Tonology of Daegu Korean and an OT solution

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In this paper we will present the pitch patterns of Daegu Korean words as well as the rule of how a compound gets its accent, and an OT solution of the data, among others.

1. Segments and syllable structure

The phonemes of this dialect are as follows: short vowels /i, ɯ, u, e, o, ɔ, a/; long vowels/iː, ɯː, uː, eː, oː, ɔː, aː/; semivowels /w, j/; consonants /p, pʰ, p', t, tʰ, t', ʧ, ʧʰ, ʧ', k, kʰ, k', m, n, ŋ, s, s', h, r/.

The syllable structure in Daegu Korean, and maybe also in other Korean languages, can be represented by a basic structure like CGVC, in which C stands for consonants, G for glides or semi-vowels, and V for vowels. V is believed indispensable, and all other elements are optional. Hence eight possible types of syllables allowed. They are V, VC, CV, CVC, GV, GVC, CGV and CGVC (Kim & Shibatani 1976).

2. Pitch pattern inventory

Several scholars have described the tone system of Daegu dialect (Kim 1994a, 1994b; Rah 1974; Son 2017; etc.). Our work will be mainly based the results of Son (2017), which is the latest one.

In Daegu Korean dialect, as in many other tonal Korean dialects, every word has a tonal pattern, which is contrastive. According to Son (2017), there are n+1 oppositions for n-syllable words. This accent type is the most widely distributed in the region of north Gyeongsang-do. These are shown in table (1) with examples.

(1)

syllables / types		1	2	3	4	5
⓪	long vowel	peː 'twofold' R	uː.pi 'umbrella' H:F	maː.nu.ra 'wife' H:HL	iː.sɔn.seŋ.nim 'Mr. Lee' H:HLL	paː.n.to.ʧʰe.san.ɔp 'semiconductor industry' H:HLLL
	short vowel	pe 'boat' F	ka.ʧi 'branch' HF	mu.ʧi.ke 'rainbow' HHL	jɔ.ʧa.ʧʰin.ku 'girlfriend' HHLL	kuk.p'i.ju.hak.s'eŋ 'student with government expence' HHLLL
①		pe 'pear' F	u.ri 'cage' HL	mjɔ.nɯ.ri 'daughter-in-law' HLL	nam.ʧa.ʧʰin.ku 'boyfriend' HLLL	son.ʧa.mjɔ.nɯ.ri 'granddaughter-in-law' HLLLL
②			u.ri 'we' LF	mi.na.ri 'watercelery' LHL	sin.hon.jɔ.heŋ 'honeymoon' LHLL	ʧaŋ.kɔ.ri.jɔ.heŋ 'long trip' LHLLL
③				sa.ta.ri 'ladder' LLF	kim.sɔn.seŋ.nim 'Mr. Kim' LLHL	a.kʰa.si.a.kʰot 'acacia blossoms' LLHLL
④					ka.ɯr.p'a.ram 'autumn breeze' LLLF	ɔm.ʧi.son.k'a.rak 'thumb' LLLHL
⑤						pi.heŋ.ki.jɔr.rjo 'plane fuels' LLLLF

In table (1), H, L, R and F stand for high tone, low tone, rising tone and falling tone respectively. Each syllable should and can only be linked with one of these four tones.

The pitch patterns for words are dubbed ⓪, ①, ②, ③, ④ and so forth. Words of Type ⓪ consisting of one syllable can be realized into two surface forms as respect to the length of the vowel in it. For words with a long vowel, the tone will be R, while for those with a short vowel, the tone will be F. Words of Type ⓪ consisting of two and more syllables are not affected by vowel length other than the duration itself, and the pitch patterns are HF, HHL, HHLL and so forth by adding L to the end of it to make it longer.

Words of the types other than Type ⓪, i.e. Type ①, ②, ③ and so forth, can have only one H or F in each of them. The number for their naming indicates the exact position of the syllable with an H or F in the word counted from the left.

The H/F element in a tone of non-⓪ type an accent kernel. Hence Type ⓪ is a kernel-less tone, and all other types are kernel-having tones.

The syllable of a monosyllabic words with a short vowel of both Type ⓪ and Type ① should be surfaced as an F tone. They are differentiated based on what they will behave in compound words, which we will talk about in later sections.

3. The compound rule

When two words form a compound, mostly the word on the left keeps its accent, and the word on the right loses its accent, except when the first word is final-accented and the second word is not a ⓪ type word, in which case, the word on the right keeps its accent, and the word on the left loses its accent. If there are three or more componential parts in a compound word, they will be combined each one to the neighboring one cyclically.

4. Phonological analysis

4.1 Making the system simpler

It will be clearer to observe the system if we eliminate the examples as shown in (2).

