

COLLOQUIAL FORMS IN TOKYO JAPANESE

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

(Department of Asian Studies)

We accept this thesis as conforming
to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

September 1994

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ABSTRACT

This thesis discusses the interaction of prosodic constituency with segmental and tonal analyses. This is done through the examination of two phonological reduction processes, Nasal Spreading and Vowel Deletion, in colloquial Tokyo Japanese. This thesis consists of two chapters. Chapter I analyzes Nasal Spreading, a nasal assimilation process, which occurs when the negative suffix /nai/ is attached to verb roots. In order to explain this process, first, the segmental conditions for Nasal Spreading are examined. Among verbs, only /r/-final roots trigger assimilation. This is explained in terms of Rhotic Underspecification (Mester and Ito 1989, and others), Feature Class Theory (Padgett 1994), and Feature Licensing (Ito, Mester, and Padgett 1994), demonstrating that the target /r/ lacks specification under the root node.

The prosodic account analyzes Nasal Spreading as a syllabification process. Nasal Spreading adds one mora; whereas the standard form, a general form in /nai/-suffixation, epenthesizes /a/ to break up the consonant cluster, by adding a mora and a syllable to the output string. The prosodic account also deals with the interaction with tonal system. A disyllabic requirement on the derived base can be explained with respect to a violation of tonal agreement. The tone melodies in the colloquial and standard forms must agree; however, the

constraints on Accent Shift or Initial Lowering require minimally disyllabic strings [ə ə] in the base for the agreement.

Chapter II discusses Vowel Deletion. In Vowel Deletion as well the interaction of the three types of structure is discussed. Segmentally, the type of compounds and vowels for deletion are specified. This is examined under the Theory of Underspecification (Archangeli 1988), and/or under the sonority scale approach (Prince and Smolensky 1993). The prosodic analysis deals with domain specification. The lexical tone in the second constituent of the compound blocks deletion; because it blocks formation of the single tone domain which would be the site for Vowel Deletion. Only one tonal peak is allowed in a single tone domain. The blocker splits a string of compound into two; Vowel Deletion cannot apply between two domains.

In Nasal Spreading and Vowel Deletion, segmental, prosodic, and tonal principles interact to determine the optimal output strings. The intricate interplay is accounted for with the Optimality Theoretic approach.

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INTRODUCTION

This thesis introduces and analyzes colloquial forms of Tokyo Japanese in a current theoretical framework. The central hypothesis is that prosodic constituency influences both segmental and tonal processes. Two phonological changes, Nasal Spreading and Vowel Deletion, are examined to illustrate the interaction among the above three processes. The basic hypothesis is that in phonological formations, in order to derive correct forms, the interaction of the above three must be considered. For example, segmental analysis alone cannot account for all the complexities of each derivation. The above three interact with each other and condition the phonological changes.

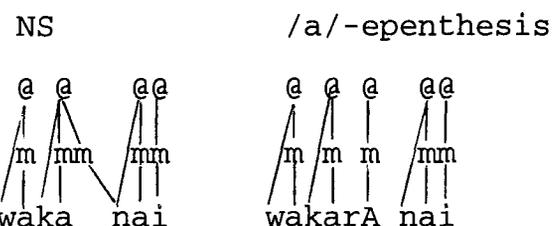
Chapter I analyzes Nasal Spreading. Nasal Spreading occurs in the negative construction of verbs. It is derived by suffixing the negative morpheme /nai/ to verb roots. Spreading takes place between the verb root and /nai/ when a consonant cluster is produced by the suffixation. /n/ of /nai/ spreads to the left, but it targets only /r/-final roots. If the root-final sound is other than /r/, spreading does not apply.

- (1) root+/nai/ colloquial neg.
 kawar-nai --- kawaN-nai '(It) does not change.'
 kawak-nai --- * kawaN-nai '(It) does not dry.'

This must be first analyzed and formulated in terms of segmental features, by adopting an approach such as Rhotic Underspecification (Mester and Ito 1989), Feature Class Theory (Padgett 1994), or Feature Licensing (Ito, Mester, and Padgett 1994).

The prosodic analysis is as follows: spreading adds an extra mora into the string as a mora augmentation process; this is done via syllabification (cf. Ito 1989). Especially, it is significant when we compare another form derived through /nai/-suffixation, which is called the standard form. The standard form is derived by epenthesizing /a/ to break up the consonant cluster. The crucial point here is that spreading makes /n/ a coda nasal /N/; /N/ is syllabified with the preceding syllable. On the other hand, /a/ cannot be linked with any existing syllable; instead, /a/ must create a syllable, by taking /r/ as its onset. In other words, Nasal Spreading maximizes the syllable size to bimoraic, while /a/-epenthesis derives an additional light syllable. This cannot be explained without considering prosodic structure.

(2) /wakar+nai/ '(I) do not understand'



Heavy monosyllabic root verbs derive superheavy syllables through Nasal Spreading. This also should be analyzed in terms of prosodic constituency: /N/ must be syllabified with the preceding syllable, however, the long syllable already contains two moras--three moras cannot be linked under a single syllable node. Prosodic analysis does not necessarily account for all the cases that are ruled out in Nasal Spreading. For example, light monosyllabic root verbs satisfy all the requirements for Nasal Spreading in terms of segmental and prosodic conditions; however, spreading does not apply. We need to consider the role of tone in this specific case. Constraints in the tonal system, such as Accent Shift or Initial Lowering have effects in cases like this.

A three dimensional approach accounts for the intricate cases and specifies the right environments for the changes. The three classes of structural constraints are organized in terms of Optimality Theory (OT). OT enables us to capture the whole picture of the constraints in the changes. For example, in OT, the difference between Nasal Spreading and /a/-epenthesis is captured by a set of constraints, including for example, Recoverability of Mora (RecM) and Recoverability of Syllable (Rec@) (Pulleyblank 1993, Archangeli and Pulleyblank 1993 (b), Ito, Mester, and Padgett 1993, and others).

(3) RecF (Recoverability of F-element): If [... α ...]output then [... α ...]input. An F-element (feature or node) that is present

in an output form is also present in the output.

RecM and Rec@ belong to the faithfulness family of constraints that deals with tight input and output relations. Nasal Spreading violates RecM by adding a mora to the output which is not included in the input. /a/-epenthesis violates both RecM and Rec@, by inserting an additional syllable.

Vowel Deletion in Chapter II is analyzed on the same analytical grounds. Vowel Deletion deletes one of VV at a morpheme boundary derived via compounding. Vowel Deletion occurs in a very specific class of compound verbs; only the compounds that constructed of 'verb(GER)+aux.' are subject to deletion. Vowels also must be specified in terms of sonority or features in 'sonority prominence' (Archangeli and Pulleyblank in press, Prince and Smolensky 1993) and/or the Theory of Underspecification (Archangeli 1988).

On the basis of segmental specifications, prosodic structure must be considered to account for deletion. Vowel Deletion applies domain-internally, but not domain-externally. Domains must be defined in terms of prosody. However, morphological domains and prosodic domains do not necessarily match in some cases (Inkelas 1989, Ishihara 1991). Vowel Deletion is blocked if the second member of compound is accented. The lexical tone in the second member of a compound blocks the formation of a

single tone domain (although, morphologically, the two constituents form a single phrase).

(4) a. masite-iru --- [masite-ru] 'be increasing'

b. masite-aru --- [masite][^Haru] 'have been added in advance'

Vowel Deletion applies in (4a), but does not apply between two domains as in (4b); the lexical high tone (H) in /aru/ is the blocker for deletion.

The intricate outputs are shown to follow from the interaction of the constraints on each kind of structure. The three dimensional approach accounts for all the cases. The Optimality Theoretic approach is adopted in both cases, Nasal Spreading and Vowel Deletion, showing that constraints are violable, and must be selected and ranked.

I. Nasal Spreading

Introduction

This chapter focuses on Nasal Spreading (nasal regressive assimilation), which is the colloquial form of the negative verbal construction (see Alfonso 1966, Miyara 1988).¹ The purpose of this section is three fold: (i) formulation of the exact condition on Nasal Spreading in terms of segmental structure, (ii) illustrate that Nasal Spreading is a syllabification process which maximizes the syllable template to bimoraicity. (iii) show that tonal constraints interact with Nasal Spreading. Nasal Spreading applies when the negative suffix /nai/ is attached to verb roots; /n/ of /nai/ spreads backward and is syllabified as a coda nasal /N/ under the preceding syllable node. Only the verbs that have /r/-final roots are subject to spreading.

This chapter is organized into five sections: preliminaries, segmental analysis, prosodic analysis, tonal interaction, and Optimality Theory. As a preliminary, I will provide some basic information on Japanese phonology. Preliminary information will include vowel and consonant inventories, syllable types, mora counting processes, and the coda condition in Japanese. In a segmental analysis, I will show that the verb root final /r/ is

the only target for spreading. This will be examined by adopting Rhotic Underspecification (Mester and Ito 1989), Feature Class Theory (Padgett 1994), and Feature Licensing (Ito, Mester, and Padgett 1994), claiming that /r/ has a special status among Japanese consonants and lacks a place node. In a prosodic analysis, I will focus on syllabification and well-formedness conditions. The difference between Nasal Spreading and /a/-epenthesis will be shown by comparing the two cases of syllabification: Nasal Spreading adds a mora under the preceding syllable while /a/-epenthesis creates a light syllable. Superheavy syllables cannot be derived, since it violates the well-formedness conditions of the language. The tonal account demonstrates that tonal constraints restrict the syllable number in the derived base to minimally disyllabic. Finally, these are compared and explained by adopting Optimality Theory.²

1. Preliminaries

In this section, the basic phonology of Japanese will be introduced: vowel and consonant inventories, syllable structure, mora counting, and the Coda Condition are included in the discussion. The above information is necessary for the segmental, prosodic, and tonal analyses. The segmental analysis requires the above information, for example, in order to define the status of /r/ and /n/ in Nasal Spreading, or the status of /i/ in Vowel Deletion.

Prosodic structure is expressed in a prosodic hierarchy. Each prosodic level in the hierarchy is defined on the basis of the basic phonological processes of Japanese. The tonal account also requires the above information; for example, the Tone Bearing Unit (TBU) in Japanese is defined as a sonorant mora. The information presented here is minimum and basic to the analysis. Detailed discussion will be added elsewhere in this thesis.

1.1. Inventories

The following vowel and consonant inventories are taken from Shibatani (1990); see also Grignon (1984).

(1) Vowel Phonemes ³

i	u
e	o
a	

(2) Consonant Phonemes

p	t	k	
b	d	g	
	s		h
	z		
	r		
m	n		
w		j	

1.2. Syllable Structure and Mora Counting

Japanese syllable types and mora counting are shown in (3)

and (4). These items are necessary for determining the Tone Bearing Unit (TBU) in Japanese. In Nasal Spreading, the syllable size is maximized by including the coda /N/. In (3), marked syllables and unmarked syllables are contrasted; unmarked syllables occur only exceptionally in manifestations such as superheavy syllables. Superheavy syllables are limited to the following cases: recent loan words, onomatopoeia, verb past and gerund forms, some colloquial (very casual) and emphatic expressions, and interjection. As to the external evidence for the markedness (or illicit) status of superheavy syllables, language games or speech errors often do not derive superheavy syllables (see Kubozono 1989, Tateishi 1989, Katada 1990). Syllables in (3) may be formed without any onset.

(3) Japanese Syllable Types (cf. Poser 1990, Ito and Mester 1993)

a. Unmarked Syllables (or licit syllables) ⁴

(C)V	me	'eye'	e	'drawing'
(C)VV	soo	'layer'	oo	'king'
(C)VC	mat-ta	'waited'	at-ta	'met'
(C)VN	haN	'seal'	oN	'sound'

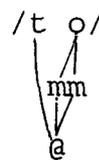
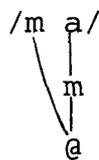
b. Marked Syllables ⁵

(C)VVC	koot-ta	'froze'	oot-ta	'covered'
(C)VVN	toon	'tone'		

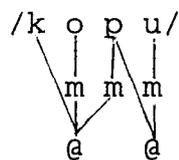
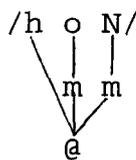
Japanese contrasts vowel length: one mora is assigned to a short vowel, while two moras are assigned to a long vowel. Consonant length is also contrasted; one mora is assigned to a coda consonant (Rime Projection). The following words show mora counting (Ito 1990, Ito, Kitagawa, and Mester 1992).

(4) Mora Counting ⁶

a. short vowel /ma/ 'pause' b. long vowel /too/ 'tower'



c. coda cons. /hoN/ 'book' d. geminate cons. /koppu/ 'glass'



A restriction on coda consonants is called the Coda (Place) Condition or Filter, as has been extensively studied in various articles (Ito 1988, Yip 1991, Ito and Mester 1993, Ito, Mester and Padgett 1993, Ito and Mester 1994). The following is a summary of their research findings. Among all the consonants presented in (2), only the following obstruents /p, t, c, k, s/ or nasal /N/ can occur in the coda position; a mora is assigned to the coda consonants. In exceptional cases, such as recent loans, voiced obstruents /b, d, j, g, z/ may appear in the coda

position: for example, /beddo/ 'bed' or /baggu/ 'bag'. However, the voiced obstruents /d/ and /g/ tend to be merged with their voiceless counter parts /t/ and /k/ as /betto/ or /bakku/, respectively. The coda obstruents must be doubly linked with the following onset. The coda nasal /N/ can be geminated, or partially geminated, linked with the place node of the following onset sound. The nasal /N/ alone among the above coda consonants can occupy the word-final position without gemination.

2. Segmental Analysis

This section analyzes the segmental environment for Nasal Spreading. The distinction between standard and colloquial forms, and verb classification specify the type of verb roots that can undergo Nasal Spreading. In order to formulate the environment, the following facts will be considered. Rhotic Underspecification claims that /r/ in Japanese has no place node. By adopting Feature Class Theory and Feature Licensing, the target and the trigger of spreading are examined, and Nasal Spreading is formulated.

2.1. Standard Form and Colloquial Form.

Two kinds of forms are derived through the suffixation of /nai/: the standard form and the colloquial form. The following set of data displays the two types of negative verbal

constructions; in the first column, input strings 'verb root + /nai/' are presented without any modification. The second column represents the standard form, used for example, in the written style. All verbs allow the standard form with the /nai/ suffixation. The third column represents the colloquial style on which we focus; the colloquial form is derived by Nasal Spreading.⁷ Complex suffixation (with a string of two or more suffixes; for example, /tabe-naka-tta/ '(I) did not eat') or compounds (for example, /tachi-domara-nai/ '(I) do not stop') are excluded from the data in order to simplify the analysis.

(5) Negative Construction with /nai/

root+/nai/	a. standard neg.	b. colloquial neg.	gloss ⁸
kawar-nai	kawar-a-nai	--- kawa-N-nai	'change'
wakar-nai	wakar-a-nai	--- waka-N-nai	'know.'
hayar-nai	hayar-a-nai	--- haya-N-nai	'be popular'
tomar-nai	tomar-a-nai	--- toma-N-nai	'stop'
suwar-nai	suwar-a-nai	--- suwa-N-nai	'sit'
tukur-nai	tukur-a-nai	--- tuku-N-nai	'make'
kaer-nai	kaer-a-nai	--- kae-N-nai	'return'
sasar-nai	sasar-a-nai	--- sasa-N-nai	'stuck'
mawar-nai	mawar-a-nai	--- mawa-N-nai	'turn round'
karamar-nai	karamar-a-nai	--- karama-N-nai	'get entangled'

In the standard form (5a) the vowel /a/ intervenes between the two consonants /r/ and /n/. In the colloquial form (5b), the

nasal /N/ appears instead of /r/. Both segments /a/ and /N/ appear between the root and the suffix.

2.2. Verb Classification

In order to characterize the type of verbs which can undergo Nasal Spreading, we also need to consider the classification of Japanese verbs (McCawley 1968, Makino and Tsutsui 1986, Vance 1987, and others). The classification of verbs is important, because conjugation varies according to the classes to which the verb belongs. On the basis of the verb classification, both forms, the standard form and that with Nasal Spreading, will be examined.

Japanese verbs are classified into three types: vowel verbs, consonant verbs, and irregular verbs. The classification is based on root-final sounds and upon their conjugation. Three classes of verbs in their negative construction are presented below:

(6) Vowel verbs: vowel verb roots end in a vowel, either /i/ or /e/.⁹

root	standard negative	
tabe	tabe-nai	'eat'
mi	mi-nai	'see'
ki	ki-nai	'wear'

ne	ne-nai	'sleep'
de	de-nai	'get out'
ire	ire-nai	'put'
ake	ake-nai	'open'
oki	oki-nai	'get up'
osie	osie-nai	'teach'

Consonant verbs: consonant verb roots end in one of the consonants /k, g, t, s, r, m, b, w/ as in (7).¹⁰

(7)	root	standard negative	
	kak	kak-a-nai	'write'
	kag	kag-a-nai	'smell'
	mat	mat-a-nai	'wait'
	sas	sas-a-nai	'sting'
	tor	tor-a-nai	'take'
	yom	yom-a-nai	'read'
	yob	yob-a-nai	'call'
	moraw	moraw-a-nai	'receive'

Irregular verbs: both vowel verbs and consonant verbs conjugate regularly, but irregular verbs do not, as their roots demonstrate.

