An Aspect of Sonorant Dissimilation in Takelma*

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Chung, Chin-Wan. (2013). An Aspect of Sonorant Dissimilation in Takelma. *The Linguistic Association of Korean Journal, 21*(4), 57-78. This study focuses on the dissimilation of coronal sonorants in Takelma prosodic words[1] and roots. The process involves multiple feature co-occurrence restrictions over a root and an affix boundary: sonorant, coronal, and nasal features. On the other hand, a less complex restriction is also observed in roots: a non-identical coronal feature restriction. It is argued that dissimilation is triggered by OCP-type constraints from the OT perspective. The selection of a segment for feature changes is achieved by the meta-constraint ranking (McCarthy and Prince 1995), which is inherently asymmetrical in nature. This study reveals that multiple feature co-occurrence restrictions force a change in a root segment; otherwise it is resistant to any featural change.

Key Words: Dissimilation, optimality, constraint, ranking, features

1. Introduction

Dissimilation refers to the process by which two identical or similar segments become less alike in terms of feature(s). Because the occurrence of two identical segments in a certain domain is prohibited in languages, one of the major ways to resolve such a situation is to change the features of the relevant segment. A general feature-changing rule like that of Chomsky and Halle (1968)

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1) We assume that a prosodic word of Takelma consists of a root/stem plus an affix.

was used in earlier rule-based approaches:

(1) [αF] → [-αF]/ ___[αF]

This rule was criticized because it did not point out a specific domain for the proper application of the rule. With the advent concepts such as the *Obligatory Contour Principle* (henceforth OCP: Leven 1973, Goldsmith 1976, McCarthy 1981), dissimilation was accounted for by the application of OCP, whose earlier concept has been extended to melodic sequences by McCarthy (1986: 208). The extended OCP is represented in (2).

(2) OCP: At the melodic level, adjacent identical elements are prohibited.

While an account for dissimilation with the OCP-based concept can provide a better explanation of the process (Yip 1988), such analysis still faces the problem of selecting which one of the two involved segments will undergo feature changes as noted by Myers (1997). He points out that an OCP based analysis of dissimilation designates one of the relevant segments or tone bearing units as the target of feature change but any formal statement of such change should clearly answer what decides segment or tone that should be delinked or left unparsed (Odden 1987: Yip 1988).

A similar problem also arises in any approach which employs underspecification and the OCP concept. This is because only a fully specified segment triggers a phonological process while an underspecified segment becomes the target of a process in the underspecification framework (Avery and Rice 1989). Since this is the case, it is very important to assume which segment is fully specified and which is not fully specified or underspecified in the analysis. This asymmetrical specification of the involved segments must be stipulated in the underlying representation but the norms that decide which segment is fully specified or underspecified must be determined.

The purpose of this paper is to provide a constraint-based analysis of sonorant dissimilation in Takelma (Sapir 1909, 1922 cited by Goodman 1992, and Lee 1991, 1994, 1996) without resorting to making stipulations or assumptions when explaining the dissimilatory examples in Takelma. We will use the

OCP-based constraints, which are accumulative in their evaluation, and argue that sonorant dissimilation in Takelma occurs to avoid segmental co-occurrence in roots and prosodic words. With respect to the selection of the target of the process, we argue that the target of feature change is chosen through the interaction of two conjoined feature co-occurrence constraints and relevant constraints drawn from the meta-constraint ranking proposed by McCarthy (1995): Faith-Root ≫ Faith-Affix. Unlike earlier analyses, we do not need to make any specific assumptions about the input representations in the constraint-based account.

The paper is structured as follows. Section 2 introduces the data for sonorant dissimilation in Takelma. Section 3 briefly discusses previous analyses and some problems they may face in their accounts. Section 4 provides an Optimality Theoretic analysis based on Prince and Smolensky (1993, 2004) and McCarthy and Prince (1995), and is followed by a brief summary of the analysis and its implications for phonology in section 5.

2. Data presentation

Before presenting the data for sonorant dissimilation in Takelma, we will first introduce the consonant and vowel inventory of the language. Takelma consonants and vowels are listed in tables (3) and (4), respectively.

