Case Studies in Glides*

Ponghyung Lee
(Taejon University)

Ponghyung Lee. 1999. Case Studies in Glides. *Studies in Phonetics, Phonology, and Morphology* 5, 147-170. This is an attempt to confirm the typological distinction among glides by conducting a couple of case studies in Korean, English, and Spanish. The result of these studies lends support to the plausibility of analytic devices provided by Optimality Theory in explicating the typological distinction among glides. **(Taejon University)**

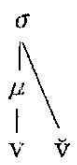
Keywords: glides, typological distinction, case studies, Optimality Theory

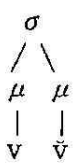
1. Introduction

The exhaustive list for glides which appear cross-linguistically is illustrated below:

(1) a. post-vocalic glides:

i. 

ii. 

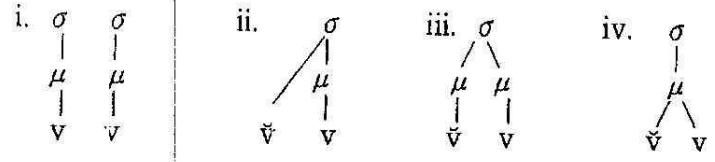
iii. 

iv. 

---

*This study is the sequel of my project on the typology of glides, the first half of which will appear at *Korean Journal of Linguistics* soon. I assume all the assumptions and analytic apparatuses used there. This paper was prepared during the stay at University of Massachusetts, Amherst from July 1997 to June 1998, where I was much benefitted from John McCarthy. Part of this study was presented at Kemyung University and Cheju University. I appreciate all the participants out there.

b. pre-vocalic glides:



The primary strength of Optimality Theoretic approach shows up in the proper prediction of factorial typology concerning phonological phenomena Regarding glides, permutation among given universally valid constraints prove to be beneficial to account for the systematic variations among languages (For the detail, refer to Lee (forthcoming)). In the following, I will investigate Korean, English, and Spanish and demonstrate the plausibility of constraint-based machinery to predict the glide types involved with each language.

For the purpose, the following constraints are relevant to our discussion.

(2) Relevant Constraints

a. ONSET (ONS): Onsetless syllables are prohibited.

b. *(μ μ)V: Long vowels are prohibited

c. *V-to-σ: A vowel directly associated into a syllable node is prohibited.

d. NORH: Prosodic units with right head are prohibited.

e. *DIPHTHONG : Diphthongs are prohibited.

f. MAX-μ : Underlying moras are preserved.

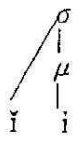
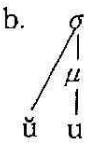
2. Korean

2.1 Characterization of Korean Glides

In this section, I will investigate Korean on-glides and argue that Korean belongs to **type (biv)**, thereby on-glides comprise co-moraic nucleus. The first evidence to put forward this idea is as follows: Korean lacks the sequences */yi/, */wu/, among rising diphthongs. We can attribute the absence of the sequences to the ill-formedness of the configuration, as illustrated in (3):

(3) a. i.  ii.  b. i.  ii. 

The preference of (3a.ii) and (3b.ii) to (3a.i) and (3b.i) is warranted by OCP, thereby two identical vowels are merged. On the other hand, let us consider the objection to this idea that Korean diphthongs are not real diphthongs and the on-glides function to fill onset, as Y. Lee 1993 argues. If Korean on-glides are attached directly to the syllable node, as those proponents state, the following representations should be permitted:

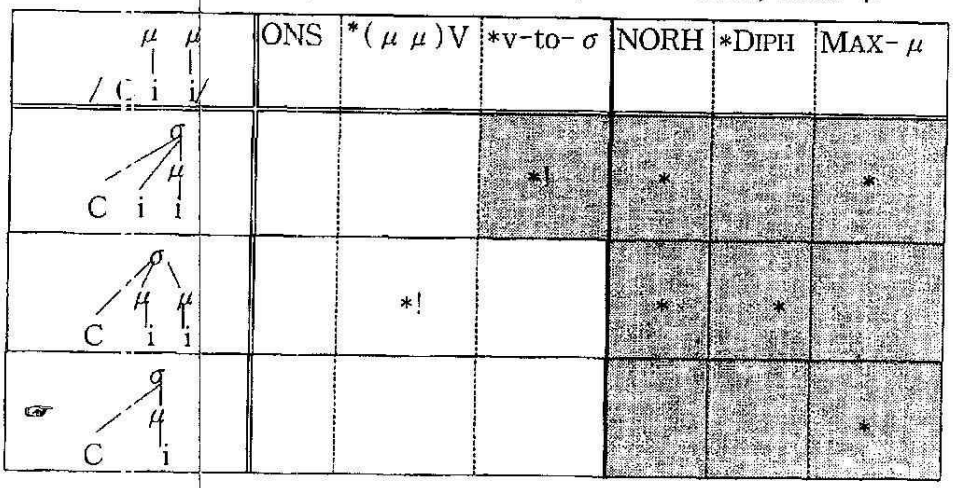
(4) a.  b. 