(8)	root	standard negative	
	ku	ko-nai	'come'

a(r) nai 'exist (animate subject) ¹¹
 su si-nai 'do'

Among the three classes of verb, only consonant verbs contain the intervening /a/. Vowel verbs do not contain the CC string, and therefore, no segment intervenes at morpheme boundaries. In (9) /a/ is epenthesized in order to break up the consonant cluster. This is illustrated in (9) as a syllabification process (see Ito 1989).¹² /a/ is then syllabified with /r/ and forms a light syllable. The presence of the added mora (and the syllable) is a by-product of syllabification.

(9) /a/-insertion:¹³



Unlike the standard construction, Nasal Spreading does not necessarily apply to all the verbs. Consider the following sets of verbs.

(10) Nasal Spreading and Verb Roots

a. /r/ final roots:

root	Nasal Spreading	
kawar	kawa-N-nai	'change'
mawar	mawa-N-nai	'turn around'

sasar sasa-N-nai 'stick'

b. other consonant roots:

sasow *saso-N-nai 'invite'

todok *todo-N-nai 'reach'

mawas *mawas-N-nai 'turn'

kagam *kaga-N-nai 'stoop down'

c. vowel verbs:

tabe *tabe-N-nai 'eat'

mi *mi-N-nai 'look at'

ki *ki-N-nai 'wear'

osie *osie-N-nai 'teach'

In (10a) all the roots which end in /r/ undergo Nasal Spreading, while none of the roots in (10b) that have consonant endings other than /r/ contain the nasal /N/. Vowel verbs in (10c) do not create the consonant cluster which triggers Nasal Spreading. It is thus possible to make the following three deductions from the above observations.

- (i) A CC (C≠N) string at the morpheme boundary must be broken up in the output form (unless Nasal Spreading takes place).
- (ii) All consonant verbs contain the epenthetic vowel /a/.
- (iii) Only /r/-final consonant verbs are subject to Nasal Spreading.

- (i) its position in the segment inventory.
- (ii) its appearance as an epenthetic consonant.

The resonant inventories are presented as follows:

(12) Japanese Resonants ¹⁵

Liquids:		r
Glides:	w	y

In (12), place is distinctive in glides; the glides /y/ and /w/ carry specifications for the tongue body features, and the obstruent system in (13) displays contrasts in voicing and place.

(13) Japanese Obstruents

		lab	cor	pal	vel
Plosive	voiceless:	p	t	c	k
	voiced:	b	d		g
Fricative	voiceless:	f	s		h
	viced:		z		

As for the second source of evidence, appearance as an epenthetic consonant, we can take an example from the present and passive forms; here the occurrence of the epenthetic /r/ is seen in the verbal paradigm.

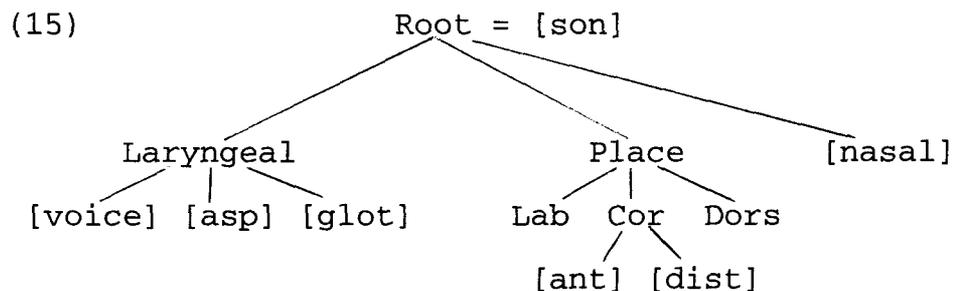
(14) Appearance as an Epenthetic Consonant ¹⁶

a.	C-final roots:	Present kak-u nom-u	Passive kak-are nom-are	'write' 'drink'
b.	V-final roots:	tabe-ru mi-ru	tabe-rare mi-rare	'eat' 'see'

Consonant-final verbs take /u/ and /are/ in the present /ru/ and /rare/. A consonant epenthesis rule inserts /r/ to break up the vowel hiatus.

2.4. Decomposition of Feature Geometry

On the ground that /r/ in Japanese lacks feature specifications, Nasal Spreading will be examined under two recent issues: one is Feature Class Theory by Padgett (1994), and the other is Feature Licensing by Ito, Mester and Padgett (1994). It could be said that Feature Class Theory is an attempt to decompose Feature Geometry. First, the 'traditional' Feature Geometry (Clements 1985, and others assumed; taken from Padgett above) is illustrated in (15).



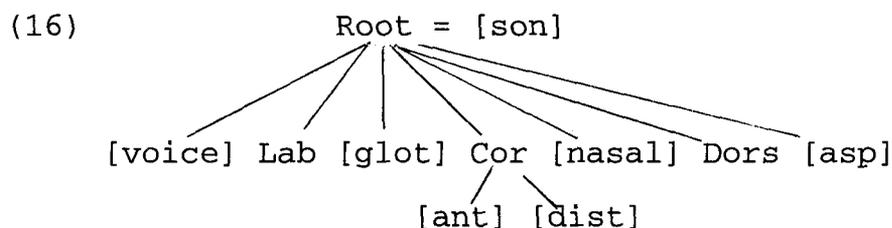
Feature Class Theory (Padgett) claims that " 'placeness' and

'laryngeality' are simply properties of features. We might say $[voice]_L$, $[asp]_L$, Lab_p , Cor_p ... (For example,) Spread (Place) means to spread a feature iff it is a member of Place." This is based on the following two assumptions.

(i) Constraints like SPREAD are gradiently violable in the sense given with Optimality Theory. The occasional result: partial class behavior.

(ii) Feature geometry does not naturally capture partial class behavior. For this reason, it can even obscure evidence for certain feature classes, thus failing on its own terms.

Representations under this account will be as follows. "Tree preserves featural dependencies."



By adopting Feature Class Theory, Nasal Spreading is formulated as spreading of the feature [nasal], instead of spreading feature nodes as illustrated below:

(17) r - n
 |
 [nas]

The other issue Feature Licensing is developed through the Theory of Underspecification (Archangeli 1984, Mester and Ito 1989) and Grounded Phonology (Archangeli and Pulleyblank in press), and also by adopting Optimality Theory (Prince and Smolensky 1993, and others). According to Ito, Mester, and Padgett, the theory claims that "upon consider(ing) the connection, ... between feature redundancy and feature underspecification, .. we link the two by means of the notion of licensing. The hypothesis formulated in (18), as a principle of universal grammar, is an explicit statement of this connection.

(18) Licensing Cancellation: If the specification F implies the specification G, then it is not the case that F licenses G.

For example, given the redundancy implication [son] > [voice], a sonorant segment does not license [voice]. The [voice] feature is licensed when linked to obstruents (19a), but not when linked to sonorants (19b)."

- (19) a. licensed [voice] b. unlicensed [voice]
- | | |
|---------|---------|
| [d] | [n] |
| | |
| [voice] | [voice] |

In Nasal Spreading, Feature Licensing is modified as follows: Feature Licensing is expressed with linking of segments, even without discussing 'licensed' or 'unlicensed', if it is not necessary. For example, /r/ is not linked with Place. Since /r/ is the only lateral among Japanese sonorants, and also lateral is universally coronal; specification of coronal for lateral is redundant. The other consonants in the verb-final position must be linked with Place features, because there is place distinction among them. By combining the above two issues, Nasal Spreading will be captured and formulated with minimal redundancy.

- (20) r - n
 |
]
 [
 [nas]

As we have seen, /r/ lacks place feature. Only the root of /r/ is present. The spreader /n/ is linked with [nasal], but it has no place specification, either; this will be discussed later. The above representation eliminates other verb-final consonants from the application of spreading.

A limited number of consonants, /k, g, t, s, r, m, b, w/, can occupy the verb-final position. Among them only /k, t, s, m/

can get gemination in Japanese. Voiced obstruents may get geminated, however, it is limited to special cases such as recent loan words. In the representations of the above four consonants /k, t, s, m/, Place must be linked; because, place is contrasted in them.

(21)

k	t	s	m
dor	cor	cor	lab

Only /r/ is not linked with Place, while other consonants must have place specifications (licensing conditions).

(22)

Place is not linked:	r
Place is linked :	k t s m
	P P P P

For example, if one of /k, t, s, m/ occupies the root-final position, spreading is blocked; because it must be linked with a place feature. In (23b) the velar stop /k/ is linked with [dorsal]; spreading cannot apply.

(23) Nasal Spreading

a. r - n	b. * k - n
	dor [nas]
[nas]	

In the formulation of Nasal Spreading in (23a), the spreader

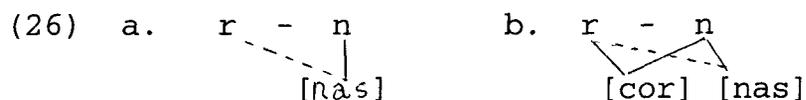
/n/ is not linked with Place, but linked with [nasal]. Nasal Spreading only spreads nasality, and Place is not involved in spreading. In order to explain this, let us first look at a set of Japanese sonorants.

(24)		lab	cor	pal	vel
	lat		r		
	nas	m	n		ŋ
	glide	w		j	

Place and manner feature specifications for the above sonorants in the inventory are as follows:

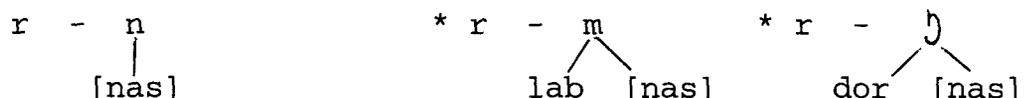
(25)	r	m	n		w	j
	cor	lab	cor	dor	lab	dor
	lat	nas	nas	nas	(approx.)	

/r/ and /n/ share the same place feature [coronal]. There is no Place spreading involved in Nasal Spreading, since both /r/ and /n/ share the [coronal] specification; only nasality of /n/ spreads to /r/ (26a). Also, the specification of [coronal] for Nasal Spreading is redundant (26b), as only nasality spreads. As for manner features, lateral of /r/ is universally underspecified (grounded) for coronality.

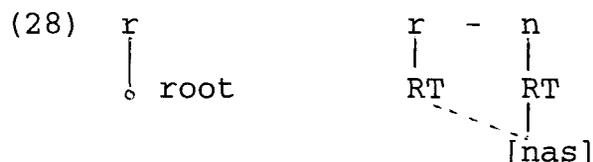


In order to achieve spreading, the spreader must not be linked with Place (27a). This representation eliminates other nasals from spreading. Spreading is blocked if the spreader is linked with Place (27b).

(27) a. Place is not linked b. Place is linked



The root (RT) node exists for all segments. The root of /r/ is the target for nasal spreading. In the representations up to here, RT is omitted for simplification; however, the existence of RT is not ignored. Since RT of /r/ receives nasality from /n/ in Nasal Spreading, RT of /r/ is not deleted from the string through Nasal Spreading. This is captured only with the existence of the root node.



As we have examined, by adopting the two issues Feature Class Theory and Feature Licensing, Nasal Spreading is captured with minimum redundancy. Also, /r/ and /n/ in Nasal Spreading can be compared with other possible verb-final consonants with the least specified features. The segmental analysis must be

included in order to specify the segments involved in spreading.

3. Prosodic Analysis

In this section, a prosodic analysis is presented to account for Nasal Spreading. A prosodic account shows the difference between Nasal Spreading and /a/-epenthesis; Nasal Spreading maximizes the syllable size to bimoraic, while /a/-epenthesis derives a light syllable. A prosodic analysis also accounts for the verbs that derive superheavy syllables. Superheavy syllables are ruled out, because they are not allowed in the negative construction.

3.1. Two Types of Syllabification

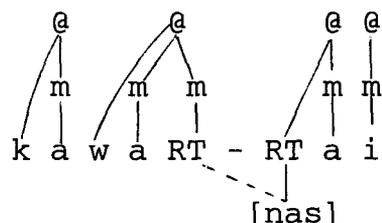
For consonant verbs, the CC cluster in the input must be broken to an alternating VCVC string in the output; otherwise, an ill-formed string would be derived.

(29) * kawar - nai CC string is created

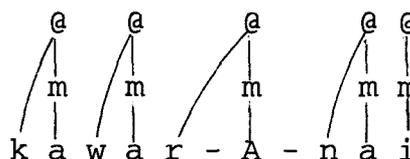
The consonant cluster is broken up by inserting /a/ for the standard form, or by spreading /n/ of /nai/ for the colloquial form. For the colloquial form, a closed syllable is formed by making the /n/ a moraic coda as in (30). The mora is syllabified under the preceding syllable node to create a closed syllable;

the syllable size is thus maximized to bimoraic.

(30) a. Nasal Spreading



b. /a/-epenthesis



In (25) the root node (RT) receives specifications from the following nasal. There is no replacement per se. All the consonant verbs are subject to /a/-epenthesis, because /a/-epenthesis does not require any specification for the root-final segment except [consonantal] status. Nasal Spreading is different from /a/-epenthesis with regard to the syllable count; /a/-epenthesis adds one syllable to the derived string, whereas Nasal Spreading minimizes the syllable count by linking the moraic /N/ under the preceding syllable node. This is why processes such as Nasal Spreading are called 'phonological reduction'.

I have been using the suffix form /nai/; however, there is controversy concerning the underlying form of the suffix (Vance 1987, Shibatani 1990). The other position is to choose /anai/ as the underlying form, including /a/ in the morpheme. Thus /a/-epenthesis does not exist; instead, negative construction is performed by the deletion of /a/ when vowel hiatus is created:

for example, /tabe-anai/ -- /tabe-nai/. Actually, the majority of verbs are consonant verbs, and therefore it seems reasonable to include /a/ in the underlying form. However, the account that chooses /anai/ leads to the following problems. The problem occurs when Nasal Spreading applies; for example, /anai/ suffixes to /wakar/ 'understand' to form /wakaranai/ without any modification. Nasal Spreading loses its motivation, since /wakar-anai/ does not create a consonant cluster. If we assume /ra/-deletion prior to spreading, what motivates such deletion, and why do no other consonant verbs undergo nasal assimilation? The /k/-final verb /kawak/ 'dry' is compared with the /r/-final verb /kawar/ 'change' as below:¹⁷

(31)	kawar+anai	---	kawaranai	---	kawaNnai	'change'
	kawak+anai	---	kawakanai	---	*kawaNnai	'dry'

Not only does the choice of /anai/ need more derivational steps, but it also is unable to explain Nasal Spreading. The account with /nai/ reduces the number of steps and provides a better explanation for Nasal Spreading.

3.2. Monomoraic Roots

This section examines the case of monosyllabic roots in which Nasal Spreading is blocked. First we examine the monosyllabic roots that consist of a light syllable, then move on

to monosyllabic roots that consist of a long syllable. The light syllable roots in (32) contain /r/ root-finally; however, Nasal Spreading does not apply.¹⁸

(32) Monosyllabic Roots

root+ /nai/	Nasal Spreading	
tor-nai	?toN-nai	'take'
sar-nai	*sa-N-nai	'leave'
mor-nai	*mo-N-nai	'leak'
ir-nai	*i-N-nai	'need'
fur-nai	?fu-N-nai	'fall'
nar-nai	?na-N-nai	'become'
tar-nai	?ta-N-nai	'suffice'
ter-nai	?te-N-nai	'shine'

All the above monosyllabic /r/-final verbs can have the epenthetic /a/; however, Nasal Spreading does not consistently apply for the above group of words.

There is some disagreement among native speakers with regard to these forms (see note 9). Roughly speaking, as for Nasal Spreading, the verbs that contain the (light) polysyllabic roots are considered definitely better and more consistent than the ones that contain the monosyllabic roots. This judgement is based on the expressions listed in this thesis, and therefore any affixes, or morphemes should not be added for the analysis here.

If any suffixes or morphemes are added to them, the whole analysis could be changed in terms of phonology, morphology, or syntax. For example, a monosyllabic word /ter/ 'shine' may form a colloquial negative form ?/teNnai/. For some speakers, this is acceptable, but not for others. When this word is pronounced in a sentence such as /asita mo teNnai yo ne/ 'probably tomorrow either, it won't shine', acceptability perhaps will increase, because of the syntactic change influencing intonational patterns, the application of fast speech rules, etc. The examination of these effects on complex phrases (sentences) is beyond the scope of this thesis.

In order to clarify the points for analysis, we need to identify the three types of forms among the /r/-final verbs: (i) polysyllabic roots in which Nasal Spreading applies most consistently. Polysyllabic roots usually consist of two to four (light) syllables. They are limited to indigenous Japanese (Yamato) verbs, and Sino-Japanese verbs and compound verbs are not included. (ii) monosyllabic root verbs, including the long syllable root verbs. These undergo Nasal Spreading; and therefore the judgement of the forms by native speakers varies more than the type (i) verbs. (iii) verbs in which Nasal Spreading does not apply, because of their semantic or pragmatic properties. The words that belong to 'literary' expressions rather than 'colloquial' expressions do not have the colloquial alternatives. For example, /kaor/ 'be fragrant' or /todomar/

'stay' are considered as 'literary use', and are less often used in casual speech; it is because Nasal Spreading is a colloquial formation. Compounds or complex suffixation, including Sino-Japanese words, are excluded from the analysis, because other linguistic constraints, for example, syntactic or pragmatic conditions, are involved (c.f. Poser 1992 for periphrastics; e.g. /benkyoo-suru/ 'to study' or /kenkyuu-suru/ 'to do research').

