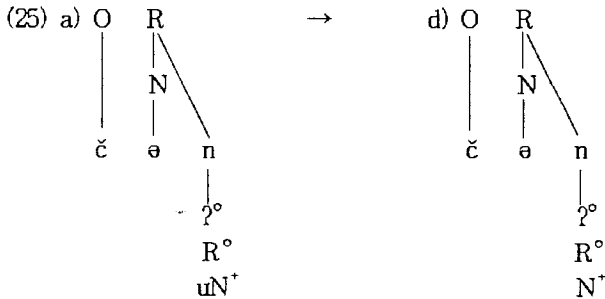
(22) a)

```
    O   R      +    O   R          →    b) O   R            O   R
    |   |\          |   |                  |   |\           |   |
    |   N \         |   N                  |   N \          |   N
    |   |  \        |   |                  |   |  \         |   |
    s   i   p       l   i                  s   i   m        n   i
            |       |                              |        |
           uh°     ʔ°                             ʔ°       ʔ°
           ʔ°      R°                             U°       R°
           U°     mN⁺                             N⁺       N⁺
          mN⁺
         ↑_____|
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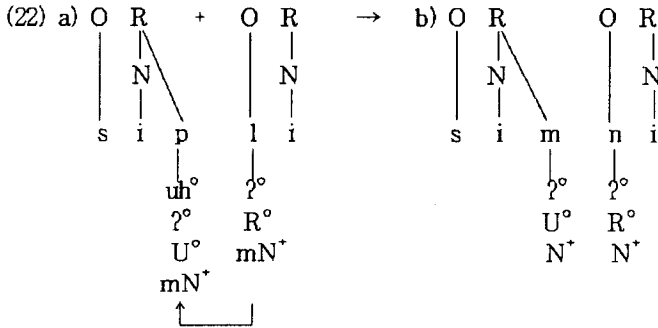
In (22a), /p/ and /l/ are in a governing relation, and hence their marked *mN*⁺ elements are realized as the element *N*⁺ by the default interpretation (16a), while the unmarked *uh*° element of /p/ is not realized phonetically by (16b). Thus, /p/ is realized as *m* in the surface form, having *ʔ*°, *U*° and *N*⁺ elements, while /l/ is realized as *n*, having *ʔ*°, *R*° and *N*⁺ elements. Under no governing relation, on the other hand, the unmarked *uh*° element and the marked *mN*⁺ element of /p/ are not realized phonetically by default interpretation (16), as shown in (23):

(23) a)

```
    O   R                 →      b) O   R
    |   |\                          |   |\
    |   N \                         |   N \
    |   |  \                        |   |  \
    s   i   p                       s   i   p
            |                               |
           uh°                             h°
           ʔ°                              ʔ°
           U°                              U°
          mN⁺
```

For the case of /čən+li/ → [čəlli], in which the sonority assimilation occurs between nasal and liquid, the unmarked *uN*⁺ element is posited in the segment /n/ of /čən/ as follows:

(24) a)

```
    O   R      +   O   R      →   b) O   R          O   R
    |   |\         |   |           |   |\          |   |
    |   N \        |   N           |   N \         |   N
    |   |   \      |   |           |   |   \       |   |
    č   ə   n      l   i           č   ə   l       l   i
            |      |                       |       |
            ʔ°     ʔ°                      ʔ°      ʔ°
            R°     R°                      R°      R°
            uN⁺
            ↑_____|
```
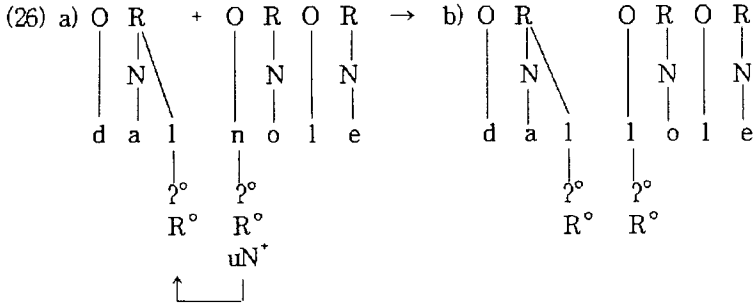
In (24), the unmarked uN^+ element of the segment /n/ cannot be realized phonetically by default interpretation (16b), since /l/ governs the preceding segment /n/ and unmarked element cannot be realized in a governing relation. Thus, /n/ is realized as *l* in the surface form, having $ʔ^o$ and R^o elements. This unmarked uN^+ element is realized as N^+ when /n/ is not in a governing relation as shown in (25):

(25) a)