The ill-formedness of (4), violation of OCP does not guarantee the elimination of those structures, because they are convertable into the well-formed structure (5).

(5) a.  b. 

Thus, the onset hypothesis of Y. Lee does not afford to explain the absence of /yi/, /wu/ sequences in Korean. On the contrary, when we assume that Korean diphthongs belong to **type (biv)**, we can account for the absence straightwardly. Note tableau (6):

(6) ONSET, *(μ μ)V, *v-to-σ >>NORH, *DIPHTHONG, MAX-μ



The constraint hierarchy in (6) suffices to account for the simplification of the identical sequences. Thus, the absence of identical vocalic sequences offers a solid ground to represent Korean diphthongs.

Second evidence supporting our analysis is that, as Eckman and Iverson 1993 indicates, no language has obstruent-glide onsets unless it also has obstruent-liquid onsets. Korean obstruent-liquid sequences are ruled out by *COMPLEX (7), thereby any complex onset and coda clusters are rigidly excluded.

(7) *COMPLEX

Clusters are prohibited at syllable margins.

Thus, the sequences obstruent-glide or glide-obstruent must be excluded from the possible onset and coda clusters.

One thing to be noticed at this point is that positing on-glides at nucleus does not imply that the glide invariably posits at nucleus. The unmarkedness CV structure presses into service when onset is empty and the consecutive double vowels show up. As Rosenthall 1994 proposes for Luganda data, when a prevocalic element is a sole member of the potential onset, the segment tends to posit at onset even in the language where on-glides usually posit at nucleus. Note the following Korean data:

(8) heəm → he.yəm 'swimming'
səlle-ə → səl.le.yə 'stirred EXPLNANATIVE'
pam-i-əss-ta → pa.mi.yət.t'a 'it was night'

Even though the epenthesized segment is a vowel underlyingly, it fills the empty slot at onset and serves as a hiatus-breaker to satisfy ONSET. This is the case in which the glide is the sole member of the potential onset. This point will be discussed once again in § 3.1.

The central difference of our idea from previous analyses is that the position of glides varies in accordance of the requirement of constraint interactions. In Kyungsang Korean, the diphthongs demonstrate an asymmetry among positions within a word: At root initial, they remain intact, otherwise, they coalescence into a simple vowel, as exemplified by (9):

(9) Coalescence (Kyungsang Korean)
a. kyəlhon → keron 'marriage'
kyəul → keul 'winter'
b. yətʃa → *etʃa 'woman'
yəul → *eul 'ford'

Y. Lee 1993 argues that this data supports his proposal that Korean on-glides are syllabified into onset. The upshot of his argument is: Since the trigger of the coalescence is the preceding consonant and on-glides are posited at onset, the dialect-specific constraint to prohibit complex onset is at play to prevent the prohibited cluster. On the other hand, when we assume that the on-glides are at nucleus, it is not easy to account for the asymmetry of coalescence between (9a) and (9b) in a persuasive way. My idea is that this data does not give us any clue to the syllable structure of Korean on-glides. Instead, I propose that the asymmetry of the coalescence is the manifestation of universal constraints.

First of all, we must notice that Kyungsang Korean is characterized as dispreferring diphthongs. In other words, this dialect is distinguished from other Korean dialects in that *DIPHTHONG is undominated. As

shown by tableaux (11), (12), the dominance of *DIPHTHONG and *COMPLEX is responsible for the asymmetry in the coalescence in (9). According to McCarthy and Prince 1995, coalescence violates UNIFORMITY.

(10) UNIFORMITY

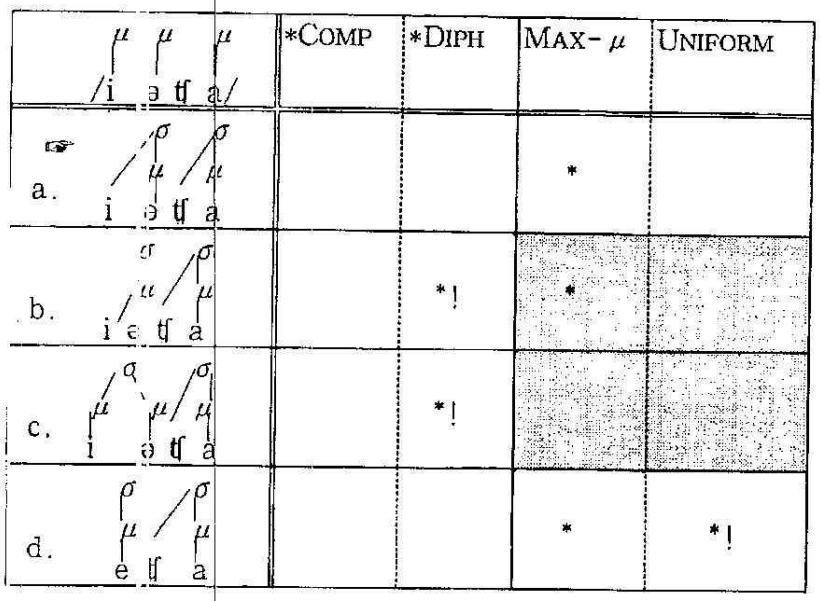
No element of S_2 has multiple correspondents in S_1.

