A Span Theory Analysis of Lexical Tone Patterns in Japanese Dialects

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Abstract

This paper proposes a Span Theory analysis of lexical tone patterns of simplex words in multi-pattern dialects such as Tokyo, Osaka, Hirosaki, and Shizukuishi but also N-pattern dialects such as Kagoshima and Miyakonojo. By replacing the accent tier in multi-pattern dialects with a linked tone coupled to a floating tone lexically specified, and the falling pattern of 2-pattern dialects by two floating tones, we show that it is possible to analyze both N-pattern and multi-pattern dialects with the same constraints. The typological variation on the timing of tonal change can be explained by the direction and domains of tonal alignment constraints while the presence or absence of contour tones can be explained by the relative ranking of MAX-TONE and *CONTOUR.

Key Words: Optimality Theory, Span Theory, pitch accent, tone, Japanese dialects

1. Introduction

Analyses of Tokyo Japanese tonal patterns in generative phonology (McCawley, 1968), autosegmental theory (Haraguchi, 1977) or Optimality Theory (Kubozono, 1995; Alderete, 2001; Labrune, 2012) make use of an accent kernel, separate from tones, usually defined as the last high-toned mora before a lexical pitch fall. However, the tonal melody of a word and the position of the accent kernel can be fully deducted from each other in Tokyo Japanese. It is therefore redundant to use both a tonal tier and an accent tier in this dialect. Furthermore, the accent kernel interacts with initial lowering in Tokyo Japanese, initial raising in Narada Japanese (Yamanashi Pref.) and with other lexical tones in dialects that have registers (Kyoto and Osaka *inter alia*). It would then be necessary to posit constraints to assign tones to the accent kernel and other faithfulness or MAX-TONE constraints specific to the tones linked to the accent kernel, to be able to account for the above phenomena. By using only a tonal tier, the above phenomena can be explained by the interaction between constraints on lexical tones and more general constraints on tone. In this paper, we will propose a span theoretical account of the tonal pattern of simplex words in several dialects using only a tonal tier and similar constraints.

2. Accent typology of Japanese dialects

2.1 Multi-pattern and N-pattern dialects

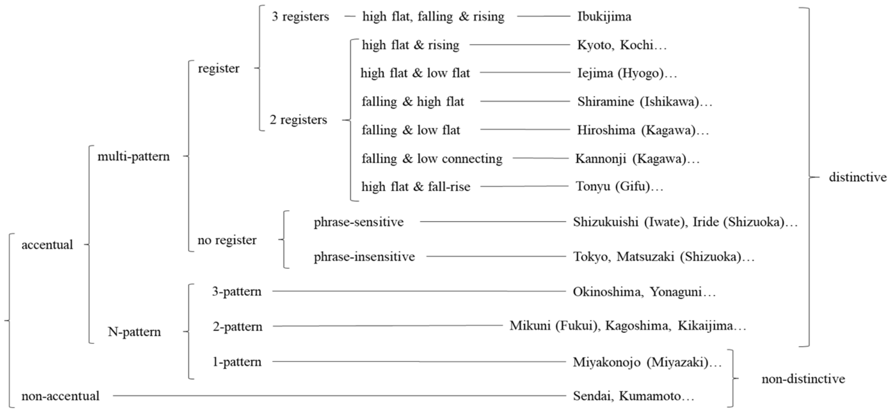

Figure 1. Typology of accent in Japanese (translated from Uwano, 1989)

As shown in Figure 1, accentual dialects can be divided into two main families: N-pattern dialects and multi-pattern dialects. In N-pattern dialects, the number of possible tonal patterns is fixed and does not depend on the number of tone bearing units (TBU) in the word[1]. For example, the Kagoshima dialect is a 2-pattern dialect (Kubozono, 2018): words may either end with a tonal fall (Type A) or with a tonal rise (Type B). Type B monosyllabic words are pronounced with a mid tone in isolation. When particles are suffixed to a word, the timing of the rise or the fall will change. In the following sections, diacritics for tones are from the International Phonetic Alphabet.