In the following monosyllabic vowel verbs and irregular verbs with vowel endings, no modification is seen after /nai/ is suffixed. As long as there is no CC string, no modification takes place regardless of the syllable count in the verb root.

(33) Monosyllabic Vowel Roots

a. vowel verbs:

root+/nai/	standard form	
mi-nai	mi-nai	'look at'
ki-nai	ki-nai	'wear'
i-nai	i-nai	'exist (animate subject)'

b. irregular verbs:

root+/nai/	standard form	
su-nai	si-nai	'do'
ku-nai	ko-nai	'come'

3.3. Superheavy Syllables in Nasal Spreading

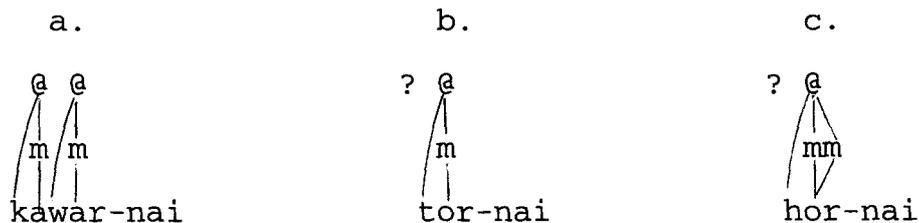
The monosyllabic consonant roots that consist of a heavy syllable do not undergo Nasal Spreading either; although they derive the standard form by inserting /a/ as a syllabification process (as will be shown later). The consonant verbs that contain long vowel roots are not as consistently accepted as the (light) polysyllabic root verbs.

(34) Monosyllabic Roots (Long Syllables)

root-/nai/	N-Spread.	
koor-nai	?koo-N-nai	'freeze'
toor-nai	?too-N-nai	'pass'
hoor-nai	?hoo-N-nai	'throw'

In (34) the heavy syllable roots derive superheavy syllables; the colloquial construction with /nai/ does not allow superheavy syllables. As we have discussed, monosyllabic roots do not consistently undergo nasal assimilation, while all the polysyllabic root verbs undergo assimilation. What, then is going on in the verbs that contain long syllables as root finals?

(35) Syllable Types in Roots



Among /r/-final monosyllabic roots, either (35b) or (35c) are ruled out for Nasal Spreading. Between the two types of monosyllabic roots, (35b) derives a superheavy syllable. There is no rule which truncates the final vowel to */honnai/; because Japanese contrasts vowel length, short versus long. For instance, /kor/ 'become stiff' and /koor/ 'freeze' are two different words, and vowel length must be distinguished. The length distinction is an underlying property of words, with moraic structure presumed in the lexicon (McCarthy and Prince 1993, p.21). The long vowel in /koor/ is an integral part of the syllable, which cannot be broken down. In Hewitt (1994) Syllable Integrity is also discussed: 'long vowels and diphthongs are never split by feet into separate constituents ... the idea was formalized as the Syllable Integrity Principle (Prince 1975)'. The vowel length contrast in Japanese also has been measured phonetically in an experimental study conducted by Beckman (1986). Thus, in (35), the string that derives the unfavorable superheavy syllable does not undergo spreading consistently. The above word /hoor/ can have /a/-epenthesis: this does not violate the syllable condition. This supports the crucial role of syllabification in the negative construction.

The other problem is that superheavy syllables are not allowed in Nasal Spreading; however, the past-tense construction derives superheavy syllables. The difference between the two formations is shown below:¹⁹

(36) Superheavy Syllables

root	negative	past	
hoor	?hooN-nai	hoot-ta	'throw'
toor	?tooN-nai	toot-ta	'pass'

The difference between the two constructions can be explained as follows: colloquial formations such as Nasal Spreading are more recent ones and must respect syllable conditions. On the other hand, the past tense construction has a longer history. During a long period of time, some phonological changes had taken place and the forms, such as in (36), became frozen.

Optimality Theory (e.g. Prince and Smolensky 1993) may explain the difference between Nasal Spreading and the past-tense forms. In Nasal Spreading /hooranai/ is definitely better than /hoonnai/ in terms of adherence to the syllable type [m (m)] . There is a choice in /nai/-suffixation: Nasal Spreading and/or /a/-epenthesis. However, the past-tense form /hootta/ is the only output form of /ta/ suffixation; no alternative, such as */hotta/, */hoota/, */hota/, or */hoorata/ is allowed. Unlike /nai/-suffixation, /a/-epenthesis does not apply in /ta/-suffixation. In Optimality Theory, constraints are violable and hierarchically organized for each candidate set in order to evaluate candidates and identify the optimal form. The constraint on syllable size that limits the mora count to two should be ranked lower in the past tense formation, compared with

that of Nasal Spreading, in order to secure the correct result for superheavy syllables in the output forms. However, this implies that ranking is specific to particular morphemes. We have examined long syllable roots; however, it is still puzzling why the monosyllabic roots, which do not derive superheavy syllables cannot undergo Nasal Spreading. To answer this puzzle, disyllabic base [C C] for /nai/-suffixation will be proposed in the following section.

4. Tone Melodies

In this section the influence of tone melody assignment on Nasal spreading will be discussed. A tonal account solves the problem with monosyllabic roots. It will be shown that constraints on tone assignment restrict the syllable number in the base string in order to rule out monosyllabic root verbs. First, the tone system and accent assignment in Tokyo Japanese are introduced followed by the sample derivation of a phrase. The preliminary description is limited to general characteristics. A detailed discussion of the tone system will be added elsewhere. Tone melodies indicated here are all based on the Tokyo accent. Different dialects have different tonal behaviours. The second part introduces accent assignment specific to the negative construction. Then, the monosyllabic verbs are re-examined in terms of agreement of tone melodies in the standard and the colloquial forms; the tone melodies in both

forms must agree, otherwise, Nasal Spreading does not apply. It will be shown that two accent assignment processes, Accent Shift and Initial Lowering, are the major factors causing a disagreement in the tone melodies.

4.1. Tone Systems of Tokyo Japanese

Japanese has a pitch accent system. Japanese does not show any systematic stress patterns in terms of intensity (loudness) of sounds in general. Although there is weight distinction of light syllables versus heavy syllables, the distinction is not metrically governed (Beckman 1982, 1986). There is a theoretical question concerning the following two distinctions: (a) stress languages, such as English or French, versus pitch accent systems; (b) 'pure tone languages', such as Mandarin or Cantonese, versus 'pitch accent languages', such as Japanese or New Shanghai (a dialect which is spoken among young people in Shanghai). The following description is abstracted from Pulleyblank (1986; chapter 5) and clarifies some points of the above question: the difference between stress languages and pitch accent systems will be discussed first, then the position that discriminate 'pitch accent languages' from 'pure tone languages' will be re-examined.

In a stress language, prominence relations are read off of metrical trees or grids. Such metrical structure is

created by general rules that determine types of feet, direction of foot assignment, etc. ... but in accent languages ... syllable structure typically plays no role in assigning tone. Also, in contrast with a typical stress system, a tonal accent system will typically not exhibit accent subordination. That is, the tonal realization of accents does not vary depending on whether the accent is primary, secondary, tertiary, etc.

The position that distinguishes 'pitch accent languages' from 'pure tone systems' has been argued for (e.g. Haraguchi 1977); however, Pulleyblank maintains that the properties presented are not all unique to accentual systems (cf. Clark 1986, Tateishi 1993):

(i) (It has been argued that) in 'pure tone

languages', there are commonly as many (or more) tones as there are tone-bearing units in a morpheme. In accentual systems, on the other hand, there will generally only be one primary accentual unit (Hyman 1978). However, there is no formal reason to expect one diacritic (=marking of lexical tones) per accentual unit.

(ii) (it has been argued that) in tone languages, tones behave in a relatively symmetric fashion, whereas in accent languages, one tone (generally the H-tone) has some special status (Hyman above). However, the important distinction between the asymmetries observed in languages so-called 'pure tone languages' is observed in accentual languages. Asymmetries result because rules of spreading, etc. will treat H-tones differently from L-tones since rules affecting H-tones may apply prior to the assignment of L-tones, while rules affecting L-tones may only apply to a fully specified string.

(iii) (it has been argued that) there is a stage in the derivation of an accentual language where the tonal representation 'consists strictly of an integral number of copies of a fixed language-specific Basic Tone Melody' (Goldsmith 1982). However, it is only the result of applying rule and convention to underlying representations that include prelinked tones (=tones that are linked with TBUs underlyingly).

In conclusion, accentual diacritics can be replaced by prelinked tones; tonal melodies can be derived by

regular phonological rules.

Tokyo Japanese has been analyzed as a two-tone system with high tones and low tones (Haraguchi 1977, 1991, Poser 1984). According to Pulleyblank (1986), only high tones are present in the representation of tones (tonal asymmetry); low tones are assigned as default in fully specified strings. Both content words and function words are classified into two types for tone melody assignment: 'accented words' and 'unaccented words' (Pierrehumbert and Beckman 1988). Most function words are unaccented. The difference between the two lies in the existence of the lexical high tone, which is also called 'accent'. In (37) the presence or absence of the lexical tone (H) is represented as part of morpheme: the accented word /wakar/ 'understand' has the lexical tone, while the unaccented word /kawar/ 'change' does not. The underlying representations of verbs do not involve prelinking of tones; the lexical tones are linked by morphological operations.

(37)	accented	unaccented
	$\left[\begin{array}{c} \text{H} \\ \text{wakar} \end{array} \right]$	$\left[\begin{array}{c} \\ \text{kawar} \end{array} \right]$

One of the characteristics of the lexical tones is that they are expressed as a sudden drop in FO contour (Kubozono 1986). It is considered that the tone bearing unit (TBU) in Japanese is the

sonorant mora. Obstruents, including coda obstruents, are transparent to tone assignment. The syllable itself can be the site for tone assignment in some cases (Haraguchi 1977, Clark 1986, Kubozono 1989, also see chapter II).²⁰

Initial Lowering (IL) has been discussed extensively among phonologists (Haraguchi 1977, 1990, 1991, Poser 1984, Selkirk and Tateishi 1988, 1991, Pierrehumbert and Beckman 1988). IL is considered as a low boundary tone insertion, which creates a LH rise word/phrase-initially. Tone melodies may vary slightly in the actual speech of individuals, because pragmatic factors are involved in actual speech production.²¹

4.2. Accent Assignment

This section demonstrates actual tone melody assignment. The standard modern transcription of tonal melodies in Tokyo Japanese is presented in (38) (based on Poser 1984, p. 23; converted from Sakuma 1919 into the standard modern transcription).²² The tone melodies with the unaccented subject marker /ga/ are added in the right column.

(38)	<u>ha</u> sī	LH	'edge'	<u>ha</u> sī gā	LHH
	<u>ha</u> sī	LH	'bridge'	<u>ha</u> sī gā	LHL
	<u>ha</u> si	HL	'chopstick'	<u>ha</u> si gā	HLL
	<u>sa</u> kura	LHH	'cherry'	<u>sa</u> kura gā	LHHH

<u>hi</u> bachi	HLL	'hibachi'	<u>hi</u> bachii ga	HLLL
<u>o</u> tāma	LHL	'soup ladle'	<u>o</u> tāma ga	LHLL
<u>a</u> tāmā	LHH	'head'	<u>a</u> tāmā ga	LHHL

These tone melodies are conditioned in part by the existence of the lexical tone. The lexical tone is part of the morpheme and prelinking of the tone is included in the input. The prelinking is only for nouns, since verbs behave quite differently. For a two-syllable accented word, contrast is made among an initial-syllable accented noun, a second-syllable accented word, and an unaccented word. For three-syllable words, the contrast involves one more type of word: the third-syllable accented word. When a word, for example /hasi/ 'chopstick', is pronounced in isolation, the initial syllable is linked with the high tone. In /hasi/ 'bridge' the second syllable is linked with H. The unaccented /hasi/ 'edge' does not have the lexical tone. In this context, there is no difference between /hasi/ 'bridge' and /hasi/ 'edge'; however, when /ga/ is attached, the distinction is clear as shown in (38): the distinction among /hasi/ 'bridge', /hasi/ 'edge', and /hasi/ 'chopstick' will be /hasiga/, /hasiga/, and /hasiga/, respectively.

The unaccented words are subject to phrasal high tone assignment. The phrasal high tone is linked with the word-final Tone Bearing Unit (TBU). Both lexical and phrasal high tones spread to the left. Finally, low boundary tones are associated

for all words at phrasal ends. Initial Lowering only applies to the initial syllable if there is no lexical tone linked with the initial syllable, while the boundary tone associated at phrasal ends may spread to the left multiply.²³

The following shows the derivation of /hasɪ/ 'bridge' followed by the particle /ga/; /ga/ does not affect the tone assignment of /hasɪ/.

(39) Derivation

Underlying Representation:	$\begin{array}{c} \text{H} \\ \\ \text{hasi} \end{array}$	'bridge'
Phrasing:	$\begin{array}{c} \text{H} \\ \\ \text{hasi ga} \end{array}$	
Low Boundary Tone Insertion:	$\begin{array}{c} \text{L\%} \quad \text{H} \quad \text{L\%} \\ \diagdown \quad \quad / \\ \text{hasi} \quad \text{ga} \end{array}$	

This is ordered as follows:

- (i) phrasing: the unaccented particle /ga/ follows /hasɪ/.
- (ii) Low Boundary Tone Insertion: (a) Insert L% to the initial (light) syllable, if it is not accented (Initial Lowering). (b) Insert L% to the final TBU and spread it to the left multiply until H blocks it.

4.3. Lexical Tones

Now we turn to Nasal Spreading. The tone melody assignment specific to Nasal Spreading will be presented in this section. For accented verbs the lexical tone is attracted to the mora preceding /nai/; /nai/ is an unaccented function word. In (40) the citation (present-tense) form is presented first, then the standard negative form, followed by the colloquial negative form.

(40) Accented Stems

citation	standard neg.	colloquial neg.	
<u>w</u> akar-u	<u>w</u> akar-a-nai	<u>w</u> aka-N-nai	'understand'
<u>s</u> asar-u	<u>s</u> asar-a-nai	<u>s</u> asa-N-nai	'stick'
<u>h</u> akar-u	<u>h</u> akar-a-nai	<u>h</u> aka-N-nai	'weigh'
<u>k</u> aramar-u	<u>k</u> aramar-a-nai	<u>k</u> arama-N-nai	'entangle'

For the accented words (40), the accent is attracted to the TBU immediately preceding /nai/; for example, /wakar/ 'understand' gets a high tone on the TBU immediately preceding /nai/ as /wakarai/. This shift is detected, because /nai/ shows sudden pitch drop in FO contour.

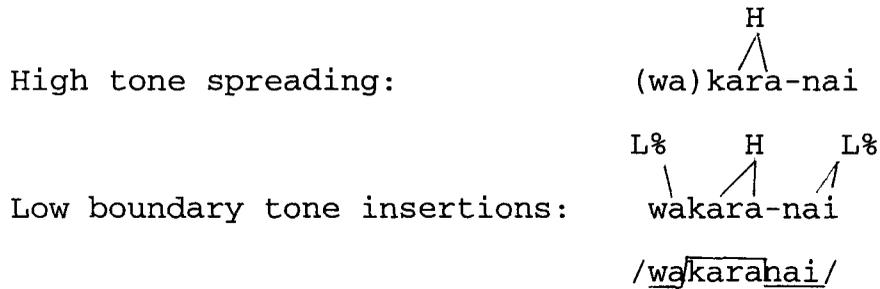
Ishihara (1991) includes prelinked tones in underlying representations of verbs; however, the question is how to determine the TBU for prelinking. For example, an accented verb /tabe/ 'eat' gets the second syllable accented in present-tense

and negative forms, /taberu/ and /tabenai/, while the initial syllable is accented in past-tense and gerund forms, /tabeta/ and /tabete/. If we take the present-tense form /taberu/ for the underlying representation, since it is the citation form, what kind of phonological evidence can support this choice?

Furthermore, if we take the present-tense form for the underlying form, in order to derive the past-tense and gerund forms, we have to delink the already linked tone, and link it again with the other TBU according to morphological conditions. What I propose here is to include the lexical high tone as part of the morpheme for verbs in (41), presented earlier in (37); however, the lexical tone is still not linked with any TBU.

(41)	accented verb	unaccented verb
	$\left[\begin{array}{c} \text{H} \\ \text{wakar} \end{array} \right]$	$\left[\text{kawar} \right]$

Linking takes place when morphological operations, such as compounding, suffixation, etc. are involved. For instance, the underlying representation of /wakar/ includes a lexical tone, but it is not linked yet. /nai/ suffixation determines the TBU for linking, that is, the TBU immediately preceding /nai/. It is possible to start writing derivations with prelinked tones by skipping the process of linking. For example, in the compound verb /tabete-iru/ 'eating PROGRESSIVE (see Chapter II)', the tone melody of /tabete/ is determined prior to compounding. The



Unaccented words (44) do not have lexical tones. A phrasal high tone (not the lexical tone) is assigned to the final TBU in the derived domain.

