

Variation in Korean vowel harmony and the emergent locality effect

Yoonjung Kang and Na-Young Ryu

University of Toronto

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Overview

1. Introduction
2. Background
3. The corpus
4. Data analysis
5. Results
6. Discussion

1. Introduction

Korean vowel harmony

- Korean exhibits two types of vowel harmony
(Kim-Renaud 1976, Park 1990, Sohn 1999)
 - Verbal suffix vowel harmony
 - Sound-symbolic vowel harmony
- Vowel harmony has gradually weakened in Korean due to several sound changes.
(S.-N. Lee 1947, W. Kim 1967, K.-M. Lee 1972)

Dialect Variation

- A study of **variation** in vowel harmony across **dialects**, where a range of degrees of attrition is represented
- Korean dialect speech corpus (*The National Institute of the Korean Language, 2004-2010*).

2. Background

Verbal suffix harmony

- A series of verbal inflectional suffixes that begin with [a] or [ʌ] depending on the stem vowel quality.

Light		Dark	
작-아 [cak- a]	'small'	길-어 [kil- ʌ]	'long'
속-아 [sok- a]	'be fooled'	물-어 [mul- ʌ]	'bite'
		세-어 [se- ʌ]	'count'
		먹-어 [mʌk- ʌ]	'eat'

Light vs. Dark

	Front		Back		
high	i	(y)	ɨ	u	Dark vowels
mid	e	(ø)	ʌ	o	Light vowels
low	(ɛ)		a		

- Last stem vowel determines the suffix vowel
 - Light V → Light allomorph [a] (ex: cak**a** ‘small’)
 - Dark V → Dark allomorph [ʌ] (ex: kil**ʌ** ‘long’)

Light vs. Dark

	Front		Back		
high	i	(y)	ɨ	u	Dark vowels
mid	e	(ø)	ʌ	o	Light vowels
low	(ɛ)		a		

- Last stem vowel determines the suffix vowel
 - Light V → Light allomorph [a] (ex: caka ‘small’)
 - Dark V → Dark allomorph [ʌ] (ex: kilʌ ‘long’)

Attrition of vowel harmony

- Light vowel stems optionally take the dark allomorph [ʌ].

(Hong 2008, HS Kang 1996, HJ Kang 2012, etc.)

[mɑk-ɑ] 막-아 ~ [mɑk-ʌ] 막-어 ‘to block’

Locality effect

- Variation in vowel harmony shows sensitivity to intervening consonants.
(Kim-Renaud 1975, Yu 2000, HS Kang 2002, Oh 2007, HJ Kang 2012 etc.)
- Harmony is more likely to be retained/obeyed when the trigger and the target vowels are strictly (surface) adjacent.

[na-a] ~ *[na-ʌ] ‘give birth’ (Kim-Renaud 1975)

낳아 *낳어

[cap-a] ~ [cap-ʌ] ‘catch’

잡아 잡어

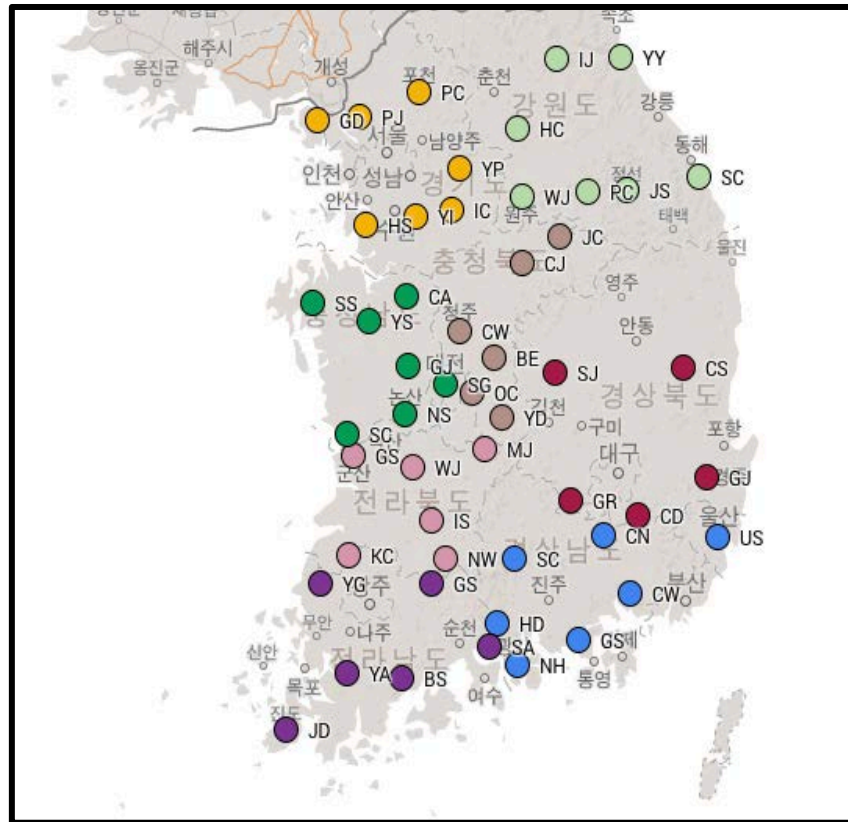
3. The corpus

The Corpus

- **The Korean dialect speech corpus**
(The National Institute of the Korean Language 2004-11)
- Sociolinguistic interviews and elicited lexical and sentential productions
- Over 60 towns in Korea and abroad
 - 51 towns analyzed in this study
- 1 or 2 speakers in their 70s~80s from each town
- Conjugations of around 350 verbs/ adjectives.
- **Extracted over 18,000 verb forms that exhibit vowel harmony.**