(1) Kagoshima dialect

a. sàkánà 'fish'	sàkàná-gà 'fish NOM'	sàkànà-kárà 'from (the) fish'
b. kòkòró 'heart'	kòkòrò-gá 'heart NOM'	kòkòrò-kàrá 'from (the) heart'
c. hī 'fire'	hì-gá 'fire NOM'	hì-kàrá 'from (the) fire'

The Miyakonojo dialect (Miyazaki Pref.) has only one pattern, a rise similar to the Type B in Kagoshima (Kubozono, 2018).

(2) Miyakonojo dialect

a. sàkàná 'fish'	sàkànà-gá 'fish NOM'
b. kòkòró 'heart'	kòkòrò-gá 'heart NOM'

In multi-pattern dialects, the number of possible tonal patterns depends on the length of the word. For example, in Tokyo Japanese, there are *n* + 1 possible patterns for a given number of morae *n*, e.g. for 3-mora long words four different patterns are observed. In Tokyo, the tonal fall is distinctive and its timing is lexically encoded (Uwano, 1989, 2012; Kubozono, 2018). Contrary to Kagoshima, its timing will not change even if particles are affixed. Examples (3b) to (3d) are accented, i.e. there is a tonal fall, while example (3a) is said to be unaccented. The position of the accent kernel is indicated with an apostrophe after it. In the Tokyo dialect, there is a tonal rise called initial lowering at the beginning of minor phrases (Poser, 1984), except if the first mora is accented.

(3) Tokyo dialect

a. sàkáná 'fish'	sàkáná-gá 'fish NOM'
b. ká'bùtò 'helmet'	ká'bùtò-gà 'helmet NOM'
c. kòkó'rò 'heart'	kòkó'rò-gà 'heart NOM'
d. òtókó' 'man'	òtókó'-gà 'man NOM'

Multi-pattern dialects can further be divided into dialects with registers such as the Osaka dialect and without registers such as the Tokyo dialect. A register is a tonal melody found independently from the presence or absence of an accent kernel and is lexically encoded. For example, Osaka has two registers: a flat register, also called high register (4a, c) and a rising register, also called low register (4b, d). Therefore, there is a total of 2*n* possible patterns for a given number *n* of morae (initially accented low register words as well as finally accented high register words do not exist).

(4) Osaka dialect (Sugito, 1995)

a. unaccented high register:	sákáná 'fish'	
b. unaccented low register:	sùzùmé 'sparrow'	
c. accented high register:	kó'kòrò 'heart'	átá'mà 'head'
d. accented low register:	kàbú'tò 'helmet'	dèp̀pâ' 'protruding tooth'

Although only the tonal tier is used in the present analysis, for practicality reasons, the distinctive tonal change in multi-pattern dialects will still be called the accent kernel.

2.2 Types of accent kernel

In Tokyo or Osaka, the accent kernel is a tonal fall, but it is not always the case in other dialects. According to Uwano (2012), there are three types of accent kernels[2]. Dialects such as Tokyo and Osaka possess a lowering kernel. The Narada dialect is the opposite with a raising kernel: the accented mora is low and the following mora is high. Narada is not only the mirror image of Tokyo regarding the type of accent kernel but also regarding the minor phrase initial tonal change: it is a fall in Narada. However, unlike Tokyo where there is a L stretch from after the accent kernel to the end of the word, in Narada, there is no H stretch after the accent kernel: only the following mora is H and the ones after it are L as in (5b).

(5) Narada dialect

a. sákànà 'fish'	sákànà-gà 'fish NOM'
b. kà'bútò 'helmet'	kà'bútò-gà 'helmet NOM'
c. kókò'ró 'heart'	kókò'ró-gà 'heart NOM'
d. ótòkò' 'man'	ótòkò'-gá 'man NOM'

The last type of kernel is the ascending kernel found in the Shizukuishi dialect (Iwate Pref.). In this dialect, all morae up to the accented mora are low and the accented mora is high. A fall is observed right after the accent kernel only when the word is in "phrase-final position" (Uwano, 2012: 1425). In Uwano's terminology, a phrase is "defined semantically as a unit containing at most one focused element" (Uwano, 2012: 1423). It appears to be close to Poser's minor phrase and also englobes connective forms such as sàkànà-tò kábútó-tó kòkórò ('a fish, a helmet and a heart'). The phrase-final position will be noted "#" and the non-phrase-final position "…".