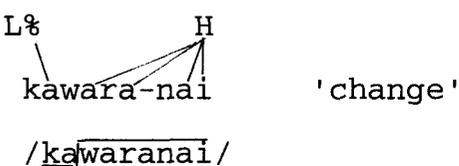
(44) Unaccented Words

standard neg.	colloquial neg.	
<u>ka</u> war-a-nai	<u>ka</u> wa-N-nai	'change'
<u>to</u> mar-a-nai	<u>to</u> ma-N-nai	'stop'
<u>sa</u> war-a-nai	<u>sa</u> wa-N-nai	'touch'
<u>ma</u> war-a-nai	<u>ma</u> wa-N-nai	'turn'

The phrasal high tone cannot be assigned for accented words, because already one (lexical) high tone exists in the same domain; to do so would violate the Obligatory Contour Principle (OCP).²⁴ Suffixation must precede phrasal high tone assignment, since the phrasal high tone is assigned with the final TBU in the output domain. High tones, either lexical or phrasal high tones, can spread forward multiply. Thus the derivation of tone melodies in /nai/-suffixation is ordered as follows:

- (i) Suffixation
- (ii) Linking of lexical tones with the TBU immediately preceding /nai/.
- (iii) High tone assignment: assign a high tone to the final TBU in the derived string, if there is no other high tone in the same domain.
- (iv) High tone spreading: spread H to the left, multiply (note that this is backward spreading by convention).
- (v) Low boundary tone insertion.

In the unaccented words (44) the phrasal high tone is assigned to the final TBU of the derived domain and spreads to the left. Unaccented words are pronounced with level tone, except for the initial syllable, which is lowered by Initial Lowering.

- (45) Initial Lowering:  'change'
- /k̄awaranai/

4.4. Agreement in Tone Melodies

The other characteristic of tone melodies in the negative construction is that tone melodies of the standard form and the colloquial form must agree. In the following table, both accented (46a) and unaccented (46b) words demonstrate the corresponding tone melodies in the standard and the colloquial

forms.

(46) a. accented stems:

citation	standard neg.	colloquial neg.	
<u>ka</u> war-u	<u>ka</u> war-a-nai	<u>ka</u> wa-N-nai	'change'
<u>sa</u> war-u	<u>sa</u> war-a-nai	<u>sa</u> wa-N-nai	'touch'
<u>to</u> mar-u	<u>to</u> mar-a-nai	<u>to</u> ma-N-nai	'stop'

b. unaccented stems:

citation	standard neg.	colloquial neg.	
<u>wa</u> kar-u	<u>wa</u> kar-a-nai	<u>wa</u> ka-N-nai	'understand'
<u>ko</u> mar-u	<u>ko</u> mar-a-nai	<u>ko</u> ma-N-nai	'be troubled'
<u>ha</u> yar-u	<u>ha</u> yar-a-nai	<u>ha</u> ya-N-nai	'spread'

The next set of data represents monosyllabic roots in which tone melodies of the standard form and the colloquial form do not agree in the negative construction.

(47) a. accented stems:

citation	standard	NS(melody 1)	NS(melody 2) ²⁵	
<u>to</u> r-u	<u>to</u> r-a-nai	? <u>to</u> -N-nai	? <u>to</u> -N-nai	'take'
<u>sa</u> r-u	<u>sa</u> r-a-nai	* <u>sa</u> -N-nai	* <u>sa</u> -N-nai	'leave'
<u>i</u> r-u	<u>i</u> r-a-nai	* <u>i</u> -N-nai	* <u>i</u> -N-nai	'roast (beans)'

b. unaccented stems:

<u>i</u> r-u	<u>i</u> r-a-nai	* <u>i</u> -N-nai	* <u>i</u> -N-nai	'need'
--------------	------------------	-------------------	-------------------	--------

<u>ta</u> r- <u>u</u>	<u>ta</u> r-a-nai	? <u>ta</u> -N-nai	? <u>ta</u> -N-nai	'suffice'
<u>ha</u> r- <u>u</u>	<u>ha</u> r-a-nai	? <u>ha</u> -N-nai	? <u>ha</u> -N-nai	'paste'

Tone melodies are morphological properties of the negative form with /nai/. However, the colloquial form, sharing the same input structure with the standard form, must follow the fixed melodies assigned to the standard form which is more general. Additional examples of 'fixed' tone melodies are shown in (48), in which present-tense verbs are compared with past-tense verbs.

(48) Tone Melodies for Present and Past Tense Verbs ²⁶

a. accented cons. verbs

root	pres.	past	
kak	<u>k</u> ak-u	<u>k</u> ai-ta	'write'
yom	<u>y</u> om-u	<u>y</u> on-da	'read'
tor	<u>t</u> or-u	<u>t</u> ot-ta	'take'

b. unaccented cons. verbs

maw	<u>m</u> a-u	<u>m</u> a-t-ta	'dance'
hak	<u>h</u> a-k-u	<u>h</u> a-i-ta	'wear'
kas	<u>k</u> a-s-u	<u>k</u> a-s-i-ta	'lend'

Both present-tense and past-tense forms agree in tone melodies, unless other elements are involved.²⁷

4.5. Accent Shift

Accent assignment will be re-examined in this section. It will be demonstrated that Accent Shift causes the mismatch between tone melodies in monosyllabic root verbs. In noun compounds, whose second member consists of more than three moras, the accent is placed on the antepenultimate mora. The following nouns have an accent on the antepenultimate mora.

(49) Accent Assignment

H yuki-geshiki	'snow scenery'	H fuyu-yasumi	'winter vacation'
H koori-mizu	'ice water'		

There is a morphological phenomenon called 'Accent Shift' (Poser 1984, Kubozono 1986, Ishihara 1991). For unaccented recent loan words that contain the antepenultimate mora within a heavy syllable, the accent is shifted to the mora within the same syllable. The following recent loan words (from English and French) contain the antepenultimate mora in the heavy syllable.

H wa[siN]ton	'Washington'	H ko[roN]bia	'Columbia'
H koohii[tee]buru	'coffee table'	H kuro[was]san	'croissant'

In (50) the accent does not fall on the antepenultimate mora, but on the initial mora in the heavy syllable which contains the antepenultimate mora.

(51) Accent Shift

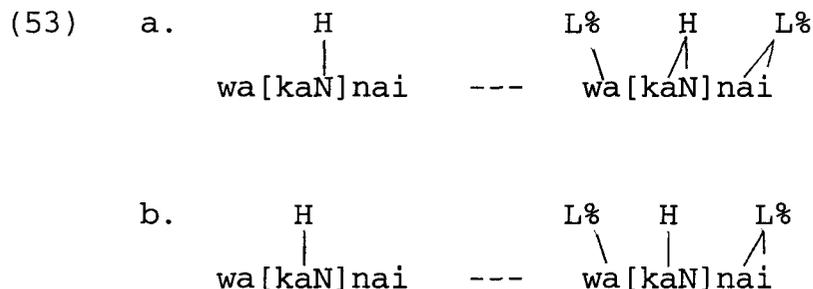
$$\dots \begin{array}{c} \text{H} \\ | \\ [\text{m m}] \text{ m m } \# \end{array}$$

However, Accent Shift is not applicable in some loan words, as shown below:

- (52)
- | | | |
|----|--|-------------|
| a. | $\begin{array}{c} \text{H} \\ \\ \text{yuubiisii} \end{array}$ | UBC |
| b. | $\begin{array}{c} \text{H} \\ \\ \text{brekkufaasuto} \end{array}$ | breakfast |
| c. | $\begin{array}{c} \text{H} \\ \\ \text{puropaNgasu} \end{array}$ | propane gas |

In the above words, tone assignment is determined either by the original English accent patterns (52a,b), or for compound nouns by making two domains for accentuation; e.g. /propan/ and /gasu/ in (52c). Thus antipenultimate accent assignment or Accent Shift is not applicable in the above cases. For the application of Accent Shift (and accent assignment in general as well), other factors such as Initial Lowering, must be considered (see 4.6).

In some cases, it is possible to place the accent on either the first or the second mora within the same syllable. The effect of Accent Shift is due to the interaction of two constraints, one requiring an accent on the first mora of a syllable, and the second requiring an accent on the antepenultimate mora, with the syllable constraint outranking the mora constraint. Kubozono (above) proposes that this is so because the syllable, not the mora, is the unit for tone assignment. Poser (above) also points out that the syllable is the TBU and the mora is the postlexical unit for tone assignment. The system of Accent Shift can be adopted for the tone assignment in the negative construction.



In (53a), the accent is on the antepenultimate mora. In (53b), the accent is shifted within the same syllable. Note that high tones only spread to the left. The two intonational curves (54a) and (54b) show the low-high-low sequence. However, the next verb /tor/ 'take' displays a serious problem in terms of tone melody agreement:

(54)	a.	b.	c.
	L% H L%	? H L%	? H L%
	tor-a-nai	[toN]-nai	[toN]-nai
	/tor-a-nai/	/toN-nai/	/toN-nai/

For accent assignment, only the above three melodies are logically possible; among them only the standard form /toranai/ (54), with the antipenultimate mora accented, can surface. In (54b) the colloquial form has the antepenultimate accent; the high tone spreads to the left (IL does not apply--this will be explained in the next section). (54c) has the initial accent because of 'Accent Shift'. Both of these melodies for /toNnai/ do not agree with the melody of /toranai/.

4.6. Initial Lowering (IL)

Another tonal process that explains the gap between the two types of tone melodies is the restriction on Initial Lowering. Haraguchi (1977) points out that words that contain heavy initial syllables tend to be pronounced without IL.²⁸ Unaccented nouns that contain light initial syllables, and unaccented nouns that contain heavy syllables initially are contrasted as follows:²⁹

(55)	a.	surface	IL	
		koobaN	?koobaN	'police station'
		koNdaN	?koNdaN	'discussion'

<u>yoo</u> huku	? <u>yo</u> huku	'clothes'
<u>soo</u> daN	? <u>so</u> daN	'counselling'
<u>ryo</u> otei	? <u>ryo</u> otei	'Japanese style restaurant'

- b. icigogari 'strawberry picking'
kasiori 'box of sweets'
ucigawa 'inside'
torigoya 'bird cage'

In (55a) heavy syllables tend to be pronounced with a level tone. On the other hand, IL applies consistently for all forms with light initial syllables. The following words containing heavy initial syllables follow the above system.³⁰ They are all unaccented words.

(56)	a.	b.	c.	
	UR	standard neg.	colloquial neg.	
	yor-nai	<u>yo</u> r-a-naï	? <u>yo</u> -N-naï	'drop by'
	ir-nai	<u>i</u> r-a-naï	* <u>i</u> -N-naï	'need'
	nar-nai	<u>na</u> r-a-naï	? <u>na</u> -N-naï	'sound'
	tar-nai	<u>ta</u> r-a-naï	? <u>ta</u> -N-naï	'suffice'
	kar-nai	<u>ka</u> r-a-naï	* <u>ka</u> -N-naï	'crop'

In (56c), Initial Lowering does not apply; the forms with /N/ are not acceptable, because their tone melodies do not agree with the ones on the standard form (56b)--a disyllabic base [@ @]-nai is

required for /nai/-suffixation.

5. Optimality Theory

The above interaction of the processes can be captured in an approach like Optimality Theory (OT). However, this thesis is not fundamentally based upon Optimality Theory, so the application of the theory is limited. OT integrates all the different sorts of environments or constraints discussed in the previous analysis, by ranking the constraints and by evaluating the candidate sets. First, I will outline Optimality Theory, based on McCarthy and Prince (1993), Prince and Smolensky (1993), Archangeli and Pulleyblank (1993b, in press), Pulleyblank (1993), Ito, Mester, and Padgett (1993), Ito (1994), and Hewitt (1994). In the second section, I will present an analysis of Nasal Spreading, within Optimality Theory.

5.1. Basic Component

The central analytical proposals of Optimality Theory are, (i), that attested phonological forms are determined by evaluation against a set of constraints, and (ii), constraints are ranked in a hierarchy. In OT constraints are violable; constraints that may be violated in optimal forms are lower-ranked, so that the optimal output forms can be secured. Universal Grammar specifies the constraint sets. Individual

grammars are set by parameters, or other kinds of arguments in general terms. The input candidate sets are produced by the function Gen. Three principles underlie the theory of Gen, as listed below (Prince and Smolensky 1993, McCarthy and Prince 1993).

(57) Gen

- a. Freedom of Analysis: Any amount of structure may be posited.
- b. Containment: No element may be literally removed from the input form. The input is thus contained in every candidate form.
- c. Consistency of Exponence: No changes in the exponence of a phonologically-specified morpheme are permitted.

By selecting and ranking the constraints differently, interlinguistic variation can be explained. Four properties of constraints interaction in Optimality Theory are:

- (i) Violability. Constraints are violable; but violation is minimal.
- (ii) Ranking. Constraints are ranked on a language-particular bases; the notion of minimal violation (or best-satisfaction) is defined in terms of this ranking.

(iii) Inclusiveness. The candidate analyses, which are evaluated by the constraint hierarchy, are admitted by very general considerations of structural well-formedness; there are no specific rules or repair strategies with specific structural descriptions or structural changes or with connections to specific constraints (McCarthy and Prince 1993).

The candidate sets are evaluated by the well-formedness constraints; the best-satisfied form is optimal. When the constraints conflict in a candidate set, the relation in the constraints will be ranked as A dominates B ($A \gg B$), as illustrated below:

(58) Constraint Tableau, $A \gg B$ (Prince and Smolensky 1993)

Candidate	A	B
* can 2		*
cand 2	*!	

The basic conventions used here are:

- Left-to-right column order mirrors the domination order of the constraints.
- Violation of a constraint is marked by *.
- Satisfaction is indicated by a blank cell.
- The sign ! draws attention to a fatal violation, the

one that is responsible for a candidate's nonoptimality.

- The symbol * draws attention to the optimal candidate.
- Shading emphasizes the irrelevance of the constraints to the fate of the candidate.

Violation becomes fatal when other candidates pass the constraint. The constraints, for example, PARSE and Rec (see 5.2) belong to 'a family of faithfulness constraints', that expresses a tight relation between input and output forms. In this thesis, violations of PARSE are marked with <>. The segments that are not included in input forms are expressed with capitalized letters.

5.2. Nasal Spreading in Optimality Theory

In Nasal Spreading, Optimality Theory integrates segmental, prosodic, and tonal constraints into a minimal number of constraints for a certain set of candidates. For example, the monosyllabic root /tor/ 'take' is expressed in the following table. The capitalized letters /N/ and /A/ indicate that they are not shown in the input. Each syllable is bracketed.

(59) Nasal Spreading: Monomoraic Roots

	Parse	Disyll	RecM	Rec@
[to]<r>-nai	*!			
[toN]-nai		*!	*	
* [to][rA]-nai			*	*
[to][rAN]-nai			**!	*

There are four possible output strings for /tor/ as in (59); Nasal Spreading does not apply to any candidate. In /to<r>-nai/, the root final segment /r/ is deleted, violating PARSE root.

PARSE(root): underlying segments(roots) must be parsed into syllable structure.³¹

PARSE(root) violations are prohibited anywhere in the negative construction. The violation of this constraint is fatal, therefore it must be ordered first. /toN-nai/ does not violate PARSE(root), since the root of /r/ exists in /toN-nai/; nasality of /n/ spreads to the root node of /r/ without any deletion.

(60) t o RT - RT a i
 |
 [nas]

In /toN-nai/ a mora is added to the output. /r/ in the input does not get any mora assigned; however, /N/ as a coda nasal, a mora is assigned to it. This is formulated as the

constraint 'Recoverability of Mora' (RecM).

RecM (Recoverability of mora): If [...m...]output then [...m...]input. A mora that is present in an output form is also present in the input (Pulleyblank 1993, Archangeli and Pulleyblank 1993 (b), Ito, Mester, and Padgett 1993, and Hewitt 1994).

In /torA-nai/ a mora is added onto the output through /a/-epenthesis. This is also a violation of RecM. The difference between /toN-nai/ and /torA-nai/ is that /torA-nai/ adds an extra syllable onto the output, since /a/ cannot be syllabified anywhere except creating a new syllable node in the string. This is formulated as a violation of Recoverability of Syllable (Rec@).

Rec@ (Recoverability of syllable): If [...@...] output then [...@...] input. A syllable that is present in an output is also present in the input (same as the above).

/toN-nai/, on the other hand, maximizes the syllable size to bimoraic; the coda /N/ is syllabified with the already existing syllable without adding any extra syllable. /toN-nai/ violates RecM, but does not violate Rec@, while /torA-nai/ violates both RecM and Rec@. /torAN-nai/ violates Rec@, and doubly violates RecM, by adding two moras into the output.

for /nai/-suffixation: [@ @]-nai (in order to meet the tonal condition).