(3) Takelma consonants (Sapir 1922 cited by Goodman 1992, and Lee 1991, 1994)

	Labial	Coronal +Ant	Coronal -Ant	Velar
Stops: Plain	p	t		k
Asp.	p^h	t^h		k^h
Glott.	p’	t’		k’
Affricates		ts’	(tʃ’)	
Fricatives		s	(ʃ)	x
Liquid		l		
Nasals	m	n		
Glides	w	y		

(4) Takelma vowels

i, ii		u, uu
e, ee		o, oo
	a	

Diphthongs: V+i,u

The sonorant dissimilation examples in Takelma are divided into two major groups, which are based on the morphological categories: prosodic words and roots. This division also reflects two different feature co-occurrence restrictions between the two categories because a stricter featural restriction is required in prosodic words while a less rigid featural co-occrrence is applied to roots. The first set of examples is also sub-divided into three groups depending on the nature of feature change in the so-called noun characteristic suffix.

In the first sub-group of sonorant dissimilation, the noun characteristic suffix /-Vn/, which appears after a root including an /l/ ending or inside of the root, changes into [-Vm] as observed in (5A) and (5B). In these examples, a segment which has undergone a featural change is bold-faced. All the examples are drawn from Sapir (Sapir 1922 cited by Goodman 1992 and Lee 1991, 1994).

(5) Noun charateristic suffix /-Vn/ → [-Vm] when preceded by an adjacent or long-distance root /l/

(A) Adjacent /...l+Vn/ sequences

a. /hel+Vn/	→	[hela**m**]	'board'
b. /kel+Vn/	→	[kela**m**]	'river'
c. /tʃ'el+Vn/	→	[tʃ'ele**m**]	'hail'
d. /tʃ'ul+Vn/	→	[tʃ'ulu**m**]	'wart'
e. /hapil+Vn/	→	[hapili**m**]	'empty'
f. /yul+Vn/	→	[yulu**m**~yula**m**]	'eagle'
g. /kul+Vn/	→	[kulu**m**]	'oak'

(B) Non-adjacent /l(V)C+Vn/ sequences

a. /lap^h+Vn/	→	[lap^{h}a**m**]	'frog'
b. /lek+Vn/	→	[leke**m**]	'kidney'
c. /lox+Vn/	→	[loxo**m**]	'manzanita'
d. /tolk^h+Vn/	→	[tolk^{h}a**m**]	'anus'

Takelma dissimilation is involved only with sonorant consonants, /m, l, n/. When a root contains a coronal sonorant and is followed by the noun characteristic suffix /-Vn/, the coronal nasal in the suffix changes into [m] in the output. By undergoing this change, the coronal sonorant co-occurrence restriction in the prosodic words can be avoided as in (5A) and (5B).

In the second sub-group of sonorant dissimilation, when a root contains a nasal /m/ and is followed by /-Vn/, the coronal nasal in the suffix changes to [l]. The featural change in the suffix in the second sub-group is interesting in that the /m/ in the root and the /n/ in the suffix do not violate the coronal sonorant co-occurrence restriction, but the change still occurs in the suffix. This is because there is another sonorant restriction in the prosodic words: nasals over a root and suffix boundary are prohibited in Takelma. In order to conform to this additional restriction, the /n/ in the suffix is forced to change to [l] in the output, satisfying both coronal and nasal co-occurrence restrictions in the prosodic words as shown by the example in (6).

(6) Noun characteristic suffix surfaces as [-Vl] after a root containging [m] (Sapir 1922:227 cited by Lee 1994)

a. /tʃ'am+Vn/	→	[tʃ'ama**l**]	'mouse'
b. /ʃim+Vn/	→	[ʃimi**l**]	'dew'
c. /meh+Vn/	→	[mehe**l**]	'basket for cooking'
d. /soom+Vn/	→	[sooma**l**]	'mountain'
e. /toom+Vn/	→	[tooma**l**]	'testicles'

The final sub-group of examples is also intriguing because sonorants in both a root and an affix undergo featural changes. This occurs when a root contains a coronal nasal /n/ and is followed by the suffix /-Vn/. To dodge two sonorant restrictions, coronal and nasal co-occurrence, the suffix /n/ changes to [m] while the root /n/ changes to [l]. This is shown by the examples in (7). The examples in (7) show a different aspect of dissimilation from the data in (5) and (6) because a segment in a root is generally immune to a featural change while a segment in an affix is the usual target (cf. McCarthy and Prince 1995; Chung 2013).