(6) Shizukuishi dialect

a. sàkànà# 'fish'	sàkànà-gà# 'fish NOM'	sàkànà…
b. ká'bùtò# 'helmet'	ká'bùtò-gà# 'helmet NOM'	ká'bútó…
c. kòkó'rò# 'heart'	kòkó'rò-gà# 'heart NOM'	kòkó'ró…
d. òtòkô'# 'man'	òtòkó'-gà# 'man NOM'	òtòkó'…

Uwano also classifies the Hirosaki dialect (Aomori Pref.) as an ascending kernel. Hirosaki and Shizukuishi have indeed very similar tone patterns. There are only two differences between the two dialects: in the Hirosaki dialect, the fall in phrase-final position does not occur just after the accent kernel but at the right edge, and unaccented words always end with a rise.

(7) Hirosaki dialect

a. sàkàná# 'fish'	sàkànà-gá# 'fish NOM'	sàkàná…
b. ká'bútò# 'helmet'	ká'bútó-gà# 'helmet NOM'	ká'bútó…
c. kòkó'rò# 'heart'	kòkó'ró-gà# 'heart NOM'	kòkó'ró…
d. òtòkô'# 'man'	òtòkó'-gà# 'man NOM'	òtòkó'…

Positing Hirosaki as having the same ascending kernel as Shizukuishi is problematic. If what is distinctive in this dialect is the position of the rise, then unaccented words have to be considered as accented. Accordingly, /sakana/ would be accented on the /na/ and /sakana-ga/ on the /ga/. Another problem comes from the phrase-final fall: it does not occur in unaccented words. To resolve these two problems, the present article proposes that Hirosaki actually has a lowering kernel similarly to Tokyo, and that the rise observed before the accent kernel is similar to the initial lowering in Tokyo. This can explain why there are a rise and no fall in phrase-final position in unaccented words. It will also be shown in section 4 that the lack of a fall in the non-phrase-final position for accented words as well as the "delay" of the fall in phrase-final position can be accounted for with an alignment constraint forcing the fall to occur only at the end of the phrase.

2.3 Underlying representation

This paper adopts an underlying representation for tones similar to that of Pierrehumbert and Beckman (1988) where most of the TBUs are underspecified for tone and the accent kernel is a linked tone followed by a floating tone. The accent kernel in Tokyo, Hirosaki, and Osaka is a linked H tone followed by a floating L tone.

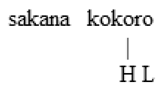

Figure 2. Underlying representation of tones in the Tokyo and Hirosaki dialects

For Osaka, similar to Pierrehumbert and Beckman (1988), it will be posited that the low register is a L tone linked to the first mora of a word. However, the high register will be considered as the default tonal melody. Unless a L tone is specified, the grammar will insert H tones and so there is no need to specify a H tone in the lexicon for high register words.

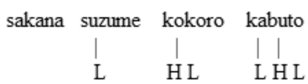

Figure 3. Underlying representation of tones in the Osaka dialect

The Narada dialect is the opposite of the Tokyo dialect: its accent kernel is a linked L tone followed by a floating H tone. The Shizukuishi dialect is partially similar to the Narada dialect in that the distinctive melody implies a tonal rise; however, the timing of the rise differs: the accent kernel in Shizukuishi is a floating L tone followed by a linked H tone.

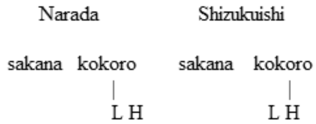

Figure 4. Underlying representation of tones in the Narada and Shizukuishi dialects

Lastly, Type B in Kagoshima will be considered as the default pattern and that Type A words possess a floating H tone followed by a floating L tone. In Miyakonojo, no tones are lexically specified.

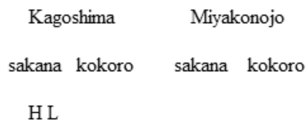

Figure 5. Underlying representation of tones for the Kagoshima and Miyakonojo dialects

This tonal account has more generalizing power than the accent account. As it was pointed out in section 1, the accent kernel is usually defined as the last high-toned mora before a lexical pitch fall in Tokyo Japanese. If this definition were extended to account for other dialects, then we could say that the accent kernel is the last mora or syllable before a lexical pitch change. But that definition would not cover the ascending kernel and there is no satisfying definition that could encompass all kernel types. With the tonal account, the “accent kernel” is the TBU with a lexically linked tone. In the same way the accent account requires some mechanism to ensure that the right tones are associated to the right TBUs, in the tonal account some mechanism is necessary to explain why only one type of tonal cluster is allowed in each dialect: word well-formedness constraints will forbid encoding lexically tones or tonal clusters that are not in the dialect's tonal inventory.