(11) *COMPLEX, *DIPHTHONG >> MAX-μ, UNIFORMITY

/k i ə l h o n/	*COMP	*DIPH	MAX-μ	UNIFORM
a. k i ə l h o n	*!		*	
b. k i ə l h o n		*!	*	*
☞ c. k ə l h o n			*	*
d. k i ə l h o n		*!		

Candidates (11b) and (11d) are eliminated by violating the dominant constraint *DIPHTHONG and candidate (11a) is ruled out by violating *COMPLEX. Candidate (11c) is optimal, despite its violation of low ranked constraints. The same constraint ranking works to account for the blocking of coalescence in (9b), as demonstrated by tableau (12):

(12)



/i ə ʧ a/	*COMP	*DIPH	MAX-μ	UNIFORM
☞ a.			*	
b.		*!	*	
c.		*!		
d.			*	*!

Unlike in the case of tableau (11), *COMPLEX serves no function to evaluate candidates, since all the candidates in (12) satisfy it vacuously. Candidates (12b) and (12c) are eliminated by violating *DIPHTHONG, so that UNIFORMITY is the final judge to determine the optimal candidate (12a).

Y. Lee 1993 186ff. recourses to additional data in favor of onset hypothesis on Korean on-glides. He presents the so-called Popuri Language Game for the purpose. As shown in (13a), speakers reduplicate each syllable and substitute the existing onset of the base with segment /p/. The reduplicants posit immediately after the base.

(13) Popuri Language Game

a. satali → sa-pa-ta-pa-li-pi 'ladder'
ʧamsil → ʧa-pam-sil-pil 'place name'

b. hakkyo → ha-pak-kyo-po *ha-pak-kyo-pyo 'school'
yəŋkam → yə-pəŋ-ka-pam *yə-pyəŋ-ka-pam 'husband'

The data attracting our attention is (13b), in which on-glides show up at the base of the reduplication. The reduplication is unfaithful to the

base in that the glides are not copied. Y. Lee argues that the onset substitution in reduplication is the process of overwriting /p/ onto onset consonants. The disappearance of glides seems to call for the onset hypothesis in that the substituant /p/ replaces the onset holistically.

The exceptionality of reduplicants for phonological phenomena has been called 'the emergence of the unmarked' by McCarthy and Prince 1995. The marked structure which is generally allowed in a language is prohibited in reduplicants. This phenomenon is compelled by the following constraint ranking schema.

(14) FAITH$_{IO}$ >> Markedness Constraint >> FAITH$_{BR}$

In this case, the faithfulness constraints in hand are MAX$_{IO}$ and MAX$_{BR}$, and the markedness constraint is *DIPHTHONG. By this constraint ranking, we can obtain the correct output (15a).

(15) MAX$_{IO}$ >> *DIPHTHONG >> MAX$_{BR}$

/kyo+p-RED/	MAX$_{IO}$	*DIPHTHONG	MAX$_{BR}$
a. ☞ kyo-po		*	*
b. kyo-pyo		**!	

The dominance of *DIPHTHONG over MAX$_{BR}$ is responsible for the emergence of unmarked output (15a).

To sum up, Korean diphthongs belong to type (biv) in (1) and the onset hypothesis on Korean on-glides is not adequate to account for them.

2.2 Glide /ɨ/ in Korean

Korean has an extraordinary diphthong /ɨi/, which is unstable as can be betrayed by its lack of invariance.[1] First of all, let us examine the

[1] There is a severe controversy on the characterization of diphthong /ɨi/. Kim-Renaud 1986 argues that the second element functions to be a glide. She proposes that the variations between a simple vowel and a diphthong in the instantiation of the sequence reflects the fact that it is under the on-going

distribution of this diphthong:

(16) a. ɪ̆i-sa [ɪ̆i.sa] ~ [i.sa] 'doctor'
ɪ̆i-to [ɪ̆i.do] ~ [i.do] 'intention'
ɪ̆i-li [ɪ̆i.ri] ~ [i.ri] 'a moral sense'

b. han-ɪ̆i [ha.ni] 'oriental doctor'
ʧək-ɪ̆i [ʧə.gi] 'hostility'
saŋ-ɪ̆i [saŋ.i] 'jacket'

c. t^{h}ɪ̆i-u-ta [t^{h}i-u-ta] 'cause to sprout'
s'ɪ̆i-u-ta [s'i-u-ta] 'cause to be covered'