Distribution of dialects analyzed

- 51 towns in 8 provinces in South Korea



4. Data analysis

Analysis

(1) Stem UR analysis

(2) KVH Morphological parser

Stem UR analysis

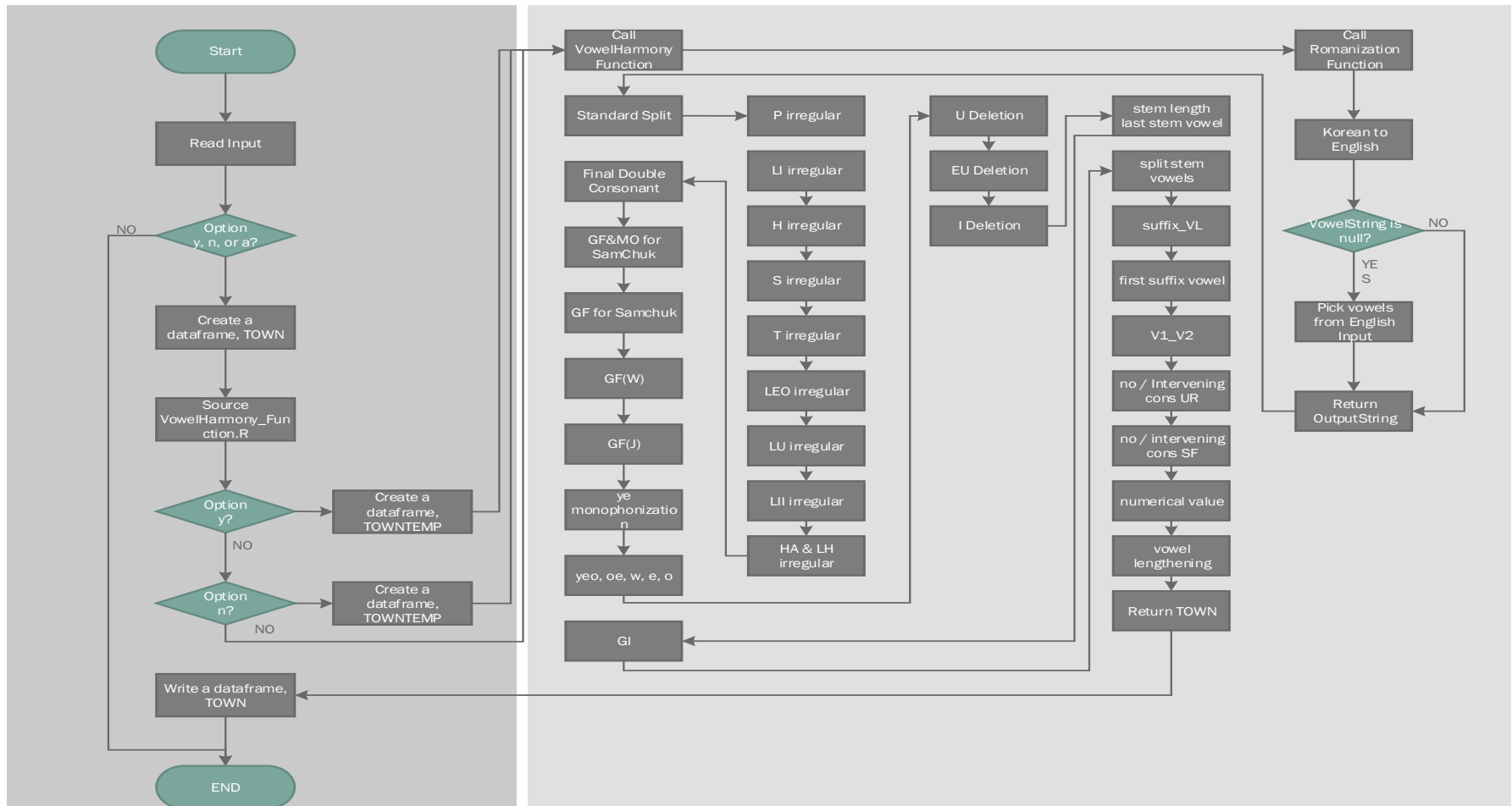
- Based on the full paradigm of a given verb produced by the speakers, the underlying form of each verb stem is manually identified.

data	paradigm	UR analysis	dialect
c ^h wɫʼa 취따	c ^h upcʼi, c ^h upkʼo, c ^h uptʼɫa, c ^h uwɫsɫ 춍찌, 춍꼬, 춍떠라, 추워서	/c ^h up/ ‘cold’ 춍-	(SCB_BE)
c ^h wɫʼa 취따	c ^h uci, c ^h uku, c ^h utɫa, c ^h unɨŋkʼe 추지, 추구, 추더라, 추닝께	/chu/ ‘dance’ 추-	(SCB_OC)

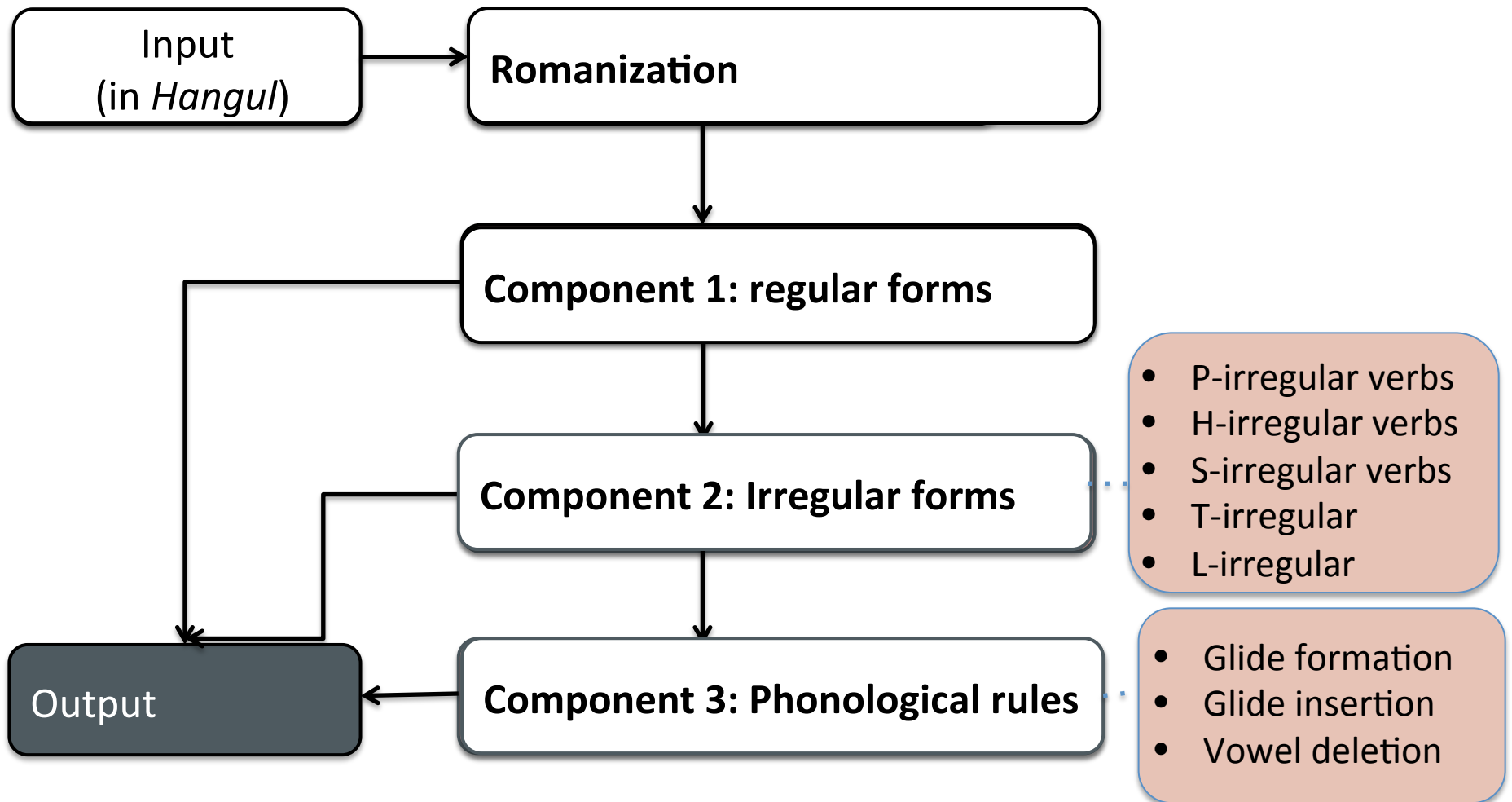
The KVH Morphological parser

- The program parses inflected forms of verbs into **stem+suffix**.
- It generates various codings for phonological characteristics of the stem and suffix.
- It is built on a **rule-based system**.
- It was developed using the **R** programming language. (R Development Core Team (2012))