3. Span Theory

Span Theory has been developed within Optimality Theory to account for feature spreading. McCarthy (2004: 3) defines a featural span as “a constituent whose terminal nodes are segments in a continuous string”. All segments are parsed into a span for every distinctive feature and they may not belong to two different spans for the same feature. For every span S of a feature F, exactly one segment H is designated as the head of S and the other segments of S take the value of H for the feature F.

McCarthy does not posit constraints on the well-formedness of spans as no candidate with unparsed segments or with headless spans may be generated in this framework. However, he admits that it is possible that not all segments in a span take the value of its head. Instead, it is possible that heads are akin to targets in a target-and-interpolation model of phonetic interpretation, where "phonetic interpretation could just as well involve a gradual approach to and/or decline from the span head's target value" (McCarthy, 2004: 3). Pierrehumbert and Beckman (1988) has shown that this model of phonetic interpretation where only the accented mora and a few other morae are specified for tone can explain the pitch values for Tokyo and Osaka Japanese, and so in this paper it is considered that except for the span heads, TBUs can be left underspecified for tone.

In Osaka, Hirosaki, and Shizukuishi, finally-accented words are pronounced with a falling contour tone in isolation. To be able to account for contour tones in this framework, the present study also proposes that the terminal nodes of featural spans may be shorter than segments. Because of the lack of articulatory data, nothing will be postulated on the precise alignment of spans and articulatory events (onset, c-center, release or offset, see Gafos (2002)). When a segment is divided into several spans, they will be noted as S_1 and S_2 in the tableaux.

4. Analysis

4.1 Constraints

In Optimality Theory (Prince & Smolensky, 1993/2004), candidates are generated from the input and are evaluated for every constraint. The candidate chosen as output is the one violating the lowest ranking constraint in comparison to the other candidates. Constraints are universal but their ranking is language-dependent. Constraints relevant to the present analysis are as follows.

(8) a. General constraints on spans (McCarthy, 2004)

*A-SPAN (F): assign one violation mark for every pair of adjacent spans of the feature [F].

FAITHHEADSPAN (F): assign one violation mark for every segment specified for the feature [F] in the input that is not the head of a F span in the output.

b. General constraints on tone adapted from Yip (2002) and modified for spans

MAX-T: no deletion of tones. Assign one violation mark for every tone in the input that has no correspondent in the output.

*CONTOUR: no contour tones. Assign one violation mark for every TBU belonging to more than one tone span.

*{H, L, M}: no {H, L, M} tones. Assign one violation mark for every TBU in a {H, L, M} span.

c. NOLAPSE-L / Wd: no tonal lapses. Assign a violation mark for every fully L-toned word in a phrase (Ito & Mester, 2017).

d. Alignment constraints on tone

ALIGN{Left, Right}(D, T): the {left, right} edge of domain D is aligned with tone T.

Assign one violation mark for every TBU between the {left, right} edge of D and T or $+\infty$ if there is no T in D.

ALIGN{Left, Right}(T, D): tone T is {leftmost, rightmost} in domain D. Assign one violation mark for every TBU between the {left, right} edge of D and T.

*M, that forbids mid tones, is one of the highest-ranked constraints for all dialects but Kagoshima so it will not be added in the tableaux. Two prosodic domains will be considered: the "word" and the "phrase". Definitions of prosodic units differ slightly from dialect to dialect but for the sake of typological clarity, the term "word" will be used broadly for the *bunsetsu*, which can be defined as a noun with or without adpositions or a verb/adjective with or without auxiliaries[3]; and the term "phrase" for the minor phrase (Poser, 1984). Two tonal changes will also be considered: the fall and the rise. A fall is defined as the boundary between a H span and a L span and a rise as the boundary between a L span and a H span. In the following tableaux, H spans will be noted using parentheses, L spans using square brackets and M spans using braces. The head of each span will be underlined.[4]

4.2 Tokyo dialect

In the Tokyo dialect, the relevant alignment constraints are ALIGNLEFT (Fall, Word) to align the accentual fall with the left edge of the word and ALIGNLEFT (Phrase, Rise) to align initial lowering with the left edge of the phrase. Ranking arguments are given in Tableau 1.