The circled numerals at the heads of the rows indicate the position of the accent kernel. The accent kernel takes place between the accented syllable and the next syllable.

We have interpreted words of Type ⓪ as kernelless in Daegu dialect. While kernel may remain in the second elements of compound nouns with other types, ⓪ does not keep its pitch patterns.

A word with a long tone at the beginning of the word (which is referred to as a long vowel syllable) appears in a slightly ascending tone in a single syllable word alone, but appears in a high tone in more than one syllable. It is similar to the tone of HF, HHL, HHLL, … at the point of tonal type. The differences can be attributed to the difference of the vowel length, and is combined to make ⓪ types. The long vowel is regarded as a phoneme, and not the reflection of accent difference.

(2)

syllables / types		1	2	3	4	5
⓪	long vowel	R	HF	HHL	HHLL	HHLLL
	short vowel	F				
①		F	HL	HLL	HLLL	HLLLL
②			LF	LHL	LHLL	LHLLL
③				LLF	LLHL	LLHLL
④					LLLF	LLLHL
⑤						LLLLF

By observation, we can easily see that a) in this system, R, F and H are not contrastive; b) if we assume there is always a boundary tone L% attached to the end of a word, then F at the end may be

actually H. (H+L% linked to the same syllable.) and c) if we assume there is a boundary tone %L attached to the beginning of a word, and can only be realized on a long vowel, in isolation, then R may be also H actually. (%L+H linked to the same syllable.) So we can combine R, F and H together as H, and the system will be simplified as having only H and L, as shown in (3)

(3)

syllables / types	1	2	3	4	5
⓪	H(H)	HH	HHL	HHLL	HHLLL
①	H	HL	HLL	HLLL	HLLLL
②		LH	LHL	LHLL	LHLLL
③			LLH	LLHL	LLHLL
④				LLLH	LLLHL
⑤					LLLLH

After doing this, we can find some traits of the system easily. a) Every word must have one and only one **accent**. b) Tone bearing unit (TBU) should be syllable. c) In words of Type ⓪, the accent is realized as HH on the first two syllables, or an H if monosyllabic. d) In words of other types, the accent is realized as an H on a specific syllable. e) Unaccented syllables are always linked with an L tone.

4.2 Formalizing the compound rule

We have described the compound rule in words. To make it phonologically more formalized, we still can do something.

In the compound rule, words are actually classified into three groups. They are words of Type ⓪, words of other types with an accent or H at the last syllable, and words of other types other than Type ⓪ with an accent at syllables of another position than the last one. If we name these three groups of words respectively as A, B and C, as shown in (4), the compound rule can be rewritten into phonological rules as in (5).

(4)

A	words of ⓪ type	H of Type ⓪, HH. HHL etc.
B	final-accented words	H of type ①, LH, LLH, etc
C	other words	HL, HLL, LHL, LLHL, LHLL

(5) (O means the accent of the word is lost in the compound)

A+A → AO e.g. HH+HH → HHLL	**B+A → BO** e.g. **LH+HH → LHLL**	C+A → CO e.g. HL+HH → HLLL
A+B → AO e.g. HH+LH → HHLL	**B+B → OB** e.g. **LH+LH → LLLH**	C+B → CO e.g. HL+LH → HLLL
A+C → AO e.g. HH+HL→ HHLL	**B+C → OC** e.g. **LH+HL→ LLHL**	C+C → CO e.g. HL+HL → HLLL

4.3. An Optimality Theory (OT) analysis of the compounding rule

OT works with a set of ordered constraints, an input and the candidates generated from the input, in a tableau. The constraints we are supposing for the present analysis are as follows.

(6) Constraints

ALIGN-A-LEFT: If an Type A word keeps its accent, but not on the left side of a compound, assign a * to the candidate.

ALIGN-B-RIGHT: If an Type B word keeps its accent, but not on the right side of a compound, assign a * to the candidate.

MAX-ACCENT-LEFT: The left part of a compound should keep its accent in a compound.

***LAPSE**: if neither of the two parts of a compound has an accent, assign a * to the candidate.

***CLASH**: if both of the two parts of a compound has an accent, assign a * to the candidate

Among the five constraints we have proposed, there are three faithfulness constraints, ALIGN-A-LEFT, ALIGN-B-RIGHT and MAX-ACCENT-LEFT, and two markedness constraints, *LAPSE and *CLASH.