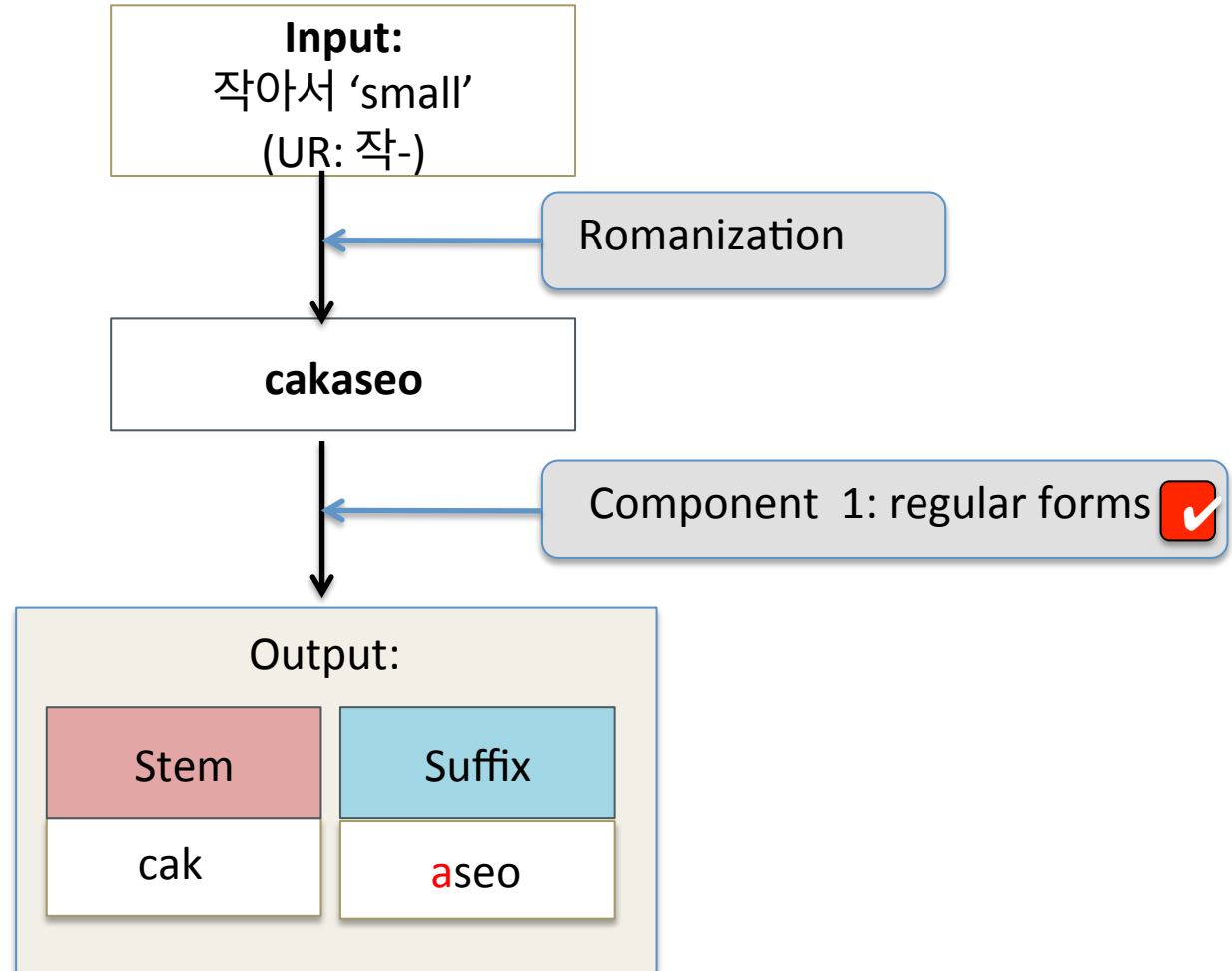
Architecture of KVH parser



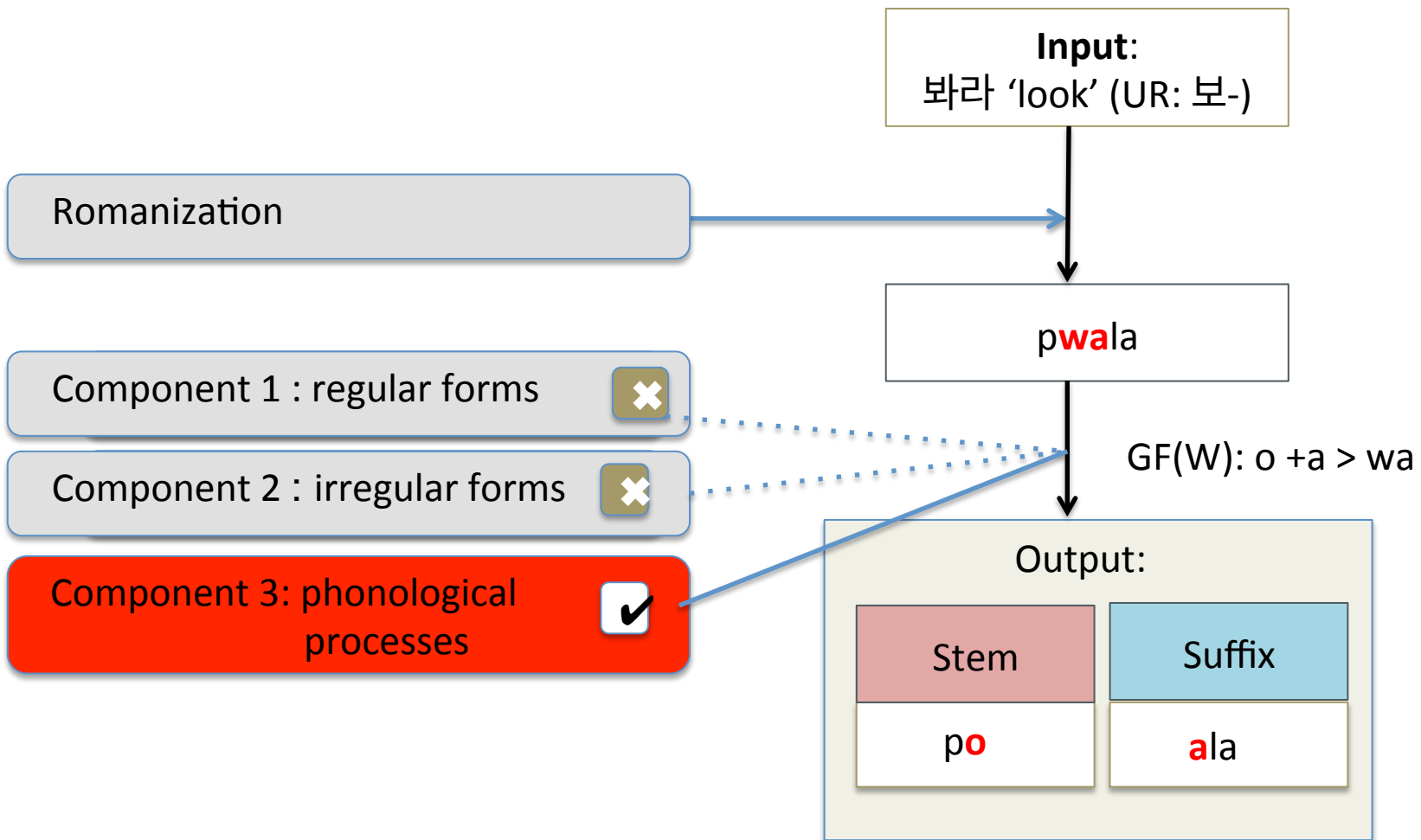
The process of the **KVH** morphological parser