This constraint also rules out cases such as /to<r>-nai/. This candidate violates PARSE(root) and DISYLL. Thus these two constraints also indicate that the negative construction is a (mora) augmentation process and not the one involving deletion. The constraints for the candidate set are ranked as follows: PARSE>>DISYLL>>RecM>>Rec@. RecM and Rec@ must be ranked lower in order to secure the best-satisfied /torA-nai/; of which, Rec@ is the final one for /a/-epenthesis, since only in /a/-epenthesis, Rec@ is violable.

The following table displays the case of a heavy syllable root /hoor/ 'throw'.

(62) Superheavy Syllables

	Parse	*3m@	Disyll	RecM	Rec@
[hoo]<r>-nai	*!		*		
[ho<o>N]-nai	*!		*	*	
[hooN]-nai		*!	*	*	
*[hoo][rA]-nai				*	*
[hoo][rAN]-nai				**!	*

Nasal Spreading does not apply in /hoor/. The long syllable contained in /hoor/ triggers an unfavourable superheavy syllable.

Unlike the past-tense formation, the /nai/ suffixation does not allow superheavy syllables. We need to include the constraint on syllable size.

*Tri-moraic Syllables (*3m@): avoid syllables with three moras: @<2m (Hewitt 1994).

The ranking of the faithfulness family of constraints, PARSE, RecM, and Rec@, is the same as the case of /tor/. /ho<o>N-nai/ violates PARSE by shortening the long vowel. Even if /hooN/ were shortened into /hoN/, it would not form a two syllable string. /hoo<r>-nai/, /ho<o>N-nai/, and /hooN-nai/ violate the constraint DISYLL; the tone melodies of /hooN-nai/ or /ho<o>N-nai/ do not agree with the tone melody of the standard form. Violations of PARSE and *3m@ are prohibited in /nai/-suffixation, because /nai/-suffixation is achieved by augmentation, and not by deletion. DISYLL, a constraint for the base template which interacts with tonal condition follows the two constraints PARSE and *3m@.³² The five constraints are ranked as follows: PARSE>>*3m@>>DISYLL>>RecM>>Rec@.

5.3. Syllable Templates

Syllable templates in outputs are compared in the following list. In (56) the possible output syllable templates for Nasal Spreading are listed on the right of each word according to

syllabification and the mora count. A template marked with # indicates that it is in the word initial position. Without #, by adding some more syllables, it would derive different types of templates; for example, /tor/ must be distinguished from /karitor/ 'harvest' which has a trimoraic input string.

(63)	input	output(NS)		
a.	tor-nai ---	*toN-nai	*#[mm]	'take'
b.	tor-nai ---	*torAN-nai	*[m][mm]	'take'
c.	hoor-nai --	*hooN-nai	*[mmm]	'throw'
d.	hoor-nai --	*ho<o>N-nai	*[mm]	'throw'
e.	kawar-nai -	kawaN-nai	[m][mm]	'change' ³³
f.	kawar-nai -	kawa<r>-nai	*[m][m]	'change'

Nasal Spreading does not apply in monosyllabic roots (63a,b,c,d), as we have discussed. /hoor/ (63c,d) represents heavy syllable (final) roots. It violates *3m@ by deriving a superheavy syllable. In /ho<o>N-nai/ (63c) the long vowel is shortened; shortening violates the integrity of the syllable. PARSE demands the segment to be properly linked with the appropriate node. (63f) deletes the root final /r/, violating PARSE(root). Only in (63e) does Nasal Spreading apply.

Instead of using the possible template patterns presented with moras and syllables, I use the actual words in (64), since it is easier to see the comparison. The above six candidates are

laid out in the following table.

(64) Nasal Spreading: Condition and Template

	Parse	*3M@	Disyll	RecM	Rec@
[ka][wa]<r>-nai	*!				
[ho<o>N]-nai	*!		*	*	
[hoon]-nai		*!	*	*	
[toN]-nai			*!	*	
[to][rAN]-nai				**!	*
* [ka][waN]-nai				*	

This representation is somewhat unusual since types of forms are compared rather than candidate outputs for a single input. This is because the evaluation of each set of candidates is done separately; for example, a candidate set of monomoraic roots, etc. The candidate set in (64) is to compare and to evaluate possible syllable types (=templates) for Nasal Spreading. Among the six candidates in (64), PARSE violations are prohibited anywhere in the negative construction; the violation of this general constraint is serious, and thus ranked first. The violation of *3m@ as well must be serious, because superheavy syllables are prohibited; this constraint applies only for heavy syllable roots (in root final position). PARSE and *3m@ are related to syllable structure. Nasal Spreading is a mora augmentation process which maximizes the syllable template to [mm]_F; at the same time, the output strings must meet the well-

formedness syllable constraints. /nai/-suffixation is accomplished by violating RecM and/or Rec@--adding a mora to the output. Nasal Spreading specifies the template [mM]_σ (M=inserted), while /a/-epenthesis specifies the template [m]_σ [M]_σ. The difference between Nasal Spreading and /a/-epenthesis is made by Rec@. In (64) RecM is ranked before Rec@, because the optimal form /kawaN-nai/ violates RecM, but not seriously as the case of /torAN-nai/. DISYLL rules out the monosyllabic stems in the input. DISYLL does not concern syllable internal structure. DISYLL governs the tonal agreement in the standard and the colloquial forms. Thus the constraints are ordered as follows: PARSE>>*3m@>>DISYLL>>RecM>>Rec@ for Nasal Spreading.

Vowel verbs do not involve any modification in the negative construction. They are not subject to either /a/-epenthesis or Nasal Spreading. They do not create a consonant cluster by suffixation. Next, in the following table, consonant verbs which do not have the root final /r/, for example, /kak/ 'write', are examined. /a/-epenthesis applies, but Nasal Spreading cannot apply.

(65) /a/ Epenthesis: Consonant Verbs

	Parse	Disyll	RecM	Rec@
[ka]<k>-nai	*!	*		
[ka<k>N]-nai	*!	*	*	
[ka][kAN]-nai			**!	*
*[ka][kA]-nai			*	*

The consonant cluster derived by suffixation must be broken up by /a/-epenthesis; /a/-epenthesis is treated as a syllabification process. None of the segments contained in the input can be deleted; PARSE is ranked first. The /r/ final root can undergo Nasal Spreading, however, the other consonant final roots cannot undergo spreading.

In (65), the deletion of the root-final /k/ results in the fatal violation of PARSE(root). In the /r/-final root, the root of /r/ is targeted for spreading. The root of /r/ receives its feature specification from the following /n/ by spreading, without deleting the root; obviously, this is different from the case of the /k/-final verb. Nasal Spreading does not violate PARSE(root) in this regard. DISYLL is included in the set of conditions. The result of DISYLL overlaps with the result of PARSE; however, the distinction between the two constraints will be clear when we consider longer consonant verbs, for example,

/saso<w>/ 'invite'. /sasow/, consisting of a disyllabic root, can pass DISYLL, but violates PARSE, if there is any deletion. /kakan-nai/ violates RecM seriously, because the two moras for /a/ and /N/ are not included in the input. Rec@ is ranked last for /a/-epenthesis. The three constraints ranked as PARSE>>DISYLL>>RecM>>Rec@ can account for the verbs which have consonants other than /r/ root-finally.

Finally, the target /r/ and the spreader /n/, analyzed in 'the segmental analysis' (Chapter I-2), will be re-examined under the Optimality Theoretic approach. In this section, /r/ and /n/ are analyzed separately.

As we have examined, /r/ is not linked with any feature. Only the root node is present in the representation of /r/ in Nasal Spreading. Therefore, in (66a) /r/ fulfills both licensing of place and manner feature specifications. On the other hand, (66b) violates licensing of the place feature, by linking [coronal], and (66c) violates licensing of the manner feature, by linking [lateral].

(66) a. r b. * r c. * r
 | |
 [cor] [lat]

The two licensing violations are as follows:

License Place (P): the place feature(s) must be licensed (cf.

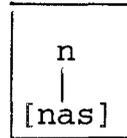
lat, cor] violates both License P and License M. [r] with no specification is optimized.

The spreader /n/ can be captured in the same manner. /n/ is licensed as [n-nasal]. There is no place specification for /n/, but [nasal] is specified in Nasal Spreading.

- (69) a. License Place: n, m, ŋ
 | | |
 lab dor
- b. License Manner F: n, m, ŋ
 | | |
 nas nas nas

Among the three nasals /n, m, ŋ /, /n/ does not have a place specification. The other two have labial or dorsal specifications. As for manner feature(s), all of the nasals are licensed by [nasal]. The candidates for the spreader /n/ are evaluated as follows:

(70) The Spreader /n/: Input



	License P	License M
<pre> n / \ nas cor </pre>	*	*
<pre> n cor </pre>	*	
<pre> n nas </pre>		
n		*

[n-cor] violates License P and License M. [n-nas, cor] violates License P. [n] does not get any specification; License M is violated. [n-nas] is optimized.

Feature Class Theory and Feature Licensing account for the examination of segments in Nasal Spreading. Under the Optimality Theoretic approach, possible candidate segments at morpheme boundaries are evaluated with the two constraints, License Place and License Manner Feature.

6. Conclusion

A small set of constraints, PARSE, RecM, and Rec@ (members of the faithfulness family of constraints), *3m@, and DISYLL covers various types of conditions, and accounts for the candidates discussed in the previous sections. Different combinations and ranking of the above constraints evaluate different sets of candidates for Nasal Spreading and /a/-epenthesis. For example, /a/-epenthesis derives an additional light syllable, while in Nasal Spreading /N/ maximizes the syllable template to bimoraic. The difference between the two is that /a/-epenthesis adds one syllable to the string, violating Rec@. Both types of modifications must align with the morpheme boundary before /nai/.

In the final section, the segmental analysis has been re-examined under the Optimality Theoretic approach, adopting two issues, Feature Class Theory and Feature Licensing. Two set of constraints, License Place and License Manner Feature account for two set of candidates for the verb-final position and the suffix-initial position.

In the analysis of Nasal Spreading, I have not included the constraint ALIGN discussed in McCarthy and Prince (1993), Pulleyblank (1993) and others; for instance, the right edge of the derived base [@ @] in question must align with the morpheme

boundary before /nai/ ([@ @]-nai). The evaluation of candidates can be done with the above mentioned constraints without ALIGN, and in this way we can minimize redundancy in terms of exposition. Or analytically, in either Nasal Spreading or /a/-epenthesis, ALIGN is underspecified for all the candidate sets by specifying segmental conditions prior to prosodic analysis as the premise: segmental analysis specifies the root-final segment to be targeted for change. There is no contrast in terms of locus among the candidates in the presented tableaux. Probably, there is much more to say with regard to Optimality Theory; however, for a trial analysis, I would like to limit the discussion to the points described in this chapter, and leave it for future research.

NOTES

1. There are some more suffixes for negative formation, such as /maseN/, /mai/, or /zu/. /nai/ is called the informal negative suffix. /nai/ is a present-tense form of the root /nak/. A part of the /nak/ conjugation is given below.

nak-atta	past tense	/ta/ = past tense suffix
nak-ute	gerund	/te/ = gerundive suffix
nak-ereba	conditional	/reba/ = conditional suffix

These forms are predictable from the underlying form /nak/, and they are not allomorphs. Conjugation is complex, including intervening segments, such as /a/, /u/ or /e/. As seen in the above data, /k/ of /nak/ is present in other forms; however, the intervocalic /k/ is dropped in the citation form as /nai/ (Vance 1987, Shibatani 1990). /nai/ can be compared with the adjective /nai/; however, the conjugation of adjective /nai/ is slightly different from the suffix /nai/. I will concentrate on the suffix /nai/ which is attached to verb roots.

In this thesis, the citation form (present-tense form) /nai/ is used. The present-tense form is also called 'non-past', because the present-tense and future-tense forms are the same in Japanese, as seen in the following verbs (Makino and Tsutusi 1986).

Root	Present	Future	
tabe	taberu	taberu	'eat'
mat	matu	matu	'wait'

2. I interviewed four native speakers of Tokyo Japanese for the judgement of the data in this thesis. All of them were born in Tokyo and grew up there. The total number of years they lived outside Tokyo is less than three years. The age range is between late twenties and early forties. Thus, it is possible to state that the four speakers share the same linguistic background; however, there are still some differences in pronunciation and in judgements for some expressions. There may be pragmatic factors, such as fast speech effect, etc; however, the pragmatic differences are not the objective of the analysis. The difference in judgements cannot be avoided when we analyze actual speech.

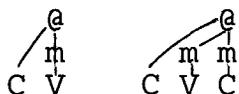
3. In the vowel inventory in Japanese, /i/ is phonetically characterized as the central vowel /i/, and /u/ is the unrounded /ɯ/. In this thesis, in the most cases, segments are expressed phonemically, or even in the Romanized characters, unless there

is need for expressing phonetic constrast.

4. The string of (C)VV is not invariably grouped together under a single syllable node; for example, a Chinese-origin word /iiN/ 'committee member' is split into two syllables as /i.iN/ (Haraguchi 1977). It is mainly because this word is considered as a sort of a compound derived from two separate words, /i/ and /iN/. Phonetically, the two /i/s in /i.iN/ are not distinct from a long vowel /ii/, e.g. in /siiN/ 'scene'. Probably, this segregation is psychological, since phonetically there is no significance so far. This is the same for diphthongs. Whether (C)V₁V₂ (V₁≠V₂) constitutes one syllable or two separate syllables is an open question.

5. (C)VVN syllables are very rare. Especially, VVN seldom shows up in Japanese. However, this syllable type is still possible, as in an emphatic expression, e.g. the word like /uuN-to/ 'very much' is formed, but it is used in a very casual context.

6. The account that links the onset directly with the syllable node is based on Archangeli (1991), McCarthy and Prince (1993) and others.



Some phonologists (Kubozono 1989, Katada 1990, Ishihara 1991) take the different position that links the onset under the following mora node with the evidence from their research on language games and error analyses. However, it doesn't make any difference in terms of mora counting at least in this thesis. In the above representations, m expresses a mora, and @ is a syllable, either light or heavy.

7. In Nasal Spreading, the phrase that I take for analysis consists of a verb root and /nai/. No other segment or morpheme precedes or follows the phrase for the analysis. For instance, in Nasal Spreading, I use the form of /toranai/ for the verb root /tor/ 'take'. The past-tense form or the gerund form /toranai/ is not included in the analysis: e.g. /toranakatta/ PAST, or /toranaide/ GERUND are not examined. Because they are subject to different sorts of structural categories, and the constraints on nasal assimilation could be different. This is beyond our focus.

Pragmatic factors, such as speech rate, may affect the judgement of words presented in this thesis. However, I minimize the involvement of such factors (but they are not totally ignored). I focus on the phonological, morphological, and prosodic aspect of colloquial formations. The analytical focus is on the underlying principles rather than the superficial

variations.

8. The gloss is added for each word/expression (or for each verb root), but the tense or other functions (morphemes or function words) are not included in translation. For example, the translation of /kawaranai/ is '(It) won't change'; however, only the meaning of the verb root /kawar/ 'change' is presented in most cases in this thesis. The meaning of function words are added and explained where necessary.

9. /i/ and /e/ are lexical properties of the verbs. Only /i/ and /e/ can appear in the root-final position. The reason why only the two vowels can occupy the the root-final position is an open question.

Consonant verbs are restricted to the particular subset of the full range of consonants. In the course of history, quite a few phonological changes took place, and some of the sounds in the current consonant inventory were derived through the merger of two sounds, etc. and only the limited number of consonants occupy the root final position in modern Japanese. For example, /utaw/ 'sing' which conjugates as /utaw-a-nai/ NEGATIVE, /utat-te/ GERUND, in modern Japanese, has the following inflectional forms in Classical Japanese.

citation continuitive forms (more like the gerundive form)

utahu --- utafi --- utafite (Saeki and Yamada 1993; p. 60)

The above inflectional forms are found, for example, in the literature during the Heian period (794-1192) and the Kamakura period (1119-1131). These changes are part of the study of Classical Japanese (Saeki and Yamada, above).

10. /a/ shows up when a consonant hiatus is created by suffixation. In other suffixation, the vowel /i/ is also inserted when the consonant hiatus is created; for example, /kak/ 'write' takes /i/ for the suffixation of the 'polite' morpheme /masu/, as /kak-i-masu/, or the reduplicative form /kaki-kaki/ 'while writing.' /i/ may be considered as a suffix, since it can occupy the word final position; e.g. the nominalized verb /yomi/ 'reading' ends in /i/. On the other hand, /a/ cannot occupy the word final position as */kaka/; it must be bound with some suffixes such as /nai/ as /kakanai/. This is one of the reasons why /a/ is considered 'epenthetic'.

11. According to McCawley (1968), the verb /aru/ 'exist' is inflected as follows:

pres. aru
 past atta
 neg. nai
 polite arimasu
 prov. areba
 tent. aroo

12. It is not clear why /a/ is chosen for the epenthetic vowel. (cf. Grignon 1984). Probably /a/ has asymmetrical status in the vowel inventory; /a/ is the only low vowel, and lacks its counterpart in terms of backness, as the only [+low] vowel.

13. The two vowels /a/ and /i/ of /nai/ can be linked under one syllable node as a diphthong. However, I leave it as two syllables. Whether they are treated under one syllable or not doesn't make any difference in the analysis here.