(7) The noun characteristic suffix surfaces as [-Vm], root /n/ dissimilates to [l]

a. /k^wan+Vn/ → [k^wa**l**a**m**] 'road'(cf. [k^wan] absolutive)

b. /xan+Vn/ → [xa**l**a**m**] 'urine'(cf. [xan] absolutive)

In the second major group of examples for Takelma sonorant dissimilation in roots, there is only one co-occurrence restriction in play: a coronal place of articulation of sonorants.2) Furthermore, the restriction is confined to non-identical coronal sonorants. Thus, non-identical coronal combinations such as *lVn* and *nVl* are not allowed while identical coronal sonorants such as *lVl* and *nVn* combinations freely occur in Takelam roots. In the following examples, co-occurrence restrictions in roots are implemented as a part of *Morpheme Structure Constraints* such that roots with unallowable sonorant combinations do not occur in Takelma as shown in (8).

(8) Sonorant co-occurrence restrictions in roots

a. /tan/	→	[tan]	'rock'
b. /tel/	→	[tel]	'yellow-jacket'
c. /ʃin/	→	[ʃin]	'wood coals'
d. /maan-/	→	[maan]	'count'
e. /mena/	→	[mena]	'bear'
f. /mel/	→	[mel]	'crow'
g. /luul-i-(t^hk^h)/	→	[luul-i-(t^hk^h)]	'(my) throat'

As presented in (8a-c), the combinations of a coronal obstruent and sonorant within a root are allowed in Takelma. Unlike the dissimimilation in prosodic words, two nasals within a root are permitted. Interestingly, identical coronal sonorants can occur in a root as in (8g) while non-identical coronal sonorants are prohibited in Takelma roots. Thus, co-occurrence restrictions of sonorants in roots are less stringent than those in prosodic words.

As we have explained in this section, sonorant dissimilation in Takelma has to do with three different co-occurrence restrictions in prosodic words: coronal,

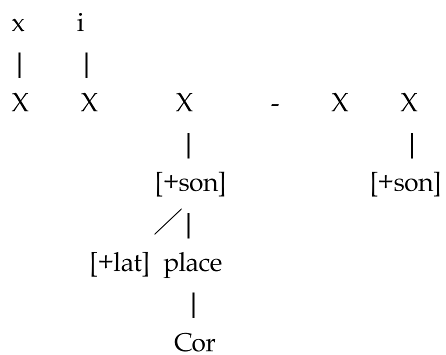
2) Readers are also referred to Suzuki (1998) for specific types of dissimilation cross-linguistically, Gallagher (2010) for various types of laryngeal dissimilation and Chung (2013) for asymmetrical target of feature changes in dissimilation.

sonorant, and nasal. In terms of featural change, the language reflects a general pattern of dissimilation where a segment in an affix undergoes a featural change. An unusual case of dissimilation also occurs where a root segment also undergoes a featural change under the duress of three different co-occurrence restrictions in prosodic words. In the root, however, exclusive restrictions such as the ban on non-identical coronal sonorants are active. Thus, there is only one common denominator between prosodic words and roots in terms of their dissimilatory factor: sonorants. In the next section, we briefly reviews previous analyses of Takelma dissimilation.

3. Previous Analyses

In this section, we briefly review some earlier analyses of Takelma dissimilation and point out problems the previous studies may face. First, we will discuss an analysis of Lee (1994), which is based on underspecification and OCP (McCarthy 1986). Based on Lee (1991), Lee (1994) argues that coronal sonorant dissimilation in prosodic words is invoked by a segment in a root and a segment in an affix undergoes a featural change when two coronal sonorants are juxtaposed over a morpheme boundary. Lee assumes that the coronal sonorant in the root is fully specified while the one in the affix is underspecified in order for the fully specified segment to trigger dissimilation, as illustrated in (9).

(9) the underlying representation of /xil-an/→[xil-am]
'sick, ghost'



In order to explain coronal sonorant dissimilation, Lee proposes three scan procedures which consist of checking the adjacency of relevant segments and two sets of default rules: one for a place tier and the other for a manner tier as presented in (10b-c), which are crucially ordered.