Component 1: regular forms



Component 3: Phonological Processes

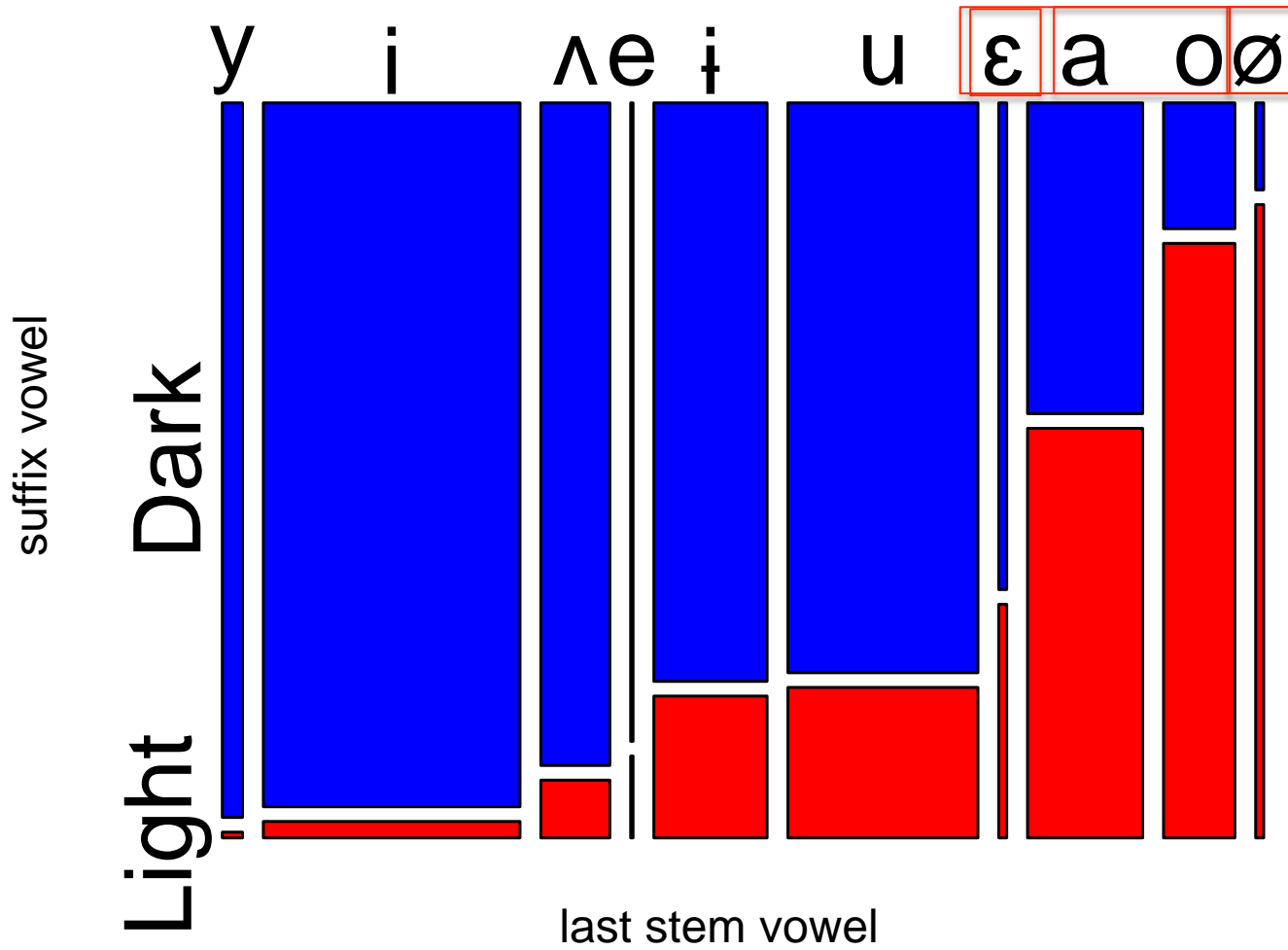


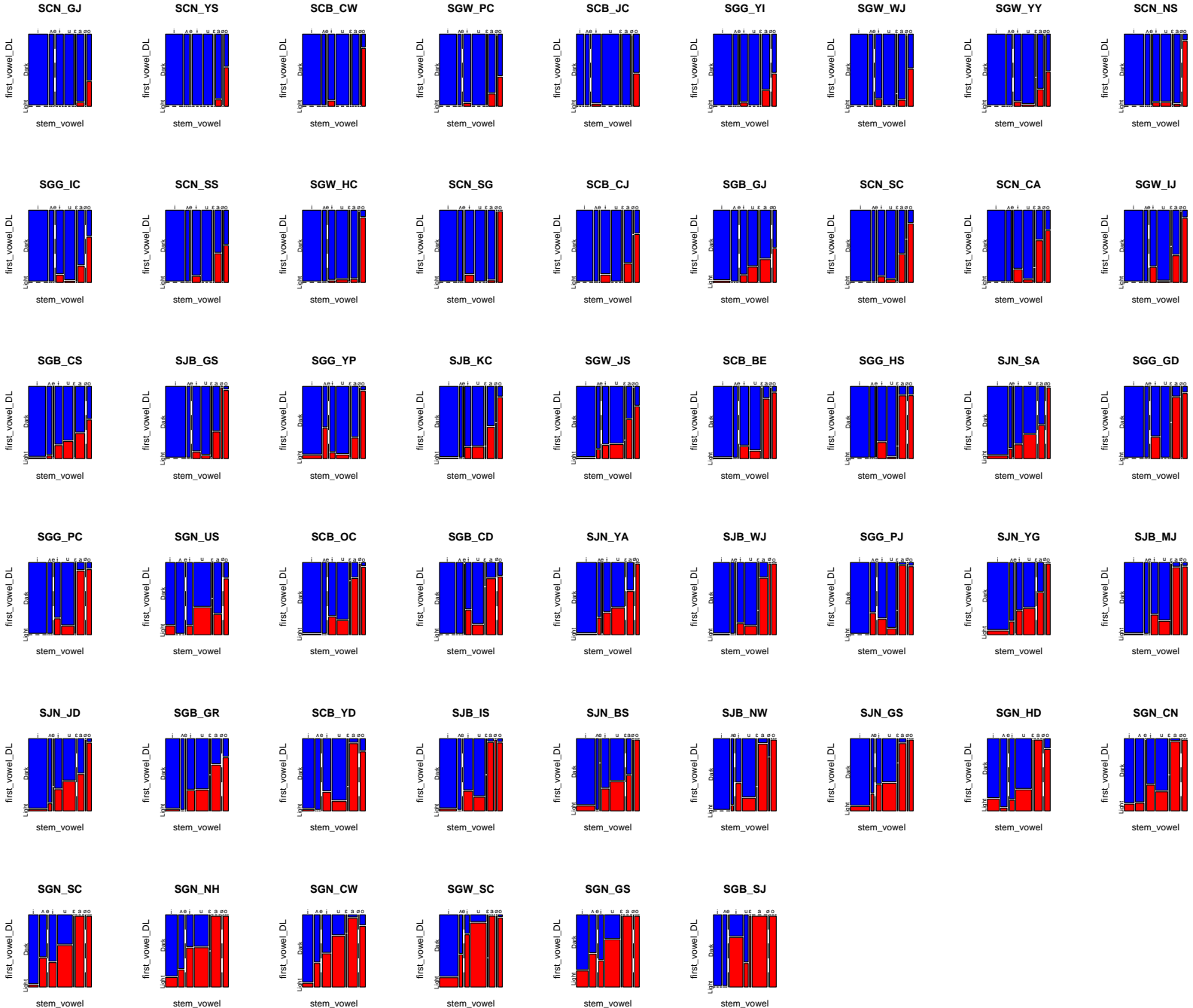
Data Structure (partial)