In Korean glide /ɪ̆/ presents a couple of systematic eccentricities. First, it stays intact in the word-initial position in slow speech and simplifies to [i] in normal or allegro speech. On the other hand, it simplifies to [i] word-medially or at word-final positions across the board. The contrastive behaviors are exemplified by (16a) and (16b). Second, even though the diphthongs posit at the word-initial syllable, glide /ɪ̆/ drops when it is preceded by a consonant, as seen by (16c). It follows that two types of deletion are involved with the /ɪ̆/ glide-vowel sequence.

(17) a. /ɪ̆/ deletes at non-word-initial position.
b. /i/ deletes, instead of /ɪ̆/ when /ɪ̆/ posits at the word-initial position. (in normal and allegro speech)

The analysis that the case of (17a) is due to the privilege of the root-initial position is well-documented by OT. Beckman 1998 points

process of monophthongization. This analysis is implausible in some respects. First, if /i/, instead of /ɪ̆/ functions to be a glide, it is a unique off-glide in Korean. The mixture of on- and off-glides is not commonplace. Second, appealing to a rule-of-thumb research method, she observed that when Korean speakers intentionally prolong the vowel sequence, the first element lengthens We also cast doubts on this argument. More often than not, phonetic evidence does not coincide with phonological facts.

out that root-initial position like some other salient positions often does not abide by phonological processes. The effect of the positional faithfulness manifests when a markedness constraint outranks a faithfulness constraint and ban the relevant process, but the markedness constraint is dominated by the domain specific faithfulness constrain. In this case, the following constraint ranking is deployed to explain the haunting of the glide.

(18) MAX wd(__...)

A segment placed at the word-initial at input has a correspondent at output.

(19) MAX wd(__...) >> *DIPHTHONG >> MAX

/ǐi-sa/	MAX wd(__...)	*DIPH	MAX
a. ☞ ǐ-sa			*
b. ǐi-sa		*!	
c. i-sa	*!		*

The dominance of MAX wd(__...) over anti-diphthong constraint results in the survival of [i] at the word-initial position in candidate (19a). The remaining candidates (19b) and (19c) fatally violate *DIPHTHONG and MAX wd(__...), respectively and they are doomed. Yet, there is unsolved problem for this analysis. As seen in tableau (20), we have no settlement among the two alternative outputs: in non-initial position, which one of the two vocalic elements deletes?

(20)

/ha.nǐi/	MAX wd(__...)	*DIPH	MAX
a. ☞ ha.ni			*
b. ha.nǐi		*!	
c. ☞ ha.ni			*

Under current constraint interaction, the tie in constraint violation prevents us from predicting the correct output (20a). However, we do not need to introduce additional constraints to cope with this situation. The established constraint ranking on the harmonic head of syllable is

ar play here.

(21) *HD/p,t,k ...>>*HD/ə,i >>*HD/i,u >>*HD/e,o>> *HD/a

Note the following table:

(22) MAX wd(____) >> *DIPHTHONG >> MAX, *HD/ə,i >> *HD/i,u

	/ha.nĭi/	MAX_{IO} wd(____)	*DIPH	MAX	*HD/ə,i	*HD/i,u
a. ☞	ha.ni			*		*
b.	ha.nĭi		*!			
c.	ha.ni			*	*!	

Among the two candidates (22a) and (22c), which satisfy *DIPHTHONG, (22a) is optimal in that (22c) fatally violates the high ranked constraint *HD/ə,i. This analysis reflects our intuition that the more sonorous a head is, the more easy to recognize.[2]

3. English

3.1 Vowel-Spreading as Hiatus-Breaker

Among the glide typology presented above, English falls under **type (aiii)** among the configurations (1). For the clarity in explanation, I re terate it as (23).

---

[2]The other analysis on the deletion of /i/ is possible. Namely, the deletion is due to the inherent markedness of the segment. The high rankedness of constraint prohibiting /i/ holds the responsibility. The deletion of /i/ is interesting in that other on-glides in Korean is permitted in the post-consonantal position; *tɥi* 'back' *hakkyo* 'school' *kyusu* 'lass' (archaic). It means that the deletion of glide is not due to *COMPLEX. This exceptionality of /i/ derives from the markedness of this glide. According to Maddieson's 1984 survey on distribution of glides in natural language, languages with /y/ and /w/ are more than three-fourths, whereas language with /ɤ/, which represents glide version of /i/ , and /ɥ/ which is glide version of /y/, high front round vowel is extremely rare by less than 2%.