14. "The mimetic vocabulary of Japanese consists of a large number of sound-imitating and manner-symbolic roots traditionally classified into Giseigo (onomatopoeic) and Gitaigo (more broadly ideophonic)."

15. Liquids and glides are not classified together as sonorants, with distinctions between them based on place. This is because of different behaviours between them. Some phonologists argue that liquids lack place feature in the feature geometry (Shaw 1991, Paradis and Prunet 1991, and others). For example, /r/ in Japanese lacks place feature, on the other hand, /w/ and /y/ are specified with place features. For example, the palatal glide /y/ can be a part of a complex onset, but the labial /w/ cannot form a complex onset.

16. In this context, whether /r/ is epenthesized or deleted is controversial (see Shibatani 1990 for this issue); however, it is not our major focus here. I leave it as an open question.

17. /a/ cannot be a part of the verb root; for example, */kasa/ 'lend' instead of /kas/. In the Japanese inflectional paradigm, it is reasonable to choose /kas/ for the verb root, because other vowel initial suffixes can follow the consonant ending root /kas/, creating various inflectional forms. The following examples demonstrate some other inflectional forms of /kas/ in contrast with the vowel verb /tabe/ 'eat'.

kas-oo	tabe-yoo	VOLITIONAL
kas-eba	tabe-reba	CONDITIONAL
kas-u	tabe-ru	NON-PAST
kas-i-ta	tabe-ta	PAST

kas-i-te	tabe-te	GERUND
kas-i-masu	tabe-masu	POLITE
kas-eru	tabe-(ra)reru	CAUSATIVE

18. The distinction between 'literary' words and 'colloquial' may conditions Nasal Spreading. However, the distinction cannot be made straightforwardly. Nasal Spreading applies to the words used frequently in daily conversation, such as /kawar/ 'change' or /wakar/ 'understand'. This tendency is general, and seen in other colloquial formations as well.

19. The cases in (36) cannot be the sequences of two syllables *[ho][oN], rather than the superheavy syllable [hooN]. This is because vowel length is a lexical property and must be treated as an integrated unit. Superheavy syllables do exist in the world's languages; for example in Arabic, the final mora in superheavy syllables is marked as extraprosodic (McCarthy and Prince 1990, pp.252-253).

20. Obstruents are transparent for tone assignment. Only Sonorant moras are TBUs (Haraguchi 1977).

21. Tone melodies in Tokyo Japanese may vary because of the following factors:

- (i) dialectal background
- (ii) idiosyncratic matters
- (iii) age/generation differences
- (iv) syntactic focus

In many cases, the differences in tone melodies occur at phrasal boundaries; some people tend to insert boundary tones, but others don't. For instance, the insertion of a low boundary tone in the end of a minor phrase is shown below:

melody 1: kawaranai '(It) doesn't change'

melody 2: kawaranai

There is no difference in meaning in the above two. Some of the other types of tonal variations will be introduced elsewhere.

22. Originally, tone melodies were transcribed in the three-tone system: high tones, mid tones, and low tones. Poser has converted it into the two tone system for the modern Tokyo Japanese.

23. Initial Lowering is considered as the continuation of a low boundary tone from the preceding phrase (Pierrehumbert and Beckman 1988). See also note 22 in Chapter II.

24. The OCP will be discussed in Chapter II.

25. See (4.6) for IL.

26. Vowel verbs have more complex tone assignment systems. Tone melodies change when suffixes, such as the polite suffix /masu/, are attached to verb roots.

27. Tone melodies of the present-tense form and the past-tense form in some accented vowel verbs do not agree.

root	present	past
tabe	tābē-ru	tābe-ta
oki	ōki-ru	ōki-ta
sime	sīme-ru	sīme-ta

This disagreement in tone melodies can be solved by making the initial syllable in the present-tense form extratonal for Initial Lowering. In longer words as well Initial Lowering applies.

present	past
(ta)bā-ru	tābe-ta
(o)kī-ru	ōki-ta
(si)mē-ru	sīme-ta

28. In the case of the CVC string in the word initial position, Initial Lowering may apply. Because [-sonorant] segments are transparent to tone melody assignment; the TBU is the sonorant mora.

e.g. kīssatēn	'coffee shop'
teṭṭē	'thorough'
naṭṭokū	'understanding'
saṭṭoo	'rushing'

There are some variation in tone melodies because of individual backgrounds, or idiosyncratic differences. The above words tend to be pronounced in level tone especially among young people in Tokyo (Asahi Newspaper 1992).

29. Especially young people in Tokyo tend to pronounce the words such as presented in (55) in a level tone (Asahi Newspaper, above).

30. Although, there are some differences in tonal melodies as described in (note 21), in the most cases tonal melodies are fixed. The example in (56c) is not favoured in Tokyo Japanese.

31. PARSE(root) is simplified as PARSE.

32. For example, /ikidoor/ 'be indignant' contains a CVCVV root. However, this is a compound verb which consists of two morphemes /iki/ and /door/.

33. The roots that have the string 'heavy syllable followed by light syllable ([mm]₁[m]₂)' may undergo Nasal Spreading. However, this is not consistent as the following examples show. Not many words contain this type of string.

root				
mookar	--	mookar-a-nai	--	mooka-N-nai 'make a profit'
hoobar	--	hoobar-a-nai	--	?hooba-N-nai 'cram (food into one's mouth)'

II. Vowel Deletion

Introduction

This chapter analyzes Vowel Deletion, a different type of colloquial formation in Tokyo Japanese. Both Nasal Spreading and Vowel Deletion exhibit superficial similarity as phonological reduction processes in colloquial formation. The difference between the two formations is that Nasal Spreading is treated as a syllabification-driven process, while in Vowel Deletion the formation of a single prosodic domain is crucial. The focus is on the interplay between a segmental change and tone melody assignment under the model in which prosodic constituency influences both segmental and tonal analyses. It will be shown that tonal constraints influence the application of Vowel Deletion. Vowel Deletion applies optionally in casual speech (cf. Miyara 1980). It is different from a fast speech effect, because it may also apply in deliberate speech (cf. Hasegawa 1979).

Vowel Deletion occurs in a specific type of compound verbs. The first member of the compound must be a verb in the gerund form, and the second member must be an auxiliary verb in any inflectional form (some people call it 'quasi-auxiliary verb' (Poser 1984)). The compound verb in question is composed of two

phrasal parts (two minimal minor phrases); they are unified into one single tone group (minor phrase) after Vowel Deletion is applied.¹ The number of tonal peaks is one of the major indicators of phrasing; basically, one tonal peak is assigned per domain (see Poser 1984, Selkirk and Tateishi 1988, 1991 for the definition of these phrases). After Vowel Deletion applies in a compound verb, the accent in the auxiliary verb is entirely suppressed, so that only one tonal peak can surface. If the auxiliary verb is linked with a lexical high tone, Vowel Deletion is blocked; the auxiliary verb must be accentless for Vowel Deletion to apply.

The organization of this chapter is as follows. First, the environment in which Vowel Deletion applies will be discussed, including the definitions of compound verbs and auxiliary verbs in Japanese. Second, the effects of tone melody assignment on the applicability of Vowel Deletion will be examined. Two types of compound verbs are discussed: one takes a single minor phrase as its tonal domain, and the other takes a minimal minor phrase. The lexical tone in the auxiliary verb plays an important role in forming a tone domain. Third, the distinction between the minor phrase and the minimal minor phrase will be defined in order to clarify the interface between tone melodies and Vowel Deletion. Finally, the processes of deletion and the tone domain formation will be formalized.

1. Environment for Vowel Deletion

This section examines the environment for Vowel Deletion. There are several types of compound verbs in Japanese. Among them, only a specific type of compound verbs is subject to Vowel Deletion. The morpho-syntactic structure of compound verbs will be analyzed first, in order to specify the type of compound verbs subject to deletion. Second, vowels subject to deletion will be examined in light of the sonority scale (Prince and Smolensky 1993) and with respect to the Theory of Underspecification (Archangeli 1988).

1.1. Compound Verbs

Vowel Deletion deletes one vowel at the boundary between the verb and the auxiliary verb, when a vowel hiatus is created by compounding. In the list of compound verbs below, expressions in the left column indicate the standard form, which is used here as the base for both written and spoken styles. The expressions in the right column are the variants of the standard form which are produced in colloquial usage.²

(1) Vowel Deletion in Compound Verbs

standard form		colloquial form	
tabe-te-iku	---	tabe-te-ku	'(I) eat and go'
VERB GER AUX			
eat go			

tabe-te-iru PROG	---	tabe-te-ru	'(I) am eating'
tabe-te-oku in advance	---	tabe-t-oku	'(I) eat in advance'
tabe-te-ageru to do (for you)	---	tabe-t-ageru	'(I) will eat for you'
tabe-te-oru PROG	---	tabe-t-oru	'(I) am eating' ³

Vowel Deletion applies only in those compound verbs which are composed of a sequence of a main verb followed by an auxiliary verb. The root of the main verb must be followed by the gerundive suffix /te/. The auxiliary verb may be in any inflectional form and follows the main verb as in (1).

Auxiliary verbs have many meanings, including aspectual meanings (duration, completive, perfective, inceptive, etc.), as well as other 'modal' meanings (Makino and Tsutsui 1989). The auxiliary verbs originate as regular verbs, sharing the same roots and inflectional behaviours. However, when these words are used as auxiliary verbs as a part of a compound, often they lose their original semantic contents and function with the above features. The contrast between their meanings as main verbs and their meanings as auxiliary verbs is presented in (2), using the word /oku/. The conjugation of /oku/ is exactly the same in (2a) and (2b).

- (2) a. Verb /oku/ 'put'
- | | | |
|-----------|----------|--------------------|
| hoN-o | oku | '(I) put the book' |
| book-OBJ. | put-VERB | |
- b. Aux. /oku/ 'do in advance'
- | | | |
|---------|-----------------|----------------------|
| tabete | - oku | '(I) eat in advance' |
| eat-GER | in advance-AUX. | |

The number of auxiliary verbs is quite limited as listed in (3) (Makino and Tsutsui above).

(3) List of Auxiliary Verbs ⁴

	original meaning	meaning as AUX.
iru	exist (animate subject)	be doing..., have done
aru	exist (inanimate subject)	have been done
iku	go	do..and go, keep doing..
kuru	come	do.. and come, come to do..
oku	put, place	do..in advance
ageru	give	do..for s.o.
miru	look, see	do..and see, try to do..
morau	receive	have s.o. do for me
oru	exist (animate subject)	be doing.., have done
kureru	give	s.o. does..for me
simau	put away	have done.., finish
hosii	want	want s.o. to do

The following compounds in (4) are structurally distinguished from the compounds in (1). Although the first member in the

compound is in the gerund form, no deletion takes place, even though a VV string is created (see Poser 1984).⁵

(4) compounds	Vowel Deletion	
tabe-te-aruku eat walk	--- *tabe-t-aruku	'(I) walk and eat'
yoN-de-miru read see	--- *yoN-d-miru	'(I) read and see'
kai-te-asobu write play	--- *kai-t-asobu	'(I) write and play'
naosi-te-oeru correct finish	--- *naosi-t-oeru	'(I) correct and finish'
kait-te-au return see	--- *kaet-t-au	'(I) return and see'

The compound verbs in (4) have the following syntactic structure: they are composed of a 'verb plus verb' string (exocentric), while the others (1) are composed of a 'verb plus auxiliary verb' string (endocentric). The second part of compound verbs in (4) maintains the original semantic contents and plays a role as a regular verb; for example, a noun such as /sosite/ 'and' may intervene as a conjunction between the two verbs, resulting in /tabete-sosite-aruku/ 'eat and walk around'. On the other hand, no word may intervene between the main verb and the auxiliary verb in the case of (1). The difference between the two usages is illustrated in (5).

(5) Syntactic Difference

- a. Verb + Verb: Vowel Deletion does not apply.
 tabe-te-aruku --- *tabe-t-aruku 'walk around and eat'
 eat walk
 VERB VERB

tabete sosite aruku
 eat and walk
 VERB NOUN VERB

- b. Verb + Aux.: Vowel Deletion is applicable

tabe-te-iru --- tabe-te-ru 'be eating'
 eat -ing
 VERB AUX.

*tabete sosite iru
 eat and -ing
 VERB NOUN AUX.

In Lexical Phonology, Mohanan (1990) deals with two kinds of compounds in Malayalam and Sanskrit: one type is sub(ordinate) and the other type is co(ordinate). Sub-compounds have the common 'head + modifier' structure, for example, the 'verb + aux.' construction /tabete-iru/, while co-compounds have the structure 'head + head', such as the 'verb and verb' construction /tabete + aruku/. The two kinds of compounds belong to different derivational stages. The application of phonological and morphological rules to compounds is determined according to what stratum the compounds belong to. In the case of Japanese compounds, Vowel Deletion belongs to the stratum where 'verb + aux.' compounding takes place.

- (6) sub-compound: tabete-iru V + Aux.
 co-compound: tabete-aruku V + V

In the following compound verbs (7), Vowel Deletion does not apply. Although the compound is composed of two parts, a regular verb and an (auxiliary) verb, it has a different morphological structure. The first member is not in the gerundive form, but in the conjunctive form with the suffix /i/ at the root-final position, or just the root (for vowel ending roots) without any modification.

(7)	compounds	deletion	
	ari - eru/uru	*ari-eru/uru	'possible to be'
	exist be possible		
	oci - au	*oc-au	'arrange meeting'
	drop meet		
	tabe - aruku	*tab-aruku	'walk around and eat'
	eat walk		
	kaki - oeru	*kak-oeru	'finish eating'
	write finish		
	tabe - naosu	*tab-naosu	'eat again'
	eat fix		
	tori - kaeru	*tor-kaeru	'change with something'
	take change		
	hasiri - mawaru	*hasir-mawaru	'run around'
	run turn		
	tabe - sugiru	*tab-sugiru	'over eat'
	eat pass		
	toori - kakaru	*toor-kakaru	'come about'
	pass start		
	kaki - hajimeru	*kak-hajimeru	'start writing'
	write start		
	mi - tsuzukeru	*m-tsuzukeru	'keep looking'
	look continue		
	moosi - komu	*moos-komu	'apply for'
	say take		

The structure here belongs to the co-compounding, 'head + head' type, since most of the cases the second member of compounds maintains its original semantic content. The difference between the two types of co-compounding is that one is 'lexical' and the other is 'syntactic': as discussed earlier, in the syntactic compound, a word such as /sosite/ 'and' may be inserted, however it does not apply to the lexical compound. For instance, the construction of /tabe-naosu/ 'eat again' in (7) is a lexical compounding, on the other hand, /tabete-aruku/ 'eat and walk' in (4) is a phrasal concatenation.

- (8) co-compounding: tabe-naosu lexical
 co-compounding: tabete-aruku phrasal concatenation

The number of compound verbs in (7) is large. They are produced rather freely (less restricted compared with the compounds in (1)). Some of them have become idiomatic expressions (Poser 1984, Ishihara 1991).

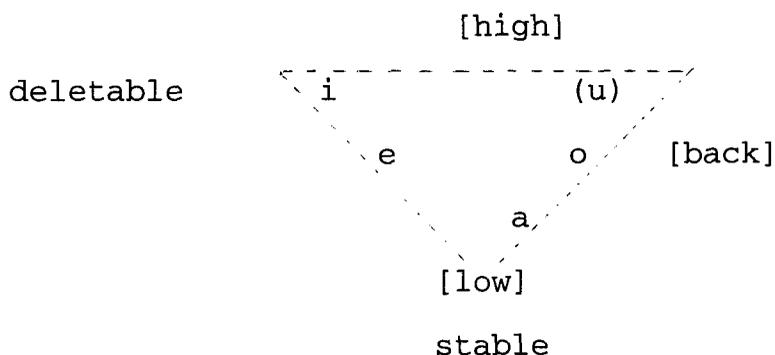
In the above compound verbs (7), Vowel Deletion does not apply even when the vowel hiatus is created: for example, /tabe-aruku/ 'walk around and eat' does not form */tabe-ruku/ or */tab-aruku/. The morphological difference between the two types of compounds is explained as follows. The compound verbs in which deletion applies consist of two free morphemes, and the other compounds consist of a string of a bound morpheme and a free

By comparing the above vowels, we can relate the position of each vowel in the vowel inventory to deletion; /i/ and /e/, [-low], [-back] vowels, are subject to deletion. In the following triangular schema, the [+high], [-back] vowel /i/ is most deletable, and the [+low] vowel /a/ is placed at the bottom as most stable. However, there is no evidence here distinguishing /o/ and /a/, or even /e/ from /o/ and /a/. /e/ drops because it is part of the gerundive suffix /te/. If the auxiliary verb has the initial /i/, the final segment in the main verb drops (cf. Pulleyblank 1988). /o/ and /a/ can be grouped together in terms of deletion, if other elements, such as tones, are not involved.