C1	C2	C3	C4	C5	C6	C7	C8
Item.id	item	standard	Input_data	Underlying_stem	Romanization	stem_en	suffix_en
		농- 알 까다롭-	놔두 아라두 까다로워서	농 알 까다롭	awadu aladu kkadalowoseo	aoh alh kkadolop	aue adu eoseo
C9	C10	C11	C12	C13	C14	C15	C16
irregular	phonological_process	stem_vowel	stem_length	last_stem_vowel	first_suffix_vowel	V1_V2	harmony
H	GF(W)	o	1	0	a	Light-Light(LL)	Harmony
		a	1	a	a	Light-Light(LL)	Harmony
P		a a o	3	0	eo	Light-Dark(LD)	Disharmony
C17	C18	C19	C20	C21	C22	C23	C24
intervening_cons_UR	intervening_cons_SF	no_intervening_cons_UR	no_intervening_cons_SF	vowel_lenghening	variation	town	Province
h		1	0	N		SGG_YI	SGG
Lh	l	2	1	N	variation	SGG_YI	SGG
p	w	1	0	N		SGG_HS	SGG

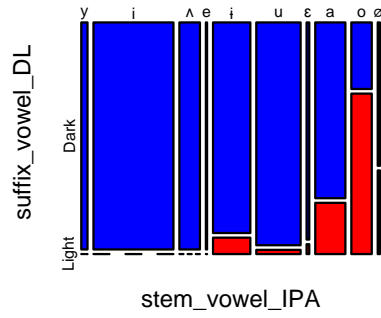
5. Results

All dialects combined

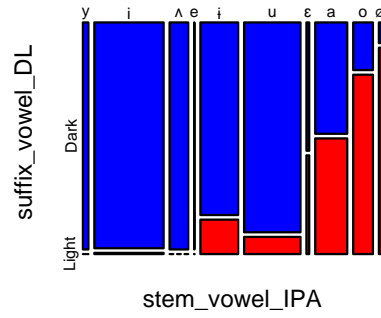




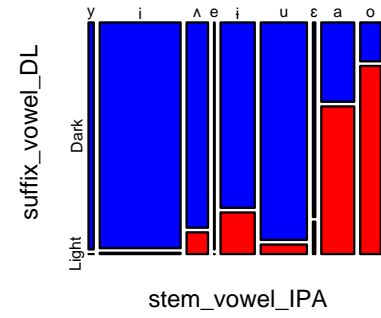
Chungnam



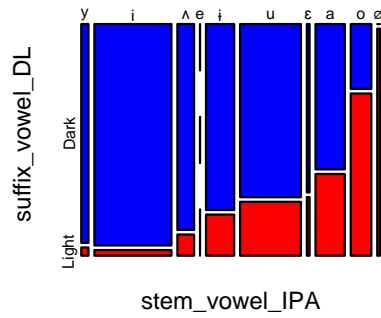
Chungbuk



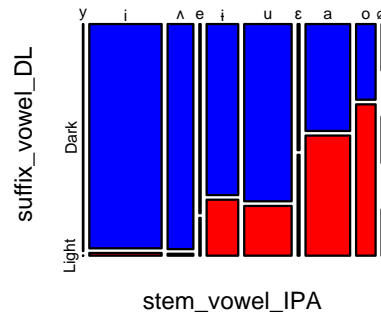
Kyeonggi



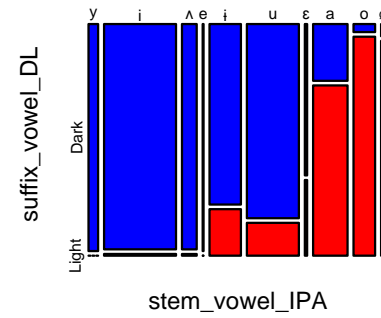
Kangwon



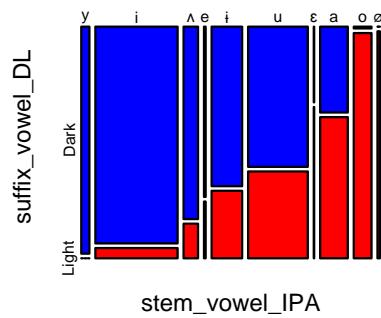
Kyeongbuk



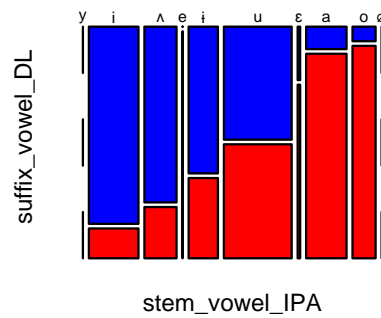
Cenbuk



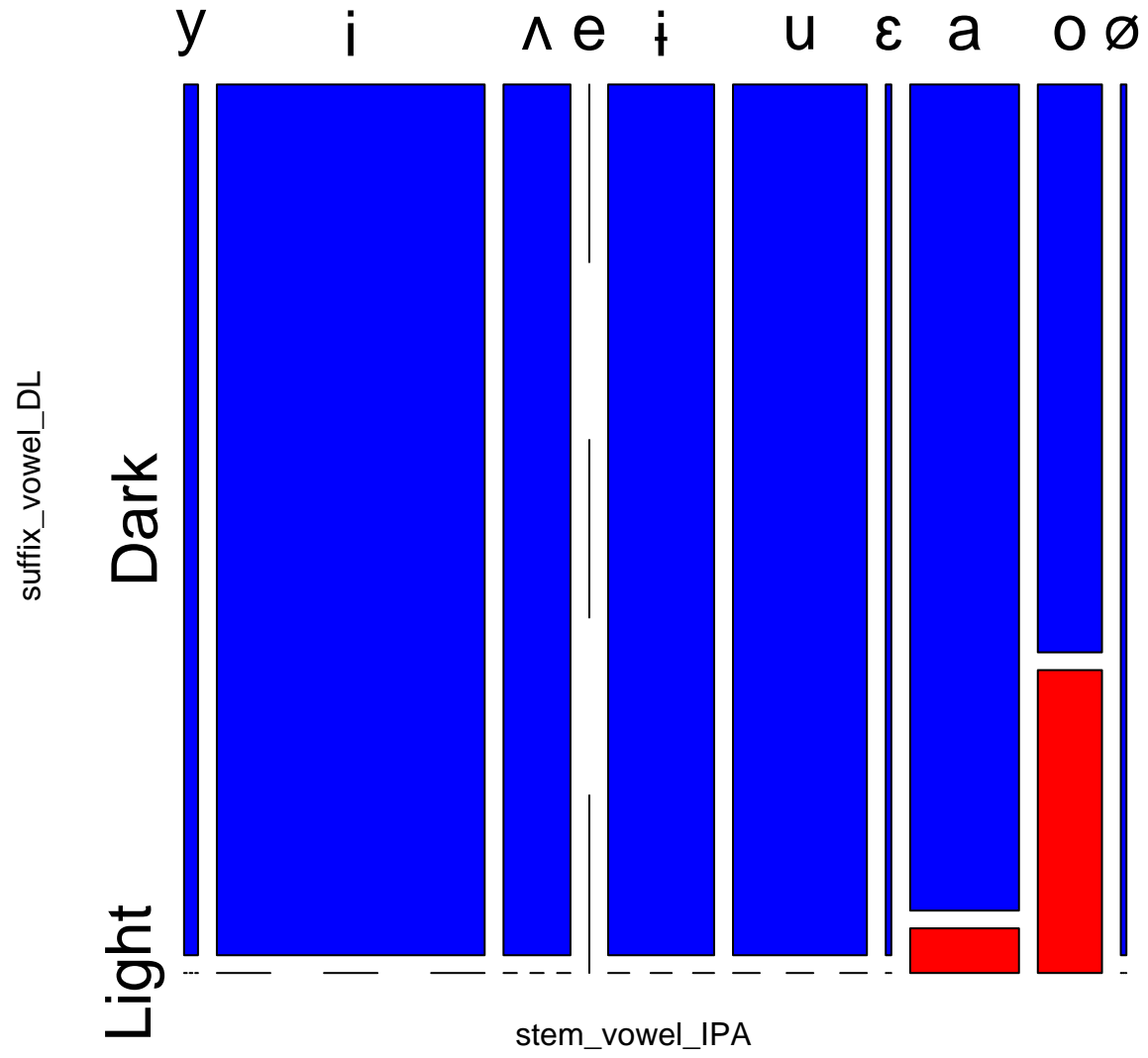