(23) 

Type of glide is warranted by the crucial dominance of NORH, MAX-μ over *DIPHTHONG. As can be seen in (24), in many dialects of English, a glide sharing its place of articulation with the preceding off-glide intervenes as hiatus-breaker.

(24) Glide Insertion (data from Harris 1995: 104)

a. three [y] and	b. two [w] of
day [y] of	go [w] and

The point to be clarified is whether the apparent glide insertion is a genuine segment epenthesis. If the process invoked to contain hiatus is really a glide epenthesis, this data would make a challenge to our claim that glides and vowels are nondistinct in feature composition and the associated syllable structure makes the difference between them. Yet, when we view that the intervening segment is not inserted, but spread from preceding off-glide, this data is no longer a challenge to us. Note the following tableau. The notation < > stands for unparsing of relevant unit. What the constraint *SEGMENT-LINK means is that a syllable node cannot associate with a segment which is already linked with a syllable node.

(25) ONSET, NORH, MAX-μ >> *DIPHTHONG
DEP >> SEGMENT-LINK

/d e i ɔ v/	ONS	NORH	MAX-μ	*DIPH	DEP	SEG-LINK
a.				*	*!	
b.			*!			*
c. ☞				*		*

The justification of the spreading option (25c) is evidenced by the homorganicity of the intervening segment and the preceding off-glides. Under the insertion analysis, the question why the inserted segment copies the preceding glide remains a mystery.

3.2 Vowel Epenthesis by Sympathy

Davis and Hammond 1995 proposes that English prevocalic glides /y/ and /w/ are split in their behavior of association into syllable: /y/ supports nucleus, whereas /w/ does onset. Their argument rigidly sticks to one assumption suggested by Steriade 1988 that co-occurrence constraints based on sonority distance are found exclusively within the pre- and post-nuclear elements, and never between the nucleus and the pre-nuclear elements. In this way, they make a distinction between co-occurrence constraints based on minimal sonority distance (MSD) and constraints against homorganic tautosyllabic sequences (OCP). As Davis 1993, Davis and Hammond 1995 demonstrate, we no longer conceive that OCP is valid only within subsyllabic constituents. OCP applies as pan-syllabic constraint, that is to say, it can control even non-adjacent elements. Also, Steriade's hypothesis on sonority distance is unstable, considering some cross-linguistic phonotactic observations, particularly the consonant-glide (CG) sequence. As Eckman and Iverson

1993: 247 points out, it is generally true that no language should have obstruent-glide onset unless it also has obstruent-liquid onset, as already noted in §2.1. The rarity of CG sequence is not attributable to the minimal sonority distance. Since the sonority distance in CG sequence is greater than in the case of consonant-liquid (CL) sequence, it is clear that other factor is involved in excluding CG sequence. For the explication, I claim that "sonority dispersion principle" rather than minimal sonority distance is responsible for the blocking the CG sequence. In OT terms, the idea is translated into constraint (26).

(26) Sonority Dispersion (adopted from Clements 1990)
Least complex syllable types are those whose onsets show a sharp and steady rise in sonority proceeding from the margin to the peak.

The similar idea on increasing or decreasing sonority profile is utilized in the analysis of Berber syllabification by Prince and Smolensky 1993. Then, it becomes clear why (27a) is more marked than (27b).[31]

(27) a. 1 5 6 b. 1 4 6
k y e k l e

The abrupt transition between second and third element in (27a) makes the sequence marked, while in the case of (27b), it keeps on increasing on the start to the end steadily. Here notice that sonority dispersion (27) is nondistinct from MSD in their basic tenet. Both of them refer to the relative degree of sonority compared with the adjacent element, so that it seems to obviate each other. In this paper, we opt for the former. One distinction is that MSD refers to a single pair of elements, while the sonority dispersion constraint refers to two consecutive pairs of elements and evaluate the two MSD's at the same time. The other important difference of the sonority dispersion from MSD is that it concerns any elements regardless of subsyllabic

[31]The sonority scale in (27) is based on the analysis of Selkirk 1984.

constituency. That is, it refers to the sequence straddling onset and nucleus as well as onset-internal sequence. This contradicts Steriade's idea and leads us to believe that sonority distance is relevant to any sequence, regardless of their subsyllabic constituency. So, Davis and Hammond's analysis of American English on-glides, which relies on Steriade's hypothesis on MSD, loses its underpinning. Let us briefly look at the analysis. Davis and Hammond observe that /y/ is freely preceded by sonorants as in (28a), while /w/ is controlled by the preceding consonants as in (28b,c), so that they conclude that /y/ is at nucleus and /w/ is at onset.

(28) a. music, mule, mural
b. *nwV-, *lwV-, *rwV-
c. thwart, twin, schwa

However, since MSD does not guarantee the subsyllabic constituency, their argument for positioning of /y/ at nucleus, whereas /w/ at onset, is not valid any more.