(10) a. Scan the root node: if adjacent [+son] features, then
b. Scan the place tier:
fill in the unspecified values with
default: [ø Place]→[COR]
[ø Place]→[LAB]
c. Scan the manner tier:
fill in the unspecified value with
default: [ ]→[+nas]
[ ]→[+lat]

Lee explains that the surface segment for the suffix is [m] as a result of applying the second default filling in rule in the place tier. If the first default were applied, the surface segment would be [n], which violates the OCP-COR. Thus, its application is blocked. In the case of dissimilation where the affix /-Vn/ changes to [-Vl] when it occurs after a root ending with /m/, such as in the examples presented in (6), Lee modifies the OCP as given in (11).

(11) Modified OCP: Make the melodies maximally different (Lee 1994:530)

Based on (11), Lee expounds that the featural change from /n/ to [l] in /soom-an/→[soom-al] 'mountain' is the result of applying the second filling-in default rule in the manner tier. The first default in the manner tier is blocked because the application of the rule will create an output that violates the modified OCP due to the similarity of the nasals in the output.

For the final case of dissimilation where each segment in the affix and root undergoes featural changes such as in the examples presented in (7), the application of the first default in (10b) to an affix is blocked by the OCP because the segment in the root is specified for [COR]. Thus, the second default is applied resulting in [m] with a labial feature in the output. On the other hand, the segment in the root which is only specified for the place feature coronal, surfaces as in [l] because the application of the second default in (10c) is blocked due to (11). Based on the procedures presented in (10) and the modified OCP, Lee (1994) accounts for sonorant dissimilation in Takelma.

Lee's analysis seems to account for Takelma sonorant dissimilation. However, her analysis may prove faulty. In order to account for the sonorant dissimilation in Takelam, Lee (1994) assumes that a segment in the affix is underspecified while a segment in the root is fully specified so that the fully specified segment can tacitly decide the surface feature representation of the affix by the application of the possible default. A critical problem in such an assumption is that there are no specific grounds for the asymmetrical feature specification for different morphological categories as pointed out by Myers (1997) who states that any formal statement of such an assumption should address its solid motivation.

A second earlier analysis of sonorant dissimilation in Takelma is an analysis by Goodman (1992). Goodman adopts the rules for dissimilation used by Odden (1987), who claims that the first step for dissimilation is to delink a feature or node and is followed by the insertion of a default value into the segment that is deprived of its feature by delinking a feature. Goodman also assumes that the application of OCP is defined on the coronal and nasal tiers whose application to segment sequences is given in (12).

(12) Statement of the OCP for Takelma
  a. *[coronal][coronal]; condition: [α sonorant]
  b. *[nasal][nasal]

According to (12a), the OCP-COR is applicable when the adjacent coronal consonants have the identical feature value for [sonorant]. Thus, if two coronal segments do not have the identical value for [sonorant], the OCP does not apply. The second statement calls for the ban on the sequence of two [nasal] specifications where the condition [α sonorant] is vacuously implied. Unlike underspecification analysis of Lee (1994), Goodman assumes that underlying segments are featurally specified in the sense of Clements (1985) and Sagey (1986). Since underlying segments are specified for their features, dissimilation in Takelam is accounted for by an operation in which the second coronal sonorant is delinked. This operation then uses the following rule in cases where the suffix /n/ is realized as [m] in the output.

(13) [ø Place]→[Labial]

After these steps, the example like /hel+Vn/ is realized as [hel-a**m**] 'board' which avoids the sequence of two adjacent coronal sonorants in Takelma. In an example which ends with /m/ in the root, the identical operation delinks the second nasal feature specification (nasal dissimilation), which results in the following structure without the nasal feature. Goodman assumes that the following is the representation of [l] in Takelma:

(14)
```
      X
      |
   [+son]          =[l]
      |
      •     Place
      |
     Cor
```

With this example, Goodman explains nasal dissimilation as in /ʃim+Vn/→[ʃimi**l**] 'dew.' Concerning a case where segments in the root and affix both undergo change to avoid two different co-occurrence restrictions as explained in (12), Goodman applies coronal dissimilation (12a) first in which the coronal feature of the affix segment is delinked and a labial feature is inserted by (13) resulting in the second intermediate form /k^wan+Vn/→ k^wana**m** →[k^wa**l**a**m**] 'road.' Since the second form still violates *[nasal][nasal], the nasal feature specification in the root is delinked, but it is not followed by any filling-in rule, resulting in [l] by (14) in the output. The derived output form does not run against the two OCP statements in (12) anymore.