The phenomenon under consideration can be related to the sonority scale, if we interpret sonority in terms of height and backness features; the more sonorous a vowel is, the greater the chance the vowel can survive.⁷

(13) Sonority Scale Expressed in the Vowel Features ⁸

(cf. Ladford 1982, p. 204)



Sonority prominence has been studied extensively in previous literature (e.g. Goldsmith 1990). In Optimality Theory (Prince and Smolensky 1993) segments are expressed in terms of P (peak) and M (margin) in a syllable internal structure, consisting of nuclei, onset and coda; that is, more sonorous segments make better syllable nuclei. Prominence scales are expressed as follows:

- (14) Syllable Position Prominence: $P > M$ (P=peak, M=margin)
 Segmental Sonority Prominence: $a > i > \dots > t$

The definition of /t/ and /a/ is that in a given language, /t/ denotes a segment of minimal sonority and /a/ a segment of maximal sonority. Based on the above scales, Margin and Peak Hierarchies are expressed as follows:

- (15) Peak Harmony: $P/a > P/i > \dots > P/t$
 Margin Harmony: $M/t > \dots > M/i > M/a$
 Margin and Peak Hierarchy: $*M/a \gg *M/i \gg *P/i \gg *P/a$
 (= $*M/i \gg *P/i$)

In the above hierarchy, $*P/\lambda$ indicates that λ must not be parsed as a syllable Peak (i.e., associated to Nuc(lei)), and in $*M/\lambda$ must not be parsed as a syllable Margin (i.e., associated to Ons(set) or Cod(a)).

The sonority scale approach can be compared with the Theory of Underspecification. According to Archangeli (1988), /i/ is an unspecified vowel in Japanese.⁹

(16) Underlying Representation of Japanese Vowels

	i	e	a	o	u
H	-	-			
L		+			
B			+	+	

This corresponds in part to the sonority scale. In the Theory of Underspecification, the asymmetrical segment is in part determined by the frequency of being used for epenthesis (or deletion). It is reasonable to state that /i/ is deleted unconditionally in Vowel Deletion, because it has unspecified status. However, Underspecification does not necessarily always correspond with the sonority scale. The unspecified vowel is determined by language specific featural properties. Therefore underspecified vowel can be even more sonorous segments, such as /a/ or /e/. For example, /a/ is unspecified in Latvian, and /e/ in Spanish (Archangeli above, pp. 28-37). Furthermore, if we assume, for example, that /a/ is more sonorous than all other vowels, this is not encoded in terms of underspecification. In a sonority scale approach, either (13, 14, 15), segments (vowels) can be ordered hierarchically; on the other hand, Underspecification does not provide any explanation why other vowels delete as well. However, both sonority prominence and Underspecification account for Vowel Deletion; since only /i/

deletes from V2, otherwise /e/ deletes from V1.

2. Tonal Interaction

This part discusses tonal interaction in Vowel Deletion. It will be shown that a lexical high tone blocks Vowel Deletion. There are two types of auxiliary verbs with regard to the accent (denoted as H): accented auxiliary verbs and unaccented auxiliary verbs.¹⁰ Whether an auxiliary verb has the tone or not is determined by pronouncing it in isolation.¹¹ An accented auxiliary verb shows the HL tonal curve. For example, /aru/, 'have done' is pronounced with the HL contour, whereas the unaccented auxiliary verb /ageru/ 'do for you' with the LHH melody does not show the HL falling contour in the citation form.¹² The distinction between the two plays an important role in deletion. If there is a lexical tone in the auxiliary verb, deletion is blocked. In order to explain this blocking effect, Stress Clash and the Obligatory Contour Principle (OCP) will be introduced first, then the high tone deletion will be formulated.

2.1. Accented vs. Unaccented Words

A compound verb that contains an accented auxiliary verb /aru/ does not undergo Vowel Deletion, while an /a/-initial unaccented auxiliary verb like /ageru/ 'do for someone' is subject to deletion.¹³ It is thus possible to say that the

lexical high tone in /aru/ blocks deletion, because Vowel Deletion does apply in /ageru/ as shown in (14). The construction of each word is as follows: for example, /tābete-aru/ is broken down into two parts, /tābete/ and /aru/, of which /tābete/ is a gerund verb, and /aru/ is an auxiliary verb. /tābete/ consists of two morphemes: the verb root /tābe/ and the gerundive suffix /te/. /aru/ consists of the root /ar/ and the present tense suffix /u/. In the analysis of compounds, I only distinguish the first member and the second member of compounds, /tābete/ and /aru/.

(17) a. H
 |
 /aru/

accented main verbs

compounds

Vowel Deletion

tābe-te-aru --- *tābe-t-aru 'have been eaten'

yōN-defaru --- *yōN-d-aru 'have been read'

mī-te-aru --- *mī-t-aru 'have been seen'

unaccented main verbs

masi-te-aru --- *masi-t-aru 'have been added'

kari-te-aru --- *kari-t-aru 'have been borrowed'

si-te-aru --- *si-t-aru 'have been done'

b. /ageru/

accented main verbs

<u>t</u> abe-te-ageru	---	t <u>a</u> be-t-ageru	'eat (it for you)'
<u>y</u> oN-de-ageru	---	y <u>o</u> N-d-ageru	'read (it for you)'
<u>m</u> il-te-ageru	---	m <u>i</u> l-t-ageru	'look at (it for you)'
unaccented main verbs			
<u>m</u> a <u>s</u> i-te-ageru	---	m <u>a</u> s <u>i</u> -t-ageru	'increase (it for you)'
<u>k</u> a <u>r</u> i-te-ageru	---	k <u>a</u> r <u>i</u> -t-ageru	'borrow (it for you)'
<u>s</u> i-te-ageru	---	<u>s</u> i-t-ageru	'do (it for you)'

We can summarise the conditions for deletion, including the case of the accented words, in the next following statements.

(i) Vowels for deletion:

/i/ is deleted from V2.

/e/ in V1 is deleted, if there is no /i/ in V2.

(ii) The lexical high tone is the blocker for deletion.¹⁴

These observations are illustrated in the following table.¹⁵

(18)		e+i	e+o	e+a	H e+a
-----	/i/ deleted	yes	N.A.	N.A.	N.A.
-----	/e/ deleted	N.A.	yes	yes	--

2.2. Stress Clash and OCP

This section explores why the accented auxiliary verb blocks

Vowel Deletion, by referring to the principles of Stress Clash and the Obligatory Contour Principle (OCP) (McCarthy 1986, and others). The following accented word /tabete aru/ 'have already been eaten' has lexical tones in the input; Vowel Deletion does not apply.

(19)	input		output		Vowel Deletion
	H	H	H L H L		
			^		
	[tabe-te]	[aru]	--- [tabete-aru]	---	*[<u>t</u> ab <u>e</u> t <u>e</u> - <u>a</u> ru]

The sequence above does not create Stress (accent) Clash, since the juxtaposed high tones are not adjacent to each other in the output form. Stress Clash is formulated by Myers (1991, p. 318): "The Clash Filter forbids adjacent entries on the metrical grid (or *xx, where x is a grid entry)." The domain for Stress Clash in (19) is derived by compounding. In /tabete aru/ the two high tones are not adjacent to each other, because low boundary tones are assigned, creating an alternating HLLHL string in the output; Stress Clash does not account for this. Instead, this may be considered as avoiding having two lexical high tones in a single domain prior to the assignment of low tones, since compounding precedes the low boundary tone insertion. The string with two peaks, such as /tabete aru/, is tentatively considered as an OCP violation, in which two identical adjacent elements are prohibited in the melodic level; since morphology and phonology may freely create OCP violations (Yip 1988, p. 66).

(20) Obligatory Contour Principle (OCP)

At the melodic level, adjacent identical elements are prohibited (McCarthy 1986, Prince 1983, Hyman and Pulleyblank 1988, Yip 1988, 1991, Myers 1991, Archangeli and Pulleyblank (in press), and others).

In the word (19), the adjacent identical high tones are prohibited within the same domain.

(21) * $\begin{array}{cc} \text{H} & \text{H} \\ | & | \\ [\text{tabete} & \text{aru}] \end{array}$

This must be avoided, and therefore the two constituents /tābete/ and /āru/ in (22b) cannot be put together in the same domain. Instead they form two separate tonal domains. Tone melodies are mapped on each domain as in (22a)--here is no OCP violation. Vowel Deletion cannot apply between the two domains. So what about the compounding? Morphologically, we still consider /tābete-āru/ to be a single compound. However, tonal domains are different from morphological domains. There must be two tonal domains in a single compound--there is a gap between two types of phrasing.

(22) a. $\begin{array}{cc} \text{H} & \text{H} \\ | & | \\ [\text{tabete}]_{\alpha} & [\text{aru}]_{\alpha} \end{array}$ * b. $\begin{array}{cc} \text{H} & \text{H} \\ | & | \\ [\text{tabete} & \text{aru}]_{\alpha} \end{array}$

There are two possible domain assignments as in (22). In (22b) we have the domain of the OCP (and of deletion) marked with α ; then because the OCP prevents analysis (22b), it blocks deletion. In (22a) Vowel Deletion does not apply between two tonal domains, even the OCP is not violated. (I will come back to this point later.)

Another problem arises at this point; why does the lexical high tone in /aru/ block Vowel Deletion in the string which consists of an unaccented verb followed by an accented auxiliary verb? ¹⁶

- (23)
- | | | | |
|-----------------------------|----|------------------------------|-----------------------|
| <u>ma</u> s <u>i</u> te-aru | -- | * <u>ma</u> s <u>i</u> t-aru | 'have been increased' |
| yo <u>N</u> de-aru | -- | *yo <u>N</u> d-aru | 'have been invited' |
| <u>ka</u> rite-aru | -- | * <u>ka</u> rit-aru | 'have been borrowed' |
| <u>si</u> te-aru | -- | * <u>si</u> t-aru | 'have been done' |
| <u>ki</u> ite-aru | -- | * <u>ki</u> it-aru | 'have been heard' |

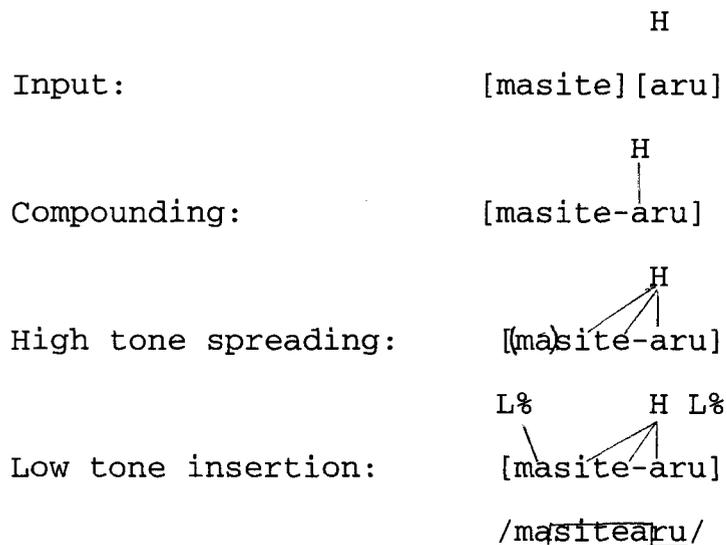
In (23), there is only one peak (plateau) derived by compounding. There is no OCP violation as in (24), because the main verb is not accented.

- (24)
- | | | |
|--------------|---|----------|
| | H | |
| | | |
| [masite-aru] | | α |

must be the domain of the OCP and of deletion; however, deletion

does not apply. This is configured as follows:

(25) Derivation:



Although the string above does not violate the OCP, the high tone in the auxiliary verb plays a role in phrasing and in mapping of tone melodies. The Obligatory Contour Principle (OCP) cannot provide a complete explanation for the above case; that is, why Vowel Deletion is blocked in the above string even when it does not violate the OCP--only one lexical tone exists within a single domain in (25). Compare the words in (23) with the following compounds that consist of a string of unaccented constituents.

(26)	compounds	deletion	
	<u>ma</u> site-iru	---	<u>ma</u> sit-eru 'be increasing'
	yo <u>nde</u> -iru	---	yo <u>nd</u> -eru 'be calling'

<u>ka</u> rite-iru	---	ka <u>ri</u> t-eru	'be borrowed'
<u>si</u> te-iru	---	si <u>t</u> e-ru	'be doing'
<u>ki</u> ite-iru	---	ki <u>i</u> te-ru	'be listening'

In (26), neither the first or the second component contains a lexical tone. Vowel Deletion applies in all strings in (26). The lexical tone in the second member of the compound must be the blocker of deletion. In the course of derivation, the unaccented strings in (26) are only subject to the Phrasal High Tone Assignment and Initial Lowering:

(27) High Tone Assignment: assign a phrasal high tone to the final TBU in the compound, if there is no lexical tone in the string.

If the lexical tone is in the same domain, the phrasal high tone is not assigned because of the OCP. IL creates a LH rise, otherwise, it will be pronounced with a level tone.

(28) Derivation:

Input: [masite] [iru]

Compounding: [masite-iru]

H insertion and spreading: 

Initial Lowering: 

/masiteiru/

2.3. Intonational Curve

The above problematic cases may be explained from a different point of view. The difference in tone melodies lies in the existence of lexical tones and phrasing. In order for Vowel Deletion to apply, the second member of the compound must be accentless. This can be seen by classifying possible tone melodies of compound verbs which undergo deletion. They are classified into four types, depending on the existence of the underlying lexical high tones in both verbs and auxiliary verbs. The classification is not based on surface tonal properties. In the list below, H stands for an accented word and o for an unaccented word.¹⁷ The classification defines the type of the compounds that are subject to deletion.

(29) a. H + \emptyset

compounds		deletion	
<u>tā</u> bete-iru	--	<u>tā</u> be-te-ru	'be eating'
<u>yō</u> N-de-iku	--	<u>yō</u> N-de-ku	'read and go'
<u>kī</u> t-te-ageru	--	<u>kī</u> t-ageru	'come (for you)'
<u>tō</u> t-te-oku	--	<u>tō</u> t-t-oku	'take it in advance'

b. \emptyset + \emptyset

<u>kā</u> ri-te-iru	--	<u>kā</u> ri-te-rū	'be borrowing'
<u>ma</u> si-te-ikū	--	<u>ma</u> si-te-kū	'have been increased'
<u>yō</u> N-de-agerū	--	<u>yō</u> N-d-agerū	'invite (you)'

si-te-oku -- si-t-oku 'do it in advance'

c. H + H

tabe-tefaru -- *tabe-t-aru 'have eaten'

yoN-defaru -- *yoN-d-aru 'have read'

kai-tefaru -- *kai-t-aru 'have written'

tot-tefaru -- *tot-t-aru 'have taken'

d. \emptyset + H

kari-te-aru -- *kari-t-aru 'have been borrowed'

masi-te-aru -- *masi-t-aru 'have been increased'

yoN-de-aru -- *yoN-d-aru 'have been called'

si-te-aru -- *si-t-aru 'have been done'

Among all the compounds above, Vowel Deletion applies only in (29a,b). The sequence of the two constituents must be [H]+[\emptyset] or [\emptyset]+[\emptyset] for Vowel Deletion to apply, but it cannot be [H]+[H] or [\emptyset]+[H]. [H]+[H] violates the OCP, but [\emptyset][H] does not. The compounds whose second member contains the lexical tone (29c,d) cannot undergo Vowel Deletion.

(30)

	deletion	OCP
\emptyset + \emptyset		
H+ \emptyset		
\emptyset +H	*	
H+H	*	*

2.4. Greek Vowel Degemination

A similar situation is found in Nespor (1979, 1987), Nespor and Vogel (1986). They observe many cases of vowel deletion and vowel degemination in numerous languages. In their research, for example in Greek, some surface strings have a left-headed stress prominence system.

(31) Greek Vowel Degemination

ayórase éna	---	ayórasena	'(he) bought a'
momízo óti	---	nomízoti	'(I) think that'
ʒarxómuna áma	---	ʒarxómunama	'(I) come (condit) if'

In Greek, the secondary stress is suppressed in a word after Vowel Degemination applied. Only one (stress) peak is allowed to surface.

Prince (1983, pp. 91-95) discusses the correlation between stress systems and tonal systems in regard to the grid notation, by referring to Japanese data. The analysis of the stress system in Greek can be compared with the analysis of the Japanese tonal phenomenon, as we concern the prominence systems of sounds. The following discussion of the Greek Vowel Degemination in Nespor (1987) should be appropriate in this context for discussing the case of tonal behaviour in Japanese.

All these initially stressed words, however, are so-called function or grammatical words. This class of words, in Greek, as in any other languages, is characterised by the possibility of undergoing a destressing rule, or, alternatively, of having stress assigned by sentence stress assignment (cf. Kiparsky 1982), possibly after Vowel Degemination. And, in fact, in (31) the function words /éna/, /óti/ and /áma/ do not bear primary word stress.

The above input strings show a sequence of two stressed words; after Vowel Degemination applies, the stress of the second constituent is lost. In the case of Japanese Vowel Deletion as well, the strings show a left-headed prominence system, [o+o] or [H+o], which are subject to deletion.

3. Formation of Tone Groups ¹⁸

This section examines the following two areas: (i) the lexical tone, the blocker of deletion--this will be examined by analyzing the case of the accented auxiliary verb /oru/. (ii) the domains for deletion. First, the minor phrase and the minimal minor phrase will be defined in terms of the phrasal hierarchy to show the exact morphological conditions for compounds. Second, the discrepancy between morphological domains and prosodic domains will be discussed. Finally, the case of

Luganda Low Tone Deletion is introduced as an example of tone domain formation.