ALIGN-A-LEFT and ALIGN-B-RIGHT were proposed based the observation that in a word of Type A, the accent is always on the left most syllables, while in a word of Type B, the accent is always on the right most syllable. MAX-ACCENT-LEFT was proposed because among all the nine possible combinations of the three types, A, B and C, seven produce compound words with the left part keeping its accent, and the right part losing its accent. *LAPSE and *CLASH were proposed based on the observation that in the process of compounding two words together into one, only one of the two componential words can keep its accent. The five constraints are then arranged in a hierarchy like the following.

(7)

*LAPSE, *CLASH >> ALIGN-A-LEFT, ALIGN-B-RIGHT >> MAX-ACCENT-LEFT

All the nine possible combinations go through this grammar and get their respective correct output. Here are some of them as example.

(8) A + C → A-O

input: A+C	*LAPSE	*CLASH	ALIGN-A-LEFT	ALIGN-B-RIGHT	MAX-ACCENT-LEFT
→ A-O					
O-C					*!
O-O	*!				*
A-C		*!			

(9) B + A → B-O

input: B+A	*LAPSE	*CLASH	ALIGN-A-LEFT	ALIGN-B-RIGHT	MAX-ACCENT-LEFT
→ B-O				*	
O-A			*		*!
O-O	*!				*
B-A		*!	*	*	

(10) B+B → O-B

input: B+B	*LAPSE	*CLASH	ALIGN-A-LEFT	ALIGN-B-RIGHT	MAX-ACCENT-LEFT
B-O				*!	
→ O-B					*
O-O	*!				*
B-B		*!		*	

(11) B+C → O-C

input: B+C	*LAPSE	*CLASH	ALIGN-A-LEFT	ALIGN-B-RIGHT	MAX-ACCENT-LEFT
B-O				*!	
→ O-C					*
O-O	*!				*
B-C		*!		*	

(12) C+B → C-O

input: C+B	*LAPSE	*CLASH	ALIGN-A-LEFT	ALIGN-B-RIGHT	MAX-ACCENT-LEFT
→ C-O					
O-B					*!
O-O	*!				*
C-B		*!			

5. Discussion

5.1 Basic vs. Non-Basic

From the above analysis, it appears that Type A and B are more basic than Type C, which is always derivable from the former two.

Evidence 1:

Monosyllabic words are either Type A or Type B, which can be identified by adding a suffix or making a compound.

Evidence 2:

C is derivable from B and A's combinations according to the compound rule as in , while A is not derivable from other B and C, and B is not derivable from A and C.

(13)

B+A → BO e.g. LH+HH → LHLL (**Type C**)

Evidence 3:

In OT grammar, A and B are actively trying to keep their accent (ALIGN-A-LEFT & ALIGN-B-RIGHT), while C is not specified in any constraints.

So, if we are forced to differentiate basic ones from non-basic ones, Type A and B seem more basic than Type C.

5.2 Left accented, Right accented, and Non-directionally accented

Enlightened by the OT analysis, we might be safe to claim that the three Types of words, A, B and C are having accents of different traits. The accent associated with words of Type A is left oriented,

and always tends to stick to the left end. The accent associated with words of Type B is right oriented, and always tends to stick to the right end. And the accent associated with words of Type C is non-oriented. The left accent surface itself as HH on the left end of a word, and the right accent surface itself as an H on the right end of a word. The non-oriented accent is surfaced as an H on any one syllable except the last one.

5.3 Pitch pattern inventory revisit

If we start deriving the pitch patterns of this language from a monosyllabic word of Type A and another monosyllabic word of Type B through the compound rule, we **can and only can** derive the whole inventory of the pitch patterns shown in (14). No more, no less.

In table 14, A stands for a monosyllabic Type A word, B for a monosyllabic Type B word, X for a monosyllabic word of Type A or B, XX for a disyllabic word of any kind, and etc.

(14)

types \ syllables	1	2	3	4
⓪ Combinations which can producing the pattern	H(H) A	HH A+A A+B	HHL A+XX HH+X	HHLL A+HLL HH+XX HHL+X
① Combinations which can producing the pattern	H B	HL B+A	HLL B+HH HL+X	HLLL B+HHL HL+XX HLL+X
② Combinations which can producing the pattern		LH B+B	LHL LH+A B+HL	LHLL B+HLL LH+HH LHL+X
③ Combinations which can producing the pattern			LLH B+LH LH+B	LLHL B+LHL LH+HL LLH+A
④ Combinations which can producing the pattern				LLLH B+LLH LH+LH LLH+B

So, it might be safe to claim that the whole inventory of pitch patterns in this language is built on three things: a) A left accent, b) A right accent, and c) A compound rule.

Multisyllabic non-compound simple words **can and only can** pick a pitch pattern from this inventory. Pitch patterns not found in this inventory like *LHHLL, *LLHH, *HHHL etc are not grammatical.

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