Like the underspecification approach by Lee (1994), Goodman's account is also trapped in the same problem. That is, when two nasals occur over morpheme boundaries, the target nasal is chosen without providing a specific reason. However, an equally well-formed intermediate form (k^wa**m**an) could have been utilized if the first nasal had been chosen for the target of delinking and inserted according to the labial feature specification in terms of avoiding the statement given in (12a). This question should have been dealt in their analysis.

Lastly, we will discuss Lee's (1996) analysis, which is based on underspecificaion and OT framework. The theoretical framework for the analysis is OT but Lee still assumes that a nasal in the root is fully specified while the one in the affix is underspecified. Based on this asymmetrical representation of the nasals, she proposes four different constraints which are ranked as follows:

(15) *COR COR ≫ *MAN MAN ≫ ParseFeat ≫ InsertFeat

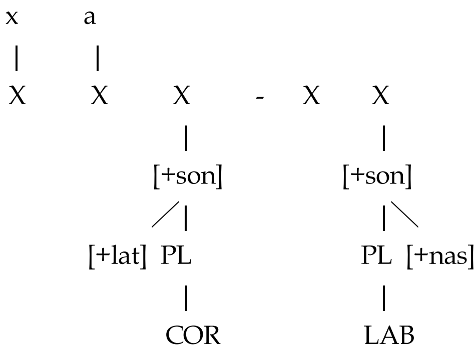
For example, the input form /xan-an/ 'urine' has the following underlying representation:

(16) input /xan-an/

```
x      a
|      |
X      X      X    -   X     X
              |              |
           [+son]         [+son]
              |
              PL
              |
             COR
```

The optimal output that is harmonic with the constraint ranking given in (16) is presented in (17).

(17) output [xal-am]



The output form in (17) satisfies two OCP constraints *COR COR and *MAN MAN and the faithfulness constraint ParseFeat while it violates InsertFeat three times because three feature specifications such as [+lat], LAB, and [+nas] are inserted. It seems that the given ranking explains this case of dissimilation in Takelma. However, there are some problems in this analysis. A crucial problem is that the input form has an asymmetrical representation between a root and an affix segment, which is a specific condition assumed for the input. This is against OT's Lexicon component, which provides input specifications and an attribute specifying that no particular property can be stated at the level of underlying representation, which is termed *Richness of the Base* (Prince and Smolensky 2004: 205; Kager 1999:19)

(18) Richness of the Base: no constraints hold at the level of underlying forms.

Without Lee's assumption for the different representation for the nasals appearing in different morphological categories, the given constraint ranking may not select the correct output form. If two nasals are equal in terms of representation, either of the two nasals can undergo a change due to the specific epenthetic featural specification in the sense of Lee (1996). Thus, both output forms such as [xa**l**a**m**] and [xa**m**a**l**] will be selected as optimal for the input /xan-an/ 'urine.'

So far we have briefly reviewed previous analyses of Takelma dissimilation but none of them are satisfactory due to their specific assumptions about the underlying representation and selection of a target that undergoes featural changes. In the next section, we will provide a constraint-based account in which no specific assumptions are made for the underlying representation. The choice of target of dissimilation naturally falls from the asymmetrical faithful ranking between Root and the affix (McCarthy and Prince 1995).

4. A Constraint-based Analysis

In this section, we will provide an account, which is based on constraints and their ranking. The analysis in this paper is different from those we discussed in the previous section in that no assumptions or conditions are made for the underlying representation. We first propose OCP-type constraints to show why one of the related segments undergoes a featural change. Though OCP-related constraints bring about dissimilation, they do not designate the target of the process. This will be achieved by the meta-constraint ranking proposed by McCarthy and Prince (1995): Faith-Root ≫ Faith-Affix. This constraint ranking naturally selects a segment in an affix to change its feature if segments in both the Root and affix share identical feature specifications. Since Takelma dissimilation is involved with several different features, the relevant OCP-type constraints are employed to explain dissimilation occurring in prosodic words.