Tableau 1. Tokyo dialect

	*CONT	FTH	MAX	ALIGNL(Fall, Wd)	ALIGNL(Phr,Rise)	*ASPAN
i. sakana→[sa](kana)						
a. ~ [sakana]					W	L
b. ~ [saka](na)					W	
ii. kabuto→(ka)[buto] | H L						
a. ~ (kabuto)			W	L		L
b. ~ (kabu)[to]				W		
c. ~ [ka_1](a_2)[buto]	W				L	W
d. ~ (ka_1)[$a_2$buto]	W					
e. ~ [ka](bu)[to]		W		W	L	W
iii. otoko→[o](toko) | H L						

	*CONT	FTH	MAX	ALIGNL(Fall, Wd)	ALIGNL(Phr,Rise)	*ASPAN
a. ~ [o](to)[ko]		W	L			W
b. ~ [o](toko$_1$)[o$_2$]	W		L			W

Using topological sorting, the following constraint lattice is found. Rankings between FAITHHEADSPAN (T) and *CONTOUR, between MAX-T and ALIGNLEFT (Phrase, Rise) and between ALIGNLEFT (Fall, Word) and *A-SPAN (T) are unknown.

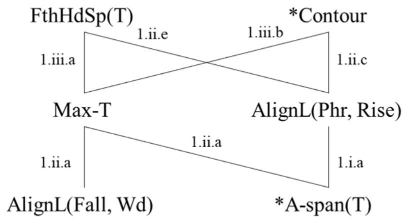

Figure 6. Constraint ranking in the Tokyo dialect

4.3 Narada dialect

In the Narada dialect, only the tonal change differs from Tokyo in the relevant alignment constraints. Also, contrary to Tokyo, *H is active in Narada. Ranking arguments are given below.

Tableau 2. Narada dialect

	*CONT	FTH	MAX	ALIGNL (Rise, Wd)	ALIGNL (Phr, Fall)	*A-SPAN	*H
i. sakana→(sa)[kana]							
a. ~ [sakana]					W	L	L
b. ~ (saka)[na]					W		W
ii. kabuto→[ka](bu)[to] | L H							
a. ~ [kabuto]			W		W	L	L
b. ~ (ka)[buto]		W	W		L	L	
c. ~ [kabu](to)				W	W	L	
d. ~ (ka$_1$)[a$_2$](bu)[to]	W				L	W	W
e. ~ [ka](buto)					W	L	W
iii. otoko→(o)[toko] | L H							

	*CONT	FTH	MAX	ALIGNL (Rise, Wd)	ALIGNL (Phr, Fall)	*A-SPAN	*H
a. ~ (o)[to](ko)		W	L	W		W	W
b. ~ (o)[toko_1](o_2)	W		L			W	W
iv. arubaito→(a)[ruba](i)[to] | L H							
a. ~ (a)[ru](ba)[ito]		W		L			
b. ~ (a)[rubaito]			W	L		L	L
c. ~ (a)[ruba](ito)						L	W

Using topological sorting, the following constraint lattice was found. The ranking is almost similar to the Tokyo dialect, with only *H taking the place of *A-SPAN (T).

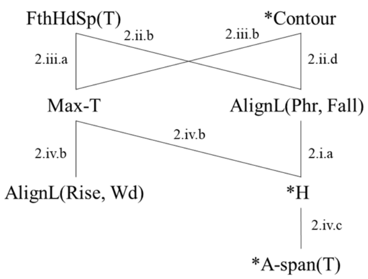

Figure 7. Constraint ranking in the Narada dialect

4.4 Hirosaki dialect

In the Hirosaki dialect, what differs from Tokyo is not the tonal change but the direction of the alignment constraints and the domain of both the fall and the rise: the relevant constraints are ALIGNRIGHT (Fall, Phrase) and ALIGNRIGHT (Word, Rise). Ranking arguments are given below.