Cenam



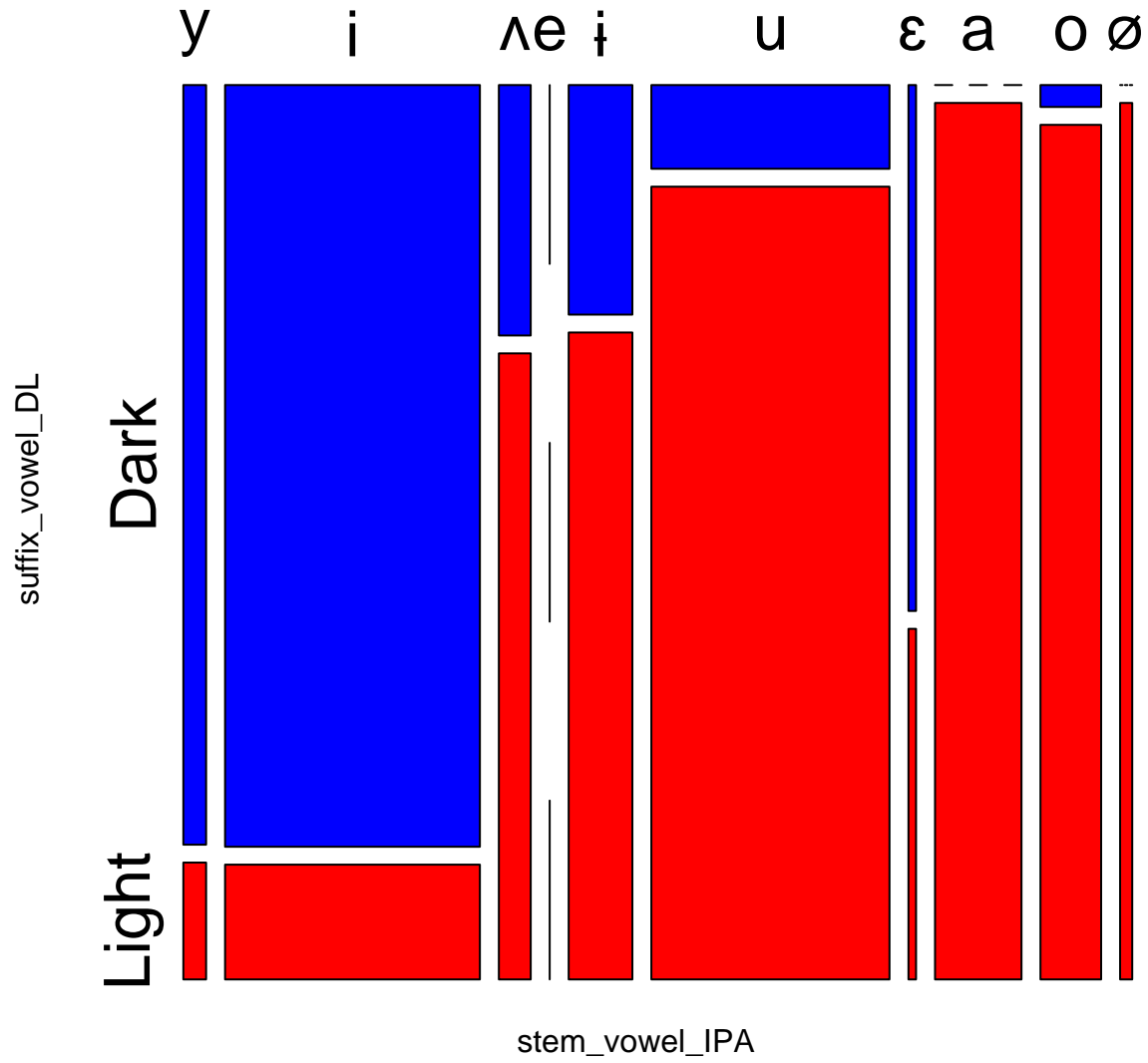
Kyeongnam



Chungnam Kongjoo



Kyeongnam Kosung



Intervening consonant effects

(1) No consonant (VV)

(2) Laryngeals (VHV)

(3) Other consonants (VCV, VCCV)

(1) No consonant (VV): /a/

- No overt suffix vowel
/ka-/ [ka-∅] 'go'

(1) No consonant (VV): /o/

- Light: **99% (n=334)**

/po-/ [p^o-a] 'see'

[pw-a] (glide formation)

[p-a] (glide deletion)

- Dark: **1%* (n=4)**

/c'o-/ [c'^o-ʌ] 'peck'

/k'o-/ [k'^o-ʌ] 'twist'

*All 4 cases from one town 공주(Kongjoo)

(2) Laryngeals (VHV)

- H-final
 - V-initial suffix: deletion
/nah-asʌ/[naasʌ] /nah-ini/ [naini] ‘give birth’
 - C-initial suffix: aspiration or gemination
/nah-ko/ [nak^ho] /nah-ni/ [nanni]
- “S-irregular”
 - V-initial suffix: deletion
/naʔ-asʌ/[naasʌ] /naʔ-ini/ [naini] ‘to improve’
 - C-initial suffix: tensification or gemination
/naʔ-ko/ [nak^ʔo] /naʔ-ni/ [nanni]

(2) Laryngeals (VHV): /a/

- Light: **98% (n=64)**
/nah-/ [na-a-to] ‘give birth’
- Dark: **2% (n=1)**
/naʔ-/ [na-ʌt’a] ‘get well’

(2) Laryngeals (VHV): /o/

- Light: **98% (n=136)**

/noh-/ [no-a] 'let go'

[nw-a] (glide formation)

[n-a] (glide deletion)