(19) Dissimilation triggering constraints for Takelma
  a. *Son-Son: Two sonorant consonants are not allowed in the output.
  b. *Cor-Cor: Two coronal consonants are not permitted in the output.
  c. *Nas-Nas]$_{PrWd}$: Two nasals are not allowed in prosodic words.

Each OCP-type constraint presented in (19) requires a different feature co-occurrence restriction in the output. Among the three constraints, the first feature sonorant must be represented in the coronal segments and redundantly present in nasals. Since this is the basic requirement for Takelma dissimilation, we then combine (19a) and (19b) into a conjoined constraint (cf. Alderete 1997) as given in (20).

(20) *Son-Son & Cor-Cor

In order to violate this conjunctive constraint, an output must contain two consonants which have both sonorant and coronal feature specifications; otherwise, the output does not violate the constraint.

The constraint given in (19c) is different from the other two in (19) because *Nas-Nas]$_{PrWd}$ prohibits the occurrence of two nasals in the prosodic words while (19a) and (19b) do not discern any morphological categories in their application. The OCP-type constraints in (19c) and (20) force featural changes in the output, which can be understood as causing dissimilation. However, the violation of such constraints can be circumvented if any of the relevant segments changes its features to become dissimilar with the other consonant. That is, the constraints do not target a particular segment. The designation of a target segment for feature change follows from the meta-ranking proposed by McCarthy and Prince (1995).

(21) Faith-Root ≫ Faith-Affix

The meta-ranking in (21) is asymmetrical because faithfulness priority is given to a root. If this is implemented, a natural target of feature change boils down to a segment in an affix.

For the proposed constraints, *Nas-Nas]$_{PrWd}$ and Faith-Root are ranked highest in the analysis and they do not show any particular ranking between them. The conjunctive constraint is ranked higher than Faith-Affix, which is ranked lowest in the analysis indicating that a segment in the affix may unfaithfully map onto its correspondent in the output. This ranking is important because if the ranking between them is reversed, no featural change can occur in the affix, which implies that the dissimilation triggering constraint does not play a role and the output most faithful to the input will be selected as optimal.

Based on the constraints and their ranking, we will first explain a dissimilation case in which a noun characteristic suffix /-Vn/ is realized as

[-Vm] when preceded by a coronal lateral /l/ in a root.

(22) /hel+Vn/ → [helam] 'board'

/hel+Vn/	*N-N]$_{PrWd}$	F-Rt	*S-S & C-C	F-Afx
a. helan			*!	
b. heman	*!	*!		
☞ c. helam				*
d. hemal		*!		*

As in (22), candidate (a) which is faithful to the input is ruled out due to its violation of the conjoined constraint. Changing the feature of a coronal lateral in the root is unsuccessful because it results in the violation of a high-ranking Faith-Root as shown in (22b) and (22d). Furthermore, candidate (b) also violates *Nas-Nas]$_{PrWd}$ so a change of the coronal lateral to the labial nasal proves to be futile. Thus, the best way to dodge the co-occurrence restrictions for sonorant coronals in the output is to change a coronal nasal in the affix to a labial nasal as in candidate (c).

The next set of examples contains two nasals in the input and if they appear in the output without undergoing any change in their feature, the examples violate the highest-ranking *Nas-Nas]$_{PrWd}$. As shown in (23d), in order to elude the violation of this constraint, a nasal segment in the affix changes into a lateral at the cost of violating the Faith-Affix constraint. This is represented in the following tableau.

(23) /meh+Vn/ →[mehel] 'basket for cooking'

/meh+Vn/	*N-N]$_{PrWd}$	F-Rt	*S-S & C-C	F-Afx
a. mehen	*!			
b. lehen		*!	*	
c. lehem		*!		*
☞ d. mehel				*

Now the most interesting aspect of sonorant dissimilation in Takelma is observed in the examples given in (7). In such examples, multiple featural co-occurrence requirements induce changes not only in the segment in the affix but also in the root. This is a peculiar case of dissimilation because the target of dissimilation is generally confined to a segment in the affix as opposed to a segment in the root. This is clearly reflected in the meta-constraint ranking given in (21). Since this complex case of dissimilation occurs in Takelma, the constraint ranking we have employed so far may not explain the examples in (7).