```
    O   R              →   d) O   R
    |   |\                  |   |\
    |   N \                 |   N \
    |   |   \               |   |   \
    č   ə   n               č   ə   n
            |                       |
          ‒ ʔ°                      ʔ°
            R°                      R°
            uN⁺                     N⁺
```
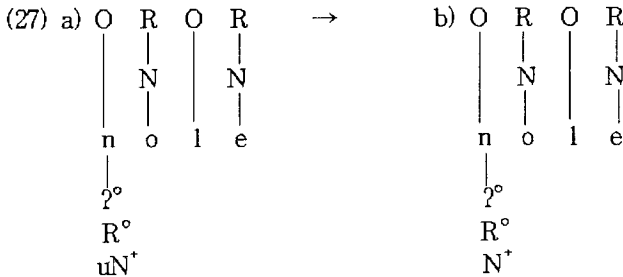
That is, there is no governing relation in (25), and hence the unmarked uN^+ element of /n/ is realized as N^+ element by (16b), producing the well-formed surface form *čən*.

Finally, let us consider the case of /dal+nore/ → [dallore], in which the sonority assimilation occurs between liquid and nasal. This case shows the progressive assimilation where the segment /n/ is assimilated to the preceding segment /l/. Since /n/ alternates with *l*, the unmarked uN^+ element is posited in /n/ lexically as follows:

(26) a) O R   + O   R   O   R   →   b) O   R   O   R   O   R

$\quad\quad$ d a l $\quad$ n o l e $\quad\quad\quad\quad$ d a l $\quad\quad$ l o l e

(with N elements, ?° and R° elements, uN⁺ element and governing relation shown in the diagram)

Since there is a governing relation between the two segments, /l/ and /n/, the unmarked uN^+ element of /n/ is not realized phonetically by default interpretation (16b). Thus, /n/ is realized as l in the surface form, having $?^o$ and R^o elements, as shown in (26b). However, this unmarked uN^+ element is realized as N^+ element under no governing relation, as shown in (27):

(27) a) O   R   O   R   →   b) O   R   O   R

$\quad\quad$ n   o   l   e $\quad\quad\quad\quad\quad$ n   o   l   e

(with N elements, $?^o$, R^o, uN^+ in a), and $?^o$, R^o, N^+ in b))

That is, the unmarked uN^+ element of /n/ is not realized phonetically by default interpretation (16b), since it is not in a governing relation. Thus, the segment /n/ is realized as n in the surface form, having $?^o$, R^o and N^+ elements.

5. Conclusion

In this paper, I have shown how phonological processes of Korean

Sonorantization can be analyzed within Government Phonology. By illustrating alternations for the phenomenon of sonority assimilation in Korean, I suggested that we adopt the Government Theory based on segmental complexity proposed by Harris (1990), who claims that any consonant sequence must satisfy certain complexity requirements. Analyzing the phenomenon of Korean sonority assimilation in this framework, several problems were highlighted. In order to solve the problems, I proposed to analyze the data for the phenomenon of Korean sonority assimilation based on the Extended Theory of Government Phonology. In this framework, by representing elements of segments involved in an alternation as marked or unmarked lexically, I have shown how the processing of this phenomenon occurs.

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