This is not the whole story on the distributional gap in English on-glides. The dominance of constraint (26) over other constraints is enough to account for the absence of /CyV/ sequences, except /Cyu/, as arranged in (29a). However, as we can see in (29b), English seems to have no restriction on /CwV/ sequences.[4]

(29) a.	yi	yeast	*Cyi	b.	wi	we	kwi	queen
	ye	yeah	*Cye		wɛ	weather	kwɛ	quench
	yey	Yeats	*Cyey		wey	way	kwey	---
	yæ	yap	*Cyæ		wæ	wax	kwæ	quack
	ya	yard	*Cya		wa	watt	kwa	quad
	yu	you	Cyu		wu	wound	kwu	---

What phonological factors are involved in distinguishing these two

[4] I attribute the absence of words starting with /kwey-/, /kwu-/ to accident in English lexicon.

glides? At this point, I would like to analyze the discrepancy between /y/ and /w/ in terms of inherent properties of obstruent-glide. According to Cairns 1988, English shows some asymmetry between (30a) and (30b).

(30) a. rounded vowel allowed
quote, quoit
b. rounded vowel prohibited
*swort, *twort, *dwort

Cairns proposes that /kw/, /gw/, /hw/ have secondary labial articulation and can avoid the effect of co-occurrence constraints on double rounded vowels in a tautosyllabic sequence. On the other hand, in (30b) the rounded vowel following /w/ is prohibited by the co-occurrence restriction. When we rely on this reasoning, we can understand the asymmetry between /y/ and /w/. Since the constraint on sonority dispersion (26) is applicable only to the sequence of CG, the complex segment in (30a) nullifies the effect of sonority dispersion. Also, for the case of (30b), in which all the obstruents are coronal, Cairns analyzes the coronal obstruent as appendix and the /w/-rounded vowel sequence is eliminated by the co-occurrence restriction. To sum up, /w/ avoids the effect of the undominated constraint (26) by being secondary articulation to dorsal consonants and appendix-hood of coronal obstruents preceding /w/[5] The /CyV/ sequence is categorically ruled out by constraint (26).

Now, let us turn our attention to the question why the /Cyu/ sequence is permitted in spite of the established constraint interaction. The /CyV/ sequence in English has been controversial in several aspects. First, the sequence is unusual in that only /Cyu/ is permitted among the series beginning with /Cy-/.[6] There are no */Cye/, */Cyo/, */Cyə/ etc. The other thing is that vowel /u/ does not necessarily

[5]Notice that the labial-/w/ sequences like *fw-, *vw-, *pw- *bw- are ruled out by OCP, which is not our main concern.

[6]Here I ignore the /Cyə/ string in stressless syllable, as in *onion, canyon, pavilion* etc.

enforce the appearance of glide /y/ in front of it. e.g. *poor, tour, push.* So we have double tasks to do here. First, it is necessary to explain why the exceptional sequences /Cyu/ occurs to the exclusion of other /Cy-/ sequences. The other one is that the underlying representation of /Cyu/ should be distinguishable from /Cu/ sequences. The SPE's approach to this challenge is to set up an abstract vowel /i/ and permits the /y/-insertion before this non-surface apparent vowel. The other possible option is to posit the glide underlyingly. Borowsky 1986 adopts the eclectic position. She posits an floating vowel /i/ before /u/ and explains that the /iu/ sequence can afford to satisfy the constraint *CG because at the lexical level the floating vowel /i/ does not attach to any prosodic structure, so that it evades the effect of constraint at the lexical level. Eventually, at the postlexical level, the floating anchors to a prosodic tier.[7] One serious problem with Borowsky's analysis is that the distinction of prosodically attached glide and floating glide has the same difficulties as Guerssel's analysis. Namely, the predictable sy lable structure should not be specified in this case. For the issue, refer to Lee (forthcoming).

For this reason, I adopt SPE's approach based on segmental feature. Then, this is a case of opacity in phonology and has been one of the serious challenge threatening to the OT framework, where only input and output representation are available. The analysis which crucially relies on intermediate level, is not avaliable in OT framework. McCarthy 1998 tries to untie the knot and suggests a solution. The crux of his resolution is as this: the selection of the optimal candidate is influenced by the phonological properties of certain designated failed candidates, analogous to the derivational theories relying upon intermediate representation. He calls the designated failed candidate as sympathetic candidate and marked ☺. Then, how can we select the sympathetic candidate? McCarthy's algorithm is that it is the most harmonic member of the set of candidates obeying some designated IO faithfulness constraint (called selector).

---

[7] Note that Borowsky's constraint ought to be clearly distinguished from OT constraints. She makes it clear that the constraint is available at the lexical level. It follows that Borowsky's constraint does not available at the surface.