Tableau 3. Hirosaki dialect

	*CONT	FTH	MAX	ALIGNR (Fall, Phr)	ALIGNR (Wd, Rise)	*A-SPAN
i. sakana#→[saka](na)						
a. ~ [sakana]					W	L
ii. kabuto#→(kabu)[to] | H L						
a. ~ (kabuto)			W			L

	*CONT	FTH	MAX	ALIGNR (Fall, Phr)	ALIGNR (Wd, Rise)	*A-SPAN
b. ~ (ka)[buto]				W		
c. ~ [ka$_1$](a$_2$bu)[to]	W				L	W
d. ~ (ka)[bu](to)				W	L	W
e. ~ [ka](bu)[to]		W			L	W
iii. otoko#→[oto](ko$_1$)[o$_2$] | H L						
a. ~ [oto](ko)	L		W			L
b. ~ [o](toko$_1$)[o$_2$]					W	
c. ~ [o](to)[ko]	L	W			W	
iv. kabuto…→(kabuto) | H L						
a. ~ (kabu)[to]			L	W		W

The constraint ranking is quite different from Tokyo and Narada: the absence of accentual fall in non-phrase-final position is explained by ALIGNRIGHT (Fall, Phrase) being ranked higher than MAX-T.

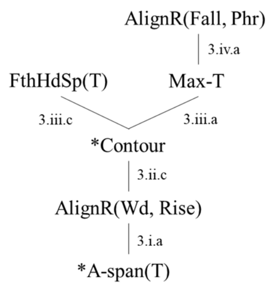

Figure 8. Constraint ranking in the Hirosaki dialect

4.5 Shizukuishi dialect

There does not appear to be any boundary-driven tonal change in Shizukuishi as unaccented words are fully L-toned. Therefore, the relevant boundary-driven alignment constraint involves a level L tone instead of a rise or a fall. There also does not appear to be a relevant accent-driven alignment constraint as *H alone can account for the timing of the fall after the accent kernel.

Tableau 4. Shizukuishi dialect

	*CONTOUR	FTH	MAX	ALIGNR(Phr, L)	*A-SPAN	*H
i. sakana#→[sakana]						
a. ~ (sakana)				W		W
ii. kabuto#→(ka)[buto] | LH						
a. ~ (kabuto)				W	L	W
b. ~ (kabu)[to]						W
c. ~ [ka$_1$](a$_2$)[buto]	W		L		W	
d. ~ [ka](bu)[to]		W	L		W	
iii. otoko#→[oto](ko$_1$)[o$_2$] | LH						
a. ~ [oto](ko)	L			W	L	
b. ~ (otoko$_1$)[o$_2$]			W		L	W
c. ~ [otoko]	L	W	W		L	L
iv. kabuto…→(kabuto) | LH						
a. ~ (ka)[buto]					W	L

Although on the surface the Hirosaki and Shizukuishi dialects appear similar, the lack of a fall in non-phrase-final position in both dialects is the result of completely different constraint interaction. In Hirosaki, it is due to ALIGNRIGHT (Fall, Phr) being ranked above MAX-T while in Shizukuishi, it is because the ranking ALIGNRIGHT (Phr, L)>*A-SPAN (T) >*H will forbid the insertion of a L tone except in the phrase-final position.

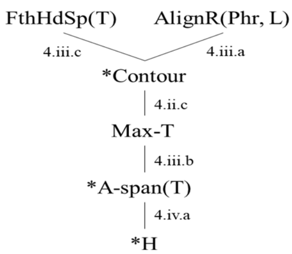

Figure 9. Constraint ranking in the Shizukuishi dialect

4.6 Osaka dialect

There is no boundary-driven tonal change in Osaka. Instead there is a register-driven tonal change: there is no ALIGN{L, R}(D, T) but two ALIGN{L,R}(T, D). Contrary to Tokyo and Hirosaki, the two alignment constraints have opposite directions: the accent-driven tonal change is left-aligned while the register-driven change is right-aligned.