3.1. Accented Auxiliary Verb /oru/

The accented auxiliary verb /oru/ will be compared with the other accented auxiliary verb /aru/, and with the unaccented case in this section. /oru/ has an initial accent, however, deletion can apply. Since the lexical tone blocks deletion, in order for deletion to apply, the accent on /oru/ has to be delinked. This operation is assumed to be fairly late, and applies only for /oru/. The auxiliary verb /oru/ originated /ori/ 'exist' in Classical Japanese.¹⁹ In modern Japanese, /oru/, as an auxiliary verb, has the function of progressive, completion, continuative state, etc. /oru/ is used less often, compared to other auxiliary verbs in Tokyo Japanese. When /oru/ 'exist' is pronounced in isolation as a regular verb, it sounds 'old' or 'classical' and is not favoured among young people in Tokyo. This is the same when it is used as an auxiliary verb as a part of a compound.

(32) accented main verbs

standard		Vowel Deletion	
t̄abe-te <u>o</u> ru	---	t̄abe-t- <u>o</u> ru	'be eating'
yōN-de <u>f</u> ōru	---	yōN-d- <u>o</u> ru	'be reading'
kāi-te <u>o</u> ru	---	kāi-t- <u>o</u> ru	'be writing'

$\overline{m\dot{i}l-te}f\overline{or\dot{u}}$ --- $\overline{m\dot{i}l-t-or\dot{u}}$ 'be looking'

unaccented main verbs

$\overline{ma}si-te-or\dot{u}$ --- $\overline{ma}si-t-or\dot{u}$ 'be increasing'

$\overline{ka}ri-te-or\dot{u}$ --- $\overline{ka}ri-t-or\dot{u}$ 'be borrowing'

$\overline{si}f-te-or\dot{u}$ --- $\overline{si}f-t-or\dot{u}$ 'be doing'

In the compounds (32) the verb final vowel /e/ is dropped. As discussed earlier, the lexical tone in auxiliary verbs blocks deletion. This discrepancy may be solved by stipulating that the lexical tone delinks only for /oru/. First, we take a look at only the case with accented main verbs.

(33) Lexical Tone Delinking

$$H \text{ -- } \emptyset / [H] + \left[\begin{array}{c} \text{---} \\ \text{oru} \end{array} \right]$$

The above delinking is related at least to the OCP. For example, delinking applies for the string / $\overline{tabete}f\overline{or\dot{u}}$ / 'be eating' avoiding having two high tones in a single domain as shown below:

(34) H H Delinking H Deletion H
 | | | | |
 [\overline{tabete}][$\overline{or\dot{u}}$] --- [$\overline{tabete-or\dot{u}}$] --- [$\overline{tabet-or\dot{u}}$]

Delinking must precede Vowel Deletion, since it provides the domain for Vowel Deletion. If the order were reversed, they would be in a bleeding order as below.

(35) H H Deletion * H H Delinking H
 | | | | |
 [tabete][oru] ---- [tabet-oru] ---- [tabet-oru]

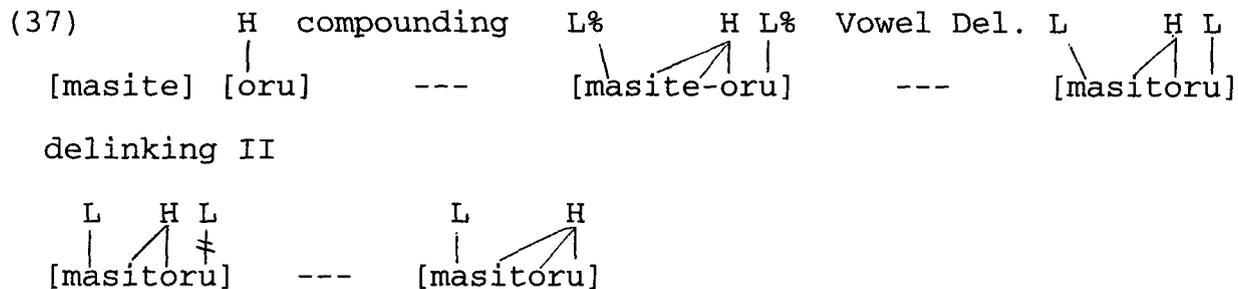
In (35), */tabetoru/ is ill-formed because of the OCP. The optional delinking for /oru/ must be ordered as follows:

- (i) Delinking
- (ii) Vowel Deletion

However, Delinking formulated in (33) does not apply to the case with unaccented main verbs. For example, when the unaccented verb /masite/ 'increase' precedes /oru/, delinking does not apply. The string o+H does not meet the condition for delinking in (33).

(36) H * delinking Vowel Deletion
 |
 [masite] [oru] --- * [masite-oru] --- [masit-oru]

The string */masiteoru/ cannot surface without Vowel Deletion; delinking cannot apply. Notice that the input [∅]+[H] string can form a single tone domain without delinking, since there is only one high tone; the OCP is not violated. Delinking applies in order to provide a single tonal domain for deletion. Thus, Vowel Deletion must immediately follow compounding.



The final low tone may be optionally delinked in the fully specified string after Vowel Deletion takes place; however, this is superficial reorganization of the tone melody, triggered by the loss of the syllable. Delinking does not apply in the string, since only one lexical tone exists in the domain. There is no motivation for delinking, since the OCP is not violated. These operations are ordered as follows:

- (38)
- (i) Lexical Tone Delinking
 - (ii) Compounding
 - (iii) Tone Melody Assignment
 - (iv) Vowel Deletion
 - (v) Phrasal High Tone Assignment
 - (vi) Low Tone Delinking

These operations and possible output strings are illustrated in the following table.

(39) Delinking And Its Application.

input	H delinking	compounding	Vowel Del.	L delinking
H H tabete oru	N.A.	H L H L [tabete] [oru]	N.A.	N.A.
	H [tabete] [oru]	H L [tabeteoru]	H L [tabetoru]	N.A.
H masite oru	N.A.	L H L [masiteoru]	L H L [masitoru]	N.A.
				L H [masitoru]

Note that delinking (I,II) and Vowel Deletion are postlexical operations in casual speech. All the tone melodies illustrated above are superficial variations. In order for Vowel Deletion to apply, a single tone domain must be formulated. A question here is what the two constituents H and \emptyset exactly mean in terms of phrasing? What kinds of characteristics do they have? We will find answers to these questions by identifying the appropriate domains for each string in the next section.

3.2. Minor Phrases and Minimal Minor Phrases

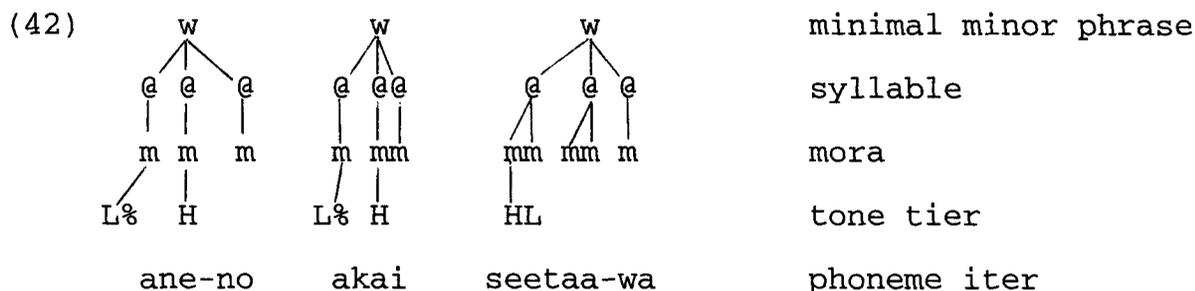
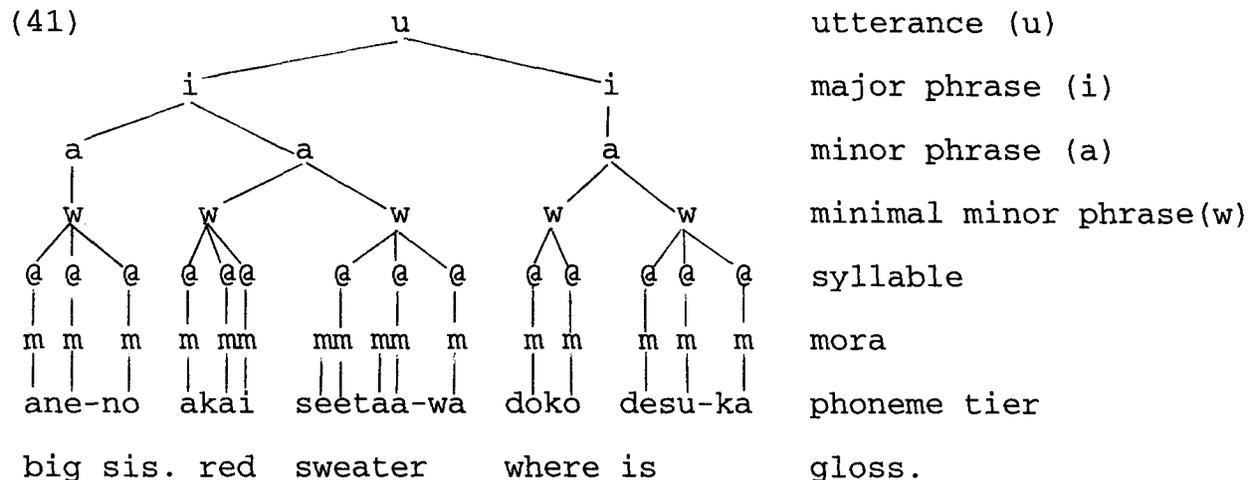
In order to analyze the accented auxiliary verbs in a phrasal context, we need to consider the phrasal hierarchy in tonology, and define the phrasal terms necessary for the discussion. Especially, the definitions of the minor phrase and the minimal minor phrases in the hierarchy are rather confusing and must be explicated in order to demarcate each string into the

appropriate tonal domain.

(40) Phrasal Hierarchy²⁰

		Utterance
Major Phrase	Intermediate Phrase
Minor Phrase	Accentual Phrase
Minimal Minor Phrase	Prosodic Word
		Syllable
		Mora
(Poser 1984)		(Pierrehumbert and Beckman 1988)

In this thesis, phrasal terms are based on Poser's, as shown in the above hierarchy. Pierrehumbert and Beckman (1988, pp. 118-120) illustrate the Phrasal Hierarchy with a sample utterance /ane-no akai seetaa-wa doko desu-ka/ 'Where is my big sister's red sweater?'. Originally, the term 'Intermediate phrase' was used for 'major phrase', 'accentual phrase' for 'minor phrase', and 'word' was used to indicate 'minimal minor phrase'. In (41) and (42) the above terms, as used in their discussion, are converted into our terms for convenience.

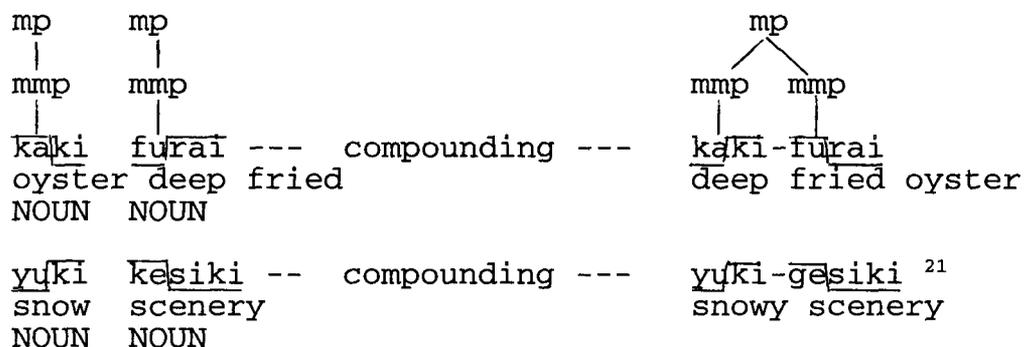


In (41), the prosodic structure for a complete sentence is presented, and (42) represents associations between morae and the tone tier for a portion of the utterance. The low boundary tone is associated with the initial mora in each minor phrase (=accentual phrase). /aka*ī*/ 'red' and /see*taa-wa/ 'about sweater' are linked together under the same minor phrase node. Initial Lowering indicates the boundary between two minor phrases, except for the words that have a lexical high tone on their initial vowels. The following descriptions are the summary of Selkirk and Tateishi (1988, pp. 322-323), discussing the distinction between the minor phrase and the minimal minor*

phrase.

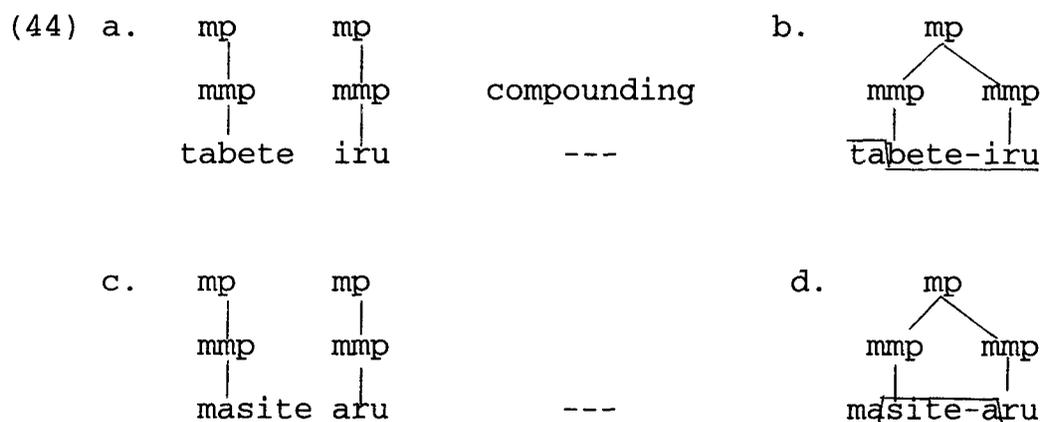
The minor phrase is comprised of the units of prosodic structure that are demarcated by instances of Initial Lowering. The term "minimal minor phrase", which is approximately the same as "prosodic word (used by them)", designates a basic lexical item plus function word sequence. A minor phrase may consist of just one minimal minor phrase, or of more than one (McCawley 1968, Poser 1984, Pierrehumbert and Beckman 1988, and Kubozono 1988). The following two examples (added here) show a case where two minimal minor phrases form a single minor phrase through compounding.

(43) Examples of Phrasing: Noun Compounding



The original tone melodies are mapped onto the words in the left column in (43). The forms in the right column show that the two minimal minor phrases are put together under a single minor phrase node. When each word undergoes compounding or forming a larger unit, different tone melodies are mapped. Initial

Lowering inserts a low boundary tone at the beginning of minor phrases, and the original tonal properties are suppressed in the derived domains. The compound verbs in (43) as well, can be organized under the above phrasal nodes; for instance, /tabete-iru/ 'be eating' is divided into two minimal minor phrases, /tabete/ and /iru/, under one minor phrase. /masitearu/ 'have been increased in advance' also shows a single minor phrase after compounding.



Selkirk and Takeishi (above) further describe the distinction between minor phrases and minimal minor phrases, (summarized) as follows. There are reasons independent from the tonology for distinguishing between the minor phrase and the minimal minor phrase. They are subject to different sorts of conditions regarding accent. The mapping of the sentence onto the minimal minor phrase ignores accent. On the other hand, the minor phrase is sensitive to accent; one tonal peak is assigned per minor phrase. Poser (1984, p. 101) describes this fact as

disagree. /t̄abetearu/ has two tonal peaks which must be split into two tone groups. The discrepancy between the two types of domains, morphological domains and tonal (or prosodic) domains, can be solved by using the term "tone domains" alone for the demarcation of strings. A "tone domain" contains only one tonal peak. If there are two peaks in the string, regardless of morphological conditions, it must be split into two tone domains. This means that in [t̄abeteiru] (45a,b), the minor phrase is the TD, and in [t̄abetearu], the minimal minor phrase is the TD. This can be characterized in terms of a 'Ranking Schema' in Optimality Theory (McCarthy and Prince 1993, pp. 102-103).

(46) Ranking Schema: P>>M (P=prosody, M=morphology)

If some morphological domain is to be prosodically conditioned, then in that domain P must dominate M. Prosodic Circumscription can be seen as fixing a dominance relation between the well-formedness requirements of two different domains, prosody (P) and morphology (M). ... In templatic and circumscriptional morphology, the constraints on prosodic structure ... take precedence over the constraints on morphological structure.

The prosodic domains derived after Vowel Deletion are illustrated in the following table.

(47) Vowel deletion and Tone Domains ²³

	Delinking	Vowel Deletion	mp=TD
e+<i> <e>+a <e>+o	--	yes	yes
H e+a	--	--	--
<H> <e>+o	yes	yes	yes

Compounding derives one TD for the strings that contain unaccented auxiliary verbs. However, for the strings that contain accented auxiliary verbs, the lexical tone blocks formation of a single TD. The optional delinking provides a single domain for deletion. After Vowel Deletion applies, only a single TD appears.

3.4. Luganda Low Tone Deletion

Vowel Deletion in Japanese is not the only case where a segmental change interacts with tone melody assignment. The next example, taken from Hyman, Katamba, and Walusimbi (1987), including data, discusses the formation of the Tone Domain (