Let us consider /Cyu/ sequence in terms of this idea. McCarthy divides the cases of opacity into two groups: (i) a generalization of a language is not surface-true. (ii) a generalization active in a language is not surface-apparent. The case of /Cyu/ at hand belongs to the former case. The crucial point here is that glide /y/ survives constraint *CG. So my solution for the problem is that MAX serves as selector, which introduces the epenthetic vowel /i/. The epenthetic vowel is enforced to posit at onset by the constraint system specific to English. Notice this type of language disallows rising diphthongs.

(31) *i >>IDENT$_{IO}$ >>*e,o >> ☺MAX>> *CG, DEP$_{IO}$, *u

	k μ i	*i	IDENT$_{IO}$	*e,o	☺MAX	*CG	DEP$_{IO}$	*u
a.	σ μ k i	*!			*			
b. ☞	σ σ < μ > μ k i u		*		√	*	*	*
c. ☺	σ μ μ k i i	*!			√	*	*	
d.	σ μ k u		*		*!			*
e.	σ μ k o		*	*!	*			

Candidates (31a) and (31c) are ruled out by the fatal violations of *i, which outranks other constraints. At the next round, candidates (31b) and (31d) tie, so the decision moves on to the next round. At the very point, sympathetic candidate (31c) is at play and selects candidate (31c) as sympathetic candidate since it is the most harmonic against relevant constraints While candidate (31b) satisfies selector ☺MAX-V, (31d) fatally violates it and it is ignored in the further consideration.

4. Spanish

Spanish diphthongs call our attention in that a surprisingly wide range of diphthongs are attested. According to Harris 1983, the distribution of diphthongs is as follows: First, any underlyingly stressed vowels are prohibited to be interpreted as glides. That is, stressed vowels are obligatorily to stay as head of nucleus. Second, when both of consecutive vowels are unstressed, the first one is to be a glide, regardless of relative sonority value.

(32) Spanish Glides (unstressed)
ĭu, ĭi, ĭe, ŭe, ĕi, ĕu, ĭo, ŭo, ŏi, ŏu, ĭa, ŭa, ăi, ău, ĕo, ŏe, ĕa, ŏa, ăe, ăo

Let us characterize Spanish diphthongs one by one. In the OT perspective, the first characteristics of Spanish diphthongs that stressed vowels are obligatory heads of concerned syllables can be straightforwardly explained. The exemption of the salient position from relevant phonological processes is another example of positional faithfulness. The positional faithfulness for the stressed syllable (33) outranks the constraint *G/-high and NORH.

(33) MAX-μ (σ(+stress))
The moras involved in the stressed syllable at input must have corresponding moras at output.

(34) ONSET, MAX-μ(σ(+stress)) >>*G/-high, NORH

/C ɛ i/	ONS	MAX-μ(σ(+stress))	*G/-high	NORH
a. C ɛ i	*!			
b. C ɛ <i>		*!		
☞ c. C ɛ i			*	*

Candidate (34c) is chosen to be the winner by its satisfaction of both undominated constraints, in contrast to the fatal violations in the case of candidates (34a) and (34b).

Next, let us move on to the second characteristics of Spanish diphthongs, as seen in (35). The apparent challenging examples call for another positional faithfulness constraint; the left-dominance and ignorance of sonority profile. When we scrutinize into Spanish, the baffling sequences share a common denominator. As Harris 1970 demonstrates by the derivational formalism (35), the second of two vowels is separated by a word boundary.

(35) Spanish Glide Formation

[-stress] → [-syllabic]/ ____ # V

As Beckman 1998 proposes, the initial position of a word has a tendency to have a privilege to resist phonological changes, which occur in other circumstances. Now, we are able to construe the Spanish diphthongs in a plausible way. The positional faithfulness constraint (36) and a faithfulness constraint in terms of feature correspondence (37) crucially outranks *G/-high and NORH.

(36) MAX-μ ROOT(____...)

The moras at root-initial vowel of the input have corresponding moras at output.

(37) IDENT(high)

A segment at the input string must be nondistinct from the correspondent at the output in terms of feature [high].

(38) MAX-μ_{ROOT}(__...), ONSET, IDENT(high)>>*G/-high, NORH

/a#i/	ONS	MAX-μ_{ROOT}(__...)	IDEN(high)	*G/-high	NORH
a. ☞ σ, μ — ă i				*	*
b. σ, μ — a ǐ		*!			
c. σ σ, μ μ — a i	*!				
d. σ, μ — ĕ i			*!	*	*

In our analysis, the dominance of positional faithfulness constraint MAX-μ_{ROOT}(__...) over the rest of constraints is responsible for the appearance of the unusual diphthongs with falling sonority contour and glide formation of more sonorous vowel. This analysis is straightforward in explaining the reverse case of rising sonority contour with an intervening morphological boundary (39).