Tableau 5. Osaka dialect

	*CONT	FTH	MAX	ALIGNR (Rise, Wd)	ALIGNL (Fall, Wd)	*A-SPAN	NOLAPSE
i. suzume→[suzu](me) | L							
a. ~ [suzume]						L	W
b. ~ (suzume)		W				L	
ii. kokoro→(ko)[koro] | H L							
a. ~ (koko)[ro]					W		
iii. deppa→[dep](pa$_1$)[a$_2$] | | L H L							
a. ~ [dep](pa)	L		W			L	
b. ~ (deppa$_1$)[a$_2$]		W	W			L	
c. ~ [de](p)[pa]	L	W		W			
iv. kabuto→[ka](bu)[to] | | L H L							
a. ~ (kabu)[to]		W	W	L		L	
b. ~ (ka)(bu)[to]		W		L			
c. ~ [ka](buto)			W		L	L	

As monomoraic words are always lengthened to two morae when pronounced in isolation and initially accented low register words as well as finally accented high register words do not exist in Osaka, it is impossible to know the ranking between *CONTOUR and the two alignment constraints.

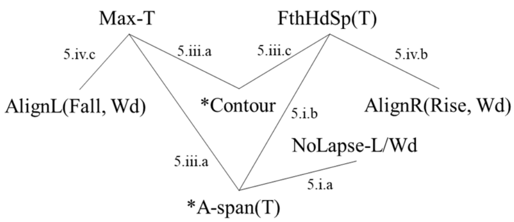

Figure 10. Constraint ranking in the Osaka dialect

4.7 Kagoshima dialect and Miyakonojo dialect

In Kagoshima, relevant alignment constraints are ALIGNRIGHT (Phrase, Rise) for the default final rise in Type B words and ALIGNRIGHT (Fall, Phrase) for the final fall in Type A words. Type B monosyllabic words are pronounced with a mid tone and so both *H and *L are active.

Tableau 6. Kagoshima dialect

	*CONT	MAX	ALIGNR (Phr, Rise)	ALIGNR (Fall, Phr)	*A-SPAN	*H	*L
i. sakana→[sa](ka)[na] HL							
a. ~ [saka](na)		W	L		L		
b. ~ [saka](na$_1$)[a$_2$]	W		L				W
c. ~ (sa)[ka](na)			L	W		W	L
ii. kokoro→[koko](ro)							
a. ~ {kokoro}			W		L	L	L
b. ~ [ko](koro)			W			W	L
iii. hi→{hi}							
a. ~ [hi$_1$](i$_2$)	W		L		W	W	W
b. ~ [hi]							W
c. ~ (hi)						W	
iv. hi→(hi$_1$)[i$_2$] HL							
a. ~ [hi$_1$](i$_2$)		W	L				
b. ~ [hi]	L	W			L	L	
c. ~ (hi)	L	W			L		L
d. ~ {hi}	L	W			L	L	L

In Miyakonojo, as there is no lexical tone, there is no need for ALIGNRIGHT (Fall, Phrase) and MAX-T; the only relevant alignment is ALIGNRIGHT (Phrase, Rise). Contrary to Kagoshima, monomoraic words are pronounced with a H tone instead of a M one (Uwano, 1999).

Tableau 7. Miyakonojo dialect

	*CONTOUR	ALIGNR (Phr, Rise)	*A-SPAN	*L
i. sakana→[saka](na)				

	*CONTOUR	ALIGNR (Phr, Rise)	*A-SPAN	*L
a. ~ (sakana)		W	L	L
b. ~ (sa)[ka](na)			W	L
ii. hi→(hi)				
a. ~ [hi_1](i_2)	W	L	W	W
b. ~ [hi]				W

The ranking is quite similar between Kagoshima and Miyakonojo with a common *CONTOUR > ALIGNRIGHT (Phrase, Rise) > *A-SPAN (T) hierarchy.

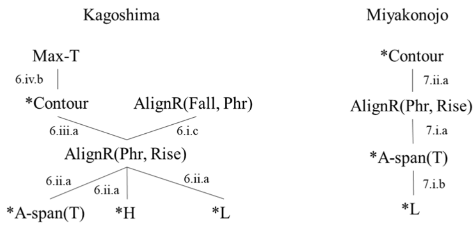

Figure 11. Constraint ranking in the Kagoshima and Miyakonojo dialects

5. Conclusion and remaining issues

In multi-pattern dialects, an accent-driven alignment constraint ALIGN{L, R}(T, D) is active and a similar constraint is found in Kagoshima for Type A words. N-pattern dialects, as well as multi-pattern dialects without registers, also show a boundary-driven alignment constraint ALIGN{L, R}(D, T), while the register-driven constraint in Osaka is similar to the accent-driven constraint.