[no-wa] (glide insertion)

- Dark: **2% (n=3)**

/coh-/ [co-wʌsʌ] 'like'

(3) Other consonants (VCV, VCCV): /a/

- Light: **56% (n=1086)**
 - /cap-/ [c**a**p-**a**] ‘grab’
 - /palk-/ [p**a**lk-**a**] ‘bright’
- Dark: **44% (n=837)**
 - /cap-/ [c**a**p-**ʌ**] ‘grab’
 - /palk-/ [p**a**lk-**ʌ**] ‘bright’

No count effect

- Light: 56% (n=1086)
 - /cap-/ [cap-a] 'grab' VCV 57% (n=794)
 - /palk-/ [palk-a] 'bright'
- Dark: 44% (n=837)
 - /cap-/ [cap-ʌ] 'grab' VCV 43% (n=605)
 - /palk-/ [palk-ʌ] 'bright'

No count effect

- Light: 56% (n=1086)
/cap-/ [cap-a] 'grab'
/palk-/ [palk-a] 'bright' VCCV 56% (n=292)
- Dark: 44% (n=837)
/cap-/ [cap-ʌ] 'grab'
/palk-/ [palk-ʌ] 'bright' VCCV 44% (n=232)

(3) Other consonants (VCV, VCCV): /o/

- Light: **77% (n=493)**

/k'oc-/ [k'oc-a] 'peg'

/kolm-/ [kolm-a] 'fester'

- Dark: **23% (n=151)**

/k'oc-/ [k'oc-ʌ] 'peg'

/kolm-/ [kolm-ʌ] 'fester'

No count effect

- Light: 77% (n=493)

/k'oc-/ [k'oc-a] 'peg' VCV 77% (n=401)

/kolm-/ [kolm-a] 'fester'

- Dark: 23% (n=151)

/k'oc-/ [k'oc-ʌ] 'peg' VCV 23% (n=121)

/kolm-/ [kolm-ʌ] 'fester'

No count effect

- Light: **77% (n=493)**
/k'oc-/ [k'oc-a] 'peg'
/kolm-/ [k^olm-a] 'fester' VCCV 75% (n=92)
- Dark: **23% (n=151)**
/k'oc-/ [k'oc-ʌ] 'peg'
/kolm-/ [k^olm-ʌ] 'fester' VCCV 25% (n=30)

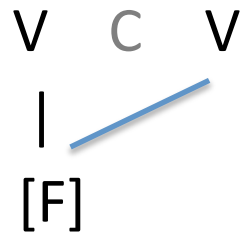
Summary

- Attrition of light vowel harmony is affecting the majority of Korean dialects.
- But, despite wide variation, in almost all dialects, light vowel harmony is consistently preserved when there is no intervening oral consonant.
- No gradient count effect: the number of intervening consonants does not matter.

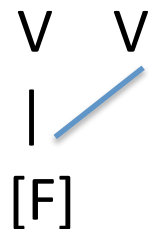
5. Discussion

Relativized vs. Strict locality

- Relativized locality
 - Seemingly non-local interactions are local when we assume only relevant targets are visible to the process.

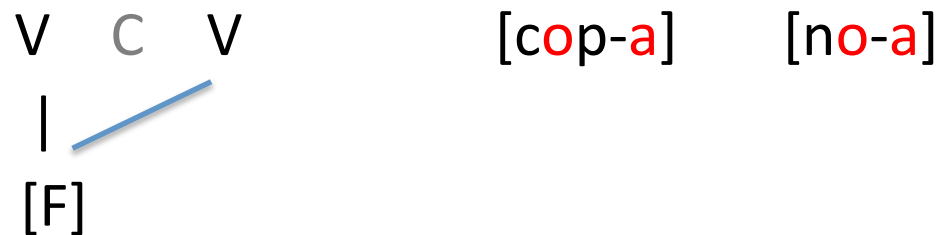


- Strict locality
 - Only strictly adjacent targets interact.

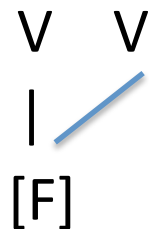


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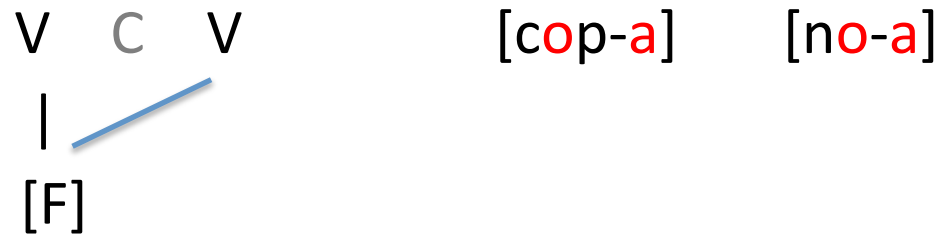


- Strict locality
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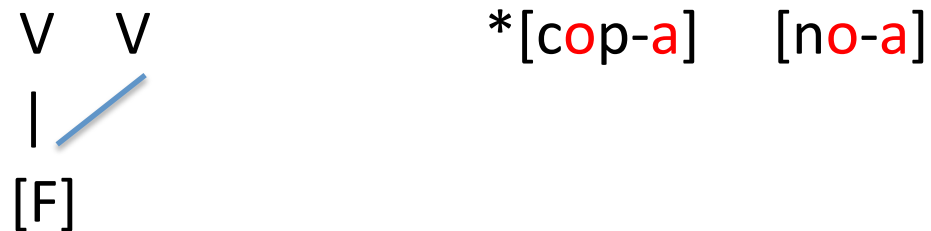


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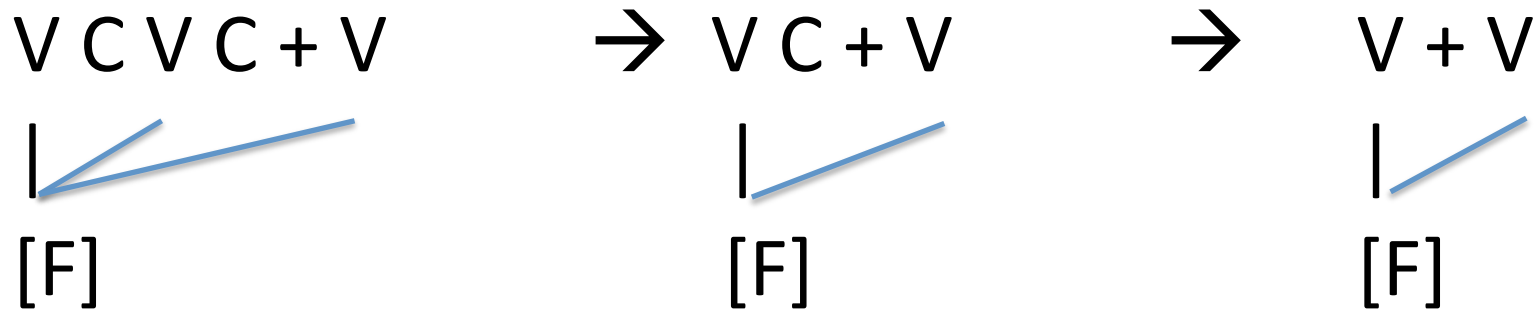


- Strict locality
 - Only strictly adjacent targets interact.