(24) /xan+Vn/ →[xalam] 'urine'

/xan+Vn/	*N-N]$_{PrWd}$	F-Rt	*S-S & C-C	F-Afx
a. xanan	*		*!	
✂ b. xanam	*			*
✂ c. xamal		*		*
☞ d. xalam		*		*
e. xamam	*!	*		*

As represented in (24), the current constraint ranking selects three candidates (b), (c), and (d) as optimal. In fact, the actual optimal form is (24d). In order to eliminate incorrect optimal forms, we need to decompose Root-Faithfulness into two: Faith-Root (Place) and Faith-Root (Manner). Concerning ranking, Faith-Root (Place) dominates Faith-Root (Manner) because the feature change in the root segment occurs only with the manner of the segment while maintaining the place feature.

With respect to the ranking relationships, Faith-Root constraints are ranked higher than the Faith-Affix constraint. To be more specific, Faith-Root (Place) is ranked highest along with *Nas-Nas]$_{PrWd}$, Faith-Root (Manner) is ranked lower than the conjoined constraint, and Faith-Affix is ranked lowest as illustrated in (25).

(25) /xan+Vn/ →[xalam] 'urine'

/xan+Vn/	*N-N]$_{PrWd}$	F-Rt (Pl)	*S-S & C-C	F-Rt (Ma)	F-Afx
a. xanan	*!		*		
b. xanam	*!				*
c. xamal		*!			*
☞ d. xalam				*	*
e. xamam	*!	*!			*
f. xanal			*!		*

The sub-divided constraints and the new constraint ranking given in (25) rule out candidates (b) and (c), which were competing with the optimal form (d) in the previous tableau. Candidate (b) is eliminated by the highest ranking *Nas-Nas]$_{PrWd}$. Candidate (c) avoids the violation of *Son-Son & Cor-Cor by changing features in both root and affix segments, but it is still inferior to candidate (d), which also has two featural modifications in the same morphological categories. This is because candidate (c) violates the highest-ranking Faith-Root(Place) while (d) satisfies it. Thus, candidate (d) is the optimal output in (25). The modified constraint ranking we use for the account of Takelma sonorant dissimilation is given in (26).

(26) *Nas-Nas]$_{PrWd}$, Faith-Root(Place) ≫ *Son-Son & Cor-Cor ≫
Faith-Root(Manner) ≫ Faith-Affix

The new constraint ranking in (26) can also account for the dissimilation examples we explained with the constraint ranking given in (22-23). The following tableau with the new ranking demonstrates one of the examples from (5A) in section 2.

(27) /hel+Vn/ →[helam] 'board'

/hel+Vn/	*N-N]$_{PrWd}$	F-Rt (Pl)	*S-S & C-C	F-Rt (Ma)	F-Afx
a. helan			*!		
b. heman	*!	*!		*	
☞ c. helam					*
d. hemal		*!		*	*

Unlike some earlier studies of Takelma sonorant dissimilation, we can explain the dissimilation examples with several constraints and their ranking without making any conditions or assumptions for underlying representations. Markedness constraints such as OCP-type constraints trigger dissimilation while the target of dissimilation is designated by the meta-constraint ranking. Interestingly, multiple feature co-occurrence constraints force featural changes in a root segment as well as an affix segment. This is intriguing if we consider the strong tendency of meta-constraint ranking between affixes and roots. As a matter of fact, if a language is involved only with a single feature co-occurrence restriction, the target of dissimilation is generally limited to an affix segment as can be observed in Georgian, Sundanese, Manipuri, and Tashlhiyt Berber (Odden 1994, 2005; Bye 2011; Chung 2013). On the other hand, if multiple OCP constraints play an important role in a language, Faith-Root, a component constraint in the meta-constraint ranking, can be violated as in the dissimilation of Takelma prosodic words.

The OT analysis of the dissimilation in Takelma prosodic words provided in this study is much more inclusive than previous accounts in that the constraint ranking given in (26) can account for feature co-occurrence restrictions occurring in Takelma roots. We can also assume that if two identical segments in roots are doubly linked as in the sense of autosegmental phonology (Goldsmith 1976). By using this assumption, two identical coronal sonorants in Takelma such as /1..l/ and /n..n/ satisfy the conjunctive constraints. As we briefly introduced in section 2, coronal consonant combinations of an obstruent plus a sonorant are allowed in Takelma. On the other hand, non-identical coronal sonorants are disallowed. Concerning nasal consonants, two nasals are allowed in roots, but two nasals cannot occur in prosodic words, which may denote that the constraint such as *Nas-Nas]$_{Root}$ is ranked so low that its effect is invisible in Takelma. Thus, the constraint ranking for sonorant dissimilation of Takelma prosodic words can be applied to roots and it can explain why non-identical coronal sonorants do not appear in Takelma roots as illustrated in (28).