(39)

/i#a/	ONSET	MAX-μ_{ROOT}(__...)	IDENT(high)	*G/-high
u — i ă		*!		*
☞ u — a				

In the presence of the constraint MAX-μ_{ROOT}(__...), the sonority profile seems to be inert in deciding the head of Spanish syllables.

Before we conclude the discussion on Spanish glides, we are wondering to what type Spanish glides belong among those in (1). Unfortunately, we still have no definite evidence. It is not certain whether it belongs **type (bii)** or to **(biv)** in (1).

5. Conclusion

So far, we have tried to support the factorial typology predicted by Optimality Theoretic analysis by examining the distributional regularities obtained from Korean, English and Spanish. This case studies prove to be successful to capture the distribution of glides in a systematic way. The analytic advantage from handling the distinction in terms of constraint interaction suffices to overcome the analytic inconsistency derived from previous derivational approaches

References

Beckman, Jill. 1998. *Positional Faithfulness*. Doctoral Dissertation, University of Massachusetts, Amherst.

Borowsky, Toni. 1986. *Topics in Lexical Phonology of English*. Doctoral Dissertation, University of Massachusetts, Amherst.

Cairns, Charles E. 1988. "Phonotactics, Markedness and Lexical Representation". *Phonology* 5, 209-236.

Casali, Roderic, F. 1997. "Vowel Elision in Hiatus Contexts: Which Vowel Goes?". *Language* 73, 493-533.

Clements, George N. and Samuel J. Keyser. 1983. *CV Phonology: A Generative Theory of the Syllable*. Cambridge: The MIT Press.

Davis, S. and M. Hammond. 1995. "On the Status of Onglides in American English". *Phonology* 12, 159-182.

Eckman, Fred and Gregory Iverson. 1993. "Sonority and Markedness among Onset Clusters in the Interlanguage of ESL Learners". *Second Language Research* 9.

Guerssel, Mohammed. 1986. "Glides in Berber and Syllabicity". *Linguistic Inquiry* 17, 1-12.

Harris, James W. 1970. "Sequences of Vowels in Spanish". *Linguistic Inquiry* 1, 129-134.

Harris, James W. 1983. *Syllable Structure and Stress in Spanish: A Nonlinear Analysis*. Cambridge: The MIT Press.

Harris, John. 1995. *English Sound Structure*. Oxford: Blackwell.

Hayes, Bruce. 1989. "Compensatory Lengthening in Moraic Phonology". *Linguistic*

Inquiry 20, 253-305.

Hayes, Bruce. 1995. *Metrical Stress Theory: Principles and Case Studies.* Chicago: The University of Chicago Press.

Kager, René. 1993. "Alternatives to the Iambic-Trochaic Law". *Natural Language and Linguistic Theory* 11, 381-432.

Kaye, D. Jonathan. 1981. "Les diphthongize caches du Vata". *Studies in African Linguistics* 12, 225-244.

Kim-Renaud, Young-Key. 1986. *Studies in Korean Linguistics.* Seoul: Hanshin Publishing Company.

Lee Ponghyung. (forthcoming). "Typology of Glides," *Korean Journal of Linguistics* 24.

Lee Yongsung. *Topics in the Vowel Phonology of Korean.* Doctoral Dissertation, Indiana University, Bloomington.

Levin, Juliette. 1985. *A Metrical Theory of Syllabicity.* Doctoral Dissertation, MIT.

McCarthy, John. 1998. "Sympathy & Phonological Opacity". ROA #251.

McCarthy, J. and A. Prince. 1986. "Prosodic Morphology". ms. University of Massachusetts and Brandeis University.

McCarthy, John and Alan Prince. 1995. "Faithfulness and Reduplicative Identity". *UMOP* 18, 333-379.

Prince, Allen and Paul Smolensky. 1993. *Optimality Theory: Constraint Interaction in Generative Grammar.* Rutgers University and University of Colorado, Boulder, RuCCS-TR-2.

Rosenthall, Samuel. 1994. *Vowel/Glide Alternation in a Theory of Constraint Interaction.* Doctoral Dissertation. University of Massachusetts, Amherst.

Rubach, Jerzy 1998. "A Slovak Argument for the Onset-Rhyms Distinction". *Linguistic Inquiry* 29, 168-179.

Selkirk, Elizabeth. 1984. "On the Major Class Features and Syllable Theory". In Aronoff, Mark and Richard T. Oehle (eds.), *Language Sound Structure,* 107-133. Cambridge: The MIT Press.

Steriade, Donca. 1988. "Review of Clements & Keyser 1983". *Language* 64, 118-123.

Zec, Draga. 1995. "Sonority Constraints on Syllable Structure". *Phonology* 12, 85-129

Ponghyung Lee
Department of English
Taejon University
96-3 Yongun-dong, Tong-gu
Taejon 300-716
phlee@dragon.taejon.ac.kr