Constraining locality

- As harmony undergoes attrition, the domain of locality narrows.
- This is a further restriction in locality from the original harmony, where harmony applies iteratively to the entire word, applying to long-distance targets.



(MK, Sound symbolic) (cf. Duncan 2015, Finnish)

Putting it in OT terms

- Implicational hierarchy

HARMONIZE VV >> HARMONIZE VCV
(Strictly local) (Relatively local)

- A phonological process cannot allow a non-local interaction without also allowing a strictly local interaction.
- The emergence of the locality effect as a case of TETU (The Emergence of the Unmarked).

Putting it in OT terms

- Harmony attrition: Preference for a default [Λ] suffix form (SUFFIX=[Λ]) moves up the harmony constraint hierarchy.
 - HARMONY VV >> HARMONY VCV >> SUFFIX=[Λ]: harmony
 - HARMONY VV >> SUFFIX=[Λ] >> HARMONY VCV: local only
 - SUFFIX=[Λ] >> HARMONY VV >> HARMONY VCV: no harmony

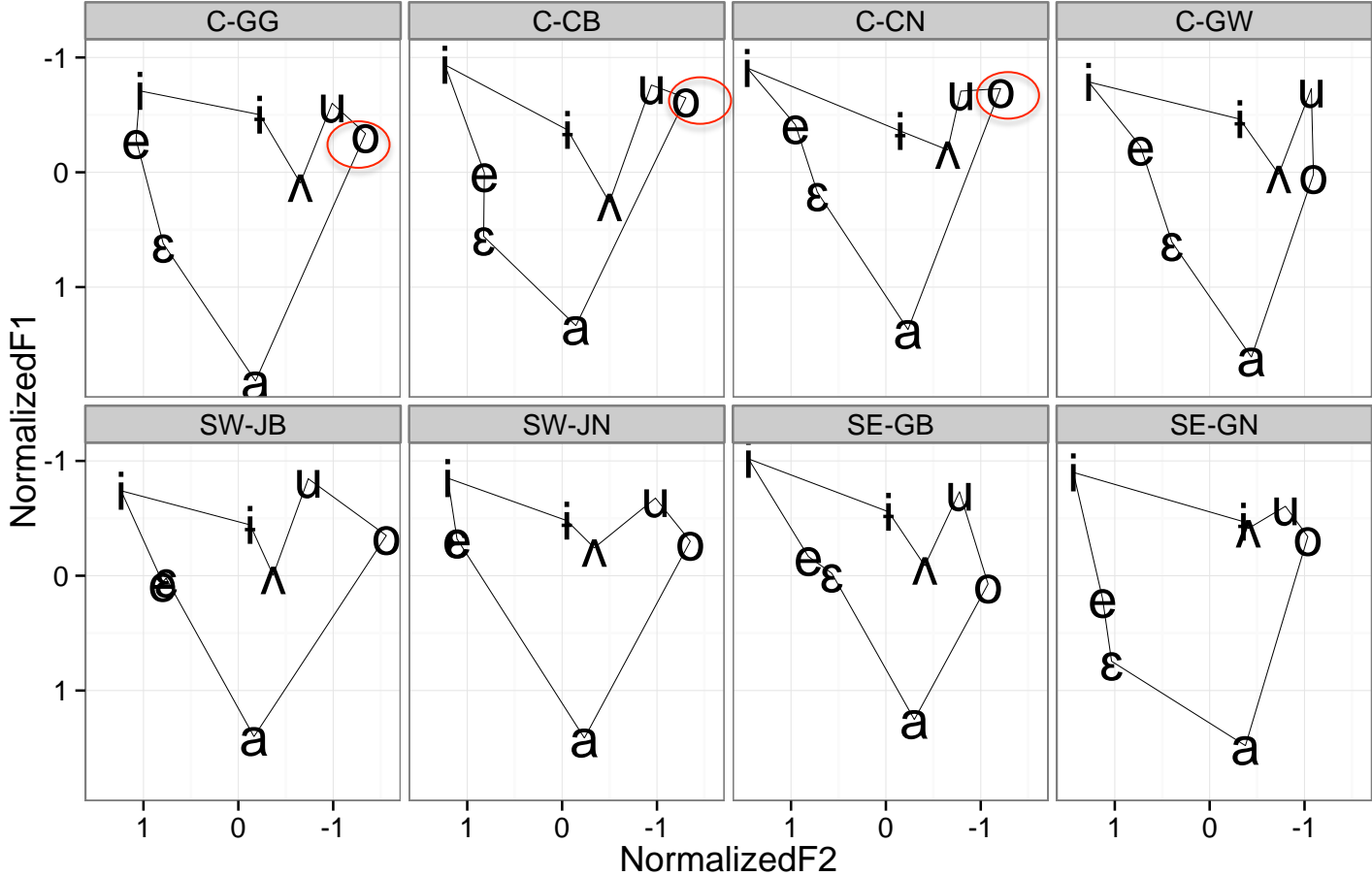
Conclusion

- The Emergence of The Unmarked in attrition of a phonological process
- Phonological variation as a fertile ground for discovery of emergent phonological properties

Future studies

- Vowel inventory/phonetic realization and harmony robustness
 - Neutral vowel effect
 - Dialectal variation in vowel inventory/vowel shift and its effect on robustness of harmony

Phonetic distribution of vowels in the same corpus



Thanks to

- The National Institute of the Korean Language
- SSHRC Partnership Development Grant
- Hyoung Seok Kwon for programming support.
- Audience at *MOLT* 2015 for feedback.

Functional alternative

- VV sequences tend to be subject to further phonological processes that obscure the original stem quality (e.g., glide formation) and retention of original harmony aids the recovery of correct UR. (H. Kang 2012)

/s' o-a/ > [s'wa]

/s' u-ʌ/ > [s'wʌ]

Functionally unmotivated harmony

- Stem-final /a/ is not subject to reduction before a vowel initial suffix. So, there is no functional motivation for /a/ to preferentially retain harmony in VV over VCV context.

Glide formation and harmony: /o/ stems

- If harmony retention is motivated by glide formation (=loss of stem vowel), we expect that when disharmony should occur more in forms without glide formation.
- This is not the case. The harmony rate is at ceiling regardless of whether glide formation applied or not.
 - Harmony rate with glide formation ([pw-a]): 99%
 - Harmony rate without glide formation([po-a]): 99%

Glide formation and harmony

- Glide formation occurs at a lower rate for VHV stems than for VV stems, a gradient opacity effect.
 - Glide formation in VV : 67% (/p \mathbf{o} - \mathbf{a} / > [pw- \mathbf{a}])
 - Glide formation in VHV : 44% (/n \mathbf{o} h- \mathbf{a} / > [nw- \mathbf{a}])
- But, again the harmony rate is at ceiling for both stem types.
 - Harmony in VV: 99%
 - Harmony in VHV: 98%

Phonetic Grounding?

- This explanation makes sense for /a/ stems as harmonic [a-a] sequences are phonetically more similar than disharmonic [a-ʌ] sequences.
- In many central dialects, /o/ is raised to a high vowel position.
- The original harmonic feature ([RTR] cf. S. Ko 2012) is synchronically opaque and the phonetic ground for treating [o-a] as phonetically more similar than [o-ʌ] is weak.

Individual dialects

	100 % Light	Variation	0 % Light
/o/ stems	25 dialects	26 dialects	0 dialects
/a/ stems	7 dialects	42 dialects	2 dialects