(28) a. /mena/ →[mena] 'bear'

/mena/	*N-N]$_{PrWd}$	F-Rt (Pl)	*S-S & C-C	F-Rt (Ma)	*N-N]$_{Rt}$
☞ a. mena					*
b. mela				*!	
c. lena		*!	*	*	
d. mema		*!			*

b. /luul/ → [luul] 'throat'

/luul/	*N-N]$_{PrWd}$	F-Rt (Pl)	*S-S & C-C	F-Rt (Ma)	*N-N]$_{Rt}$
☞ a. luul					
b. luum		*!		*	
c. muul		*!		*	
d. luun			*!	*	
e. nuul			*!	*	

As presented in (28a), candidates (c) and (d) are eliminated by their violation of Faith-Root(Place), which is the highest-ranking. Candidate (b) is also eliminated due to the violation of Faith-Root(Manner) because it satisfies the lowest-ranking *Nas-Nas]$_{Rt}$ at the cost of violating the higher ranked Faith-Root(Manner). Thus, candidate (a) emerges as optimal, which only incurs a violation of *Nas-Nas]$_{Rt}$.

(28b) illustrates that two identical sonorant consonants in candidate (a) satisfy all the given constraints including the conjoined constraint. The other candidates are suboptimal due to their violation of the highest ranking faithfulness constraint as in (b) and (c), while (d) and (e) having non-identical sonorant coronals are eliminated due to the conjunctive constraint. The tableaux in (28) show that any change of a root induces a violation of either a markedness or faithfulness constraint, which in turn proves to be fatal in evaluation. So the constraint ranking in (28) can explain the non-occurrence of *lVn and *nVl, which are considered static co-occurrent restrictions in Takelma roots. The newly included constraint, *Nas-Nas]$_{Rt}$, does not have any significant effect if it is used in prosodic word dissimilation because of its low-ranked status. The overall constraint ranking in Takelma sonorant dissimilation is presented in (29).

(29) *Nas-Nas]$_{PrWd}$, Faith-Root(Place) ≫ *Son-Son & Cor-Cor ≫ Faith-Root(Manner) ≫ Faith-Affix, *Nas-Nas]$_{Rt}$

5. Conclusion

In this study, we have provided a constraint-based account of sonorant dissimilation in Takelma. It is argued that co-occurrence restrictions such as coronal sonorants and two nasals in Takelma prosodic words is induced by two markedness constraints: *Nas-Nas]$_{PrWd}$ and *Son-Son & Cor-Cor. The target of featural modifications is determined by the asymmetrical meta-ranking constraint by McCarthy and Prince (1995), in which we subdivided Faith-Root into Faith-Root (Place) and Faith-Root (Manner). By proposing these constraints and their ranking, we do not have to face problems raised in earlier accounts such as the designation of the target segment for feature changes (cf. Myers 1997) because dissimilation and the target segment of feature changes all follow from constraint rankings. The OT analysis in this study is a more comprehensive explanation of sonorant dissimilation in Takelma prosodic words and roots than previous analyses (Lee 1991, 1994, 1996; Goodman 1992).

There are several implications of this study. First, a feature change in dissimilation is not confined only to one feature but it is possible that multiple features can be involved in dissimilation. Second, one of the major component constraints in McCarthy and Prince's meta-constraint ranking Faith-Root can be sub-divided into Faith-Root (Place) and Faith-Root (Manner), which also can be ranked differently. Third, dissimilation in prosodic words and roots shows a different aspect in terms of feature change and co-occurrence restrictions. That is, dissimilation in prosodic words is constrained by more complex feature co-occurrence conditions while less complex feature co-occurrence restrictions are applied to roots. Finally, it is possible that if multiple OCP-type constraints are involved, segments in roots also undergo changes, and generally maintain their features when roots and affixes are involved in dissimilation.

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