Table 1

Typology of alignment constraints

Dialect	Boundary-driven alignment	Accent/register-driven alignment
Tokyo	ALIGNLEFT (Phr, Rise)	ALIGNLEFT (Fall, Wd)
Narada	ALIGNLEFT (Phr, Fall)	ALIGNLEFT (Rise, Wd)
Hirosaki	ALIGNRIGHT (Wd, Rise)	ALIGNRIGHT (Fall, Phr)
Shizukuishi	ALIGNRIGHT (Phr, Low)	
Osaka		ALIGNRIGHT (Rise, Wd), ALIGNLEFT (Fall, Wd)
Kagoshima	ALIGNRIGHT (Phr, Rise)	ALIGNRIGHT (Fall, Phr)
Miyakonojo	ALIGNRIGHT (Phr, Rise)	

Given Dir and ¬Dir, two opposite directions, T_1 and T_2, two different tones and D_1 and D_2, two different prosodic domains, alignment constraints can be generalized as ALIGNDir (D_1, T_1) and ALIGNDir (T_2, D_2) for multi-pattern dialects without registers such as Tokyo, Narada and Hirosaki; ALIGNDir (T_1, D_1) and ALIGN¬Dir (T_2, D_1) for multi-pattern dialects with registers such as Osaka; ALIGNDir (D_1, T_1) and ALIGNDir (T_2, D_1) for 2-pattern dialects such as Kagoshima; and ALIGNDir(D_1, T_1) for 1-pattern dialects such as Miyakonojo. Shizukuishi is the only dialect to show a boundary-driven alignment constraint involving a level tone and no accent-driven alignment constraint even though it is a multi-pattern dialect. It is also the only dialect to allow contour tones when tones are inserted because of the boundary-driven alignment constraint. However, contour tones are not allowed for lexical tones. Accordingly, a final falling contour is allowed for [òtòkô] due to ALIGNRIGHT (Phrase, Low) but an initial rising contour is impossible for the initially-accented *[kǎbùtò] even though there is a lexical floating L before the accentual H. Other dialects with contour tones such as Osaka, Kagoshima or Hirosaki allow contour tones only to prevent the deletion of lexical tones with MAX-T being ranked above *CONTOUR. As Shizukuishi is the only dialect with an ascending kernel where the floating tone precedes the linked tone, it is necessary to analyze other ascending kernel dialects to see whether it could be a characteristic of such kernels.

Lastly, this paper has shown that it is possible to analyze the tone patterns of simplex words of not only multi-pattern dialects but also of 1-pattern and 2-pattern dialects in a unified model using only a tone tier. This makes the present account superior to the accent account: the latter requires separate constraints for multi-pattern dialects and N-pattern dialects. For example, it is impossible to capture the similarities between accent-driven tonal changes and the Type A in Kagoshima with the accent account whereas the tone account shows that they both come from a similar ALIGNDir (T, D) constraint. However, further research is still necessary to see if our model can be extended to 3-pattern dialects as well as multi-pattern dialects with 3 registers.

Notes

1 The TBU differs from dialect to dialect. In Kagoshima, it is the syllable, but in the other dialects presented here it is the mora.

2 Descending kernels (i.e., every TBU until the accent is high and the accented TBU is low) are theoretically possible but no such dialect has been reported yet according to Uwano (1989, 2012).

3 For example, *sakana* 'fish', *sakana-ga* 'fish NOM', *sakana-kara* 'from (a) fish' and *sakana-kara-mo* 'also from (a) fish' are all *bunsetsu*. For verbs, *tabe-ru* 'eat', *tabe-masu* 'eat' (polite), *tabe-sase-rare-ru* 'be made to eat' are also *bunsetsu*.

4 The default head of a span will be considered to be a TBU (mora or syllable) instead of the syllable nucleus because special morae (second part of a long vowel, moraic nasal and first part of a geminate) can be span

heads. However, as pointed out in section 3, in the case of contour tones the head of the span can be shorter than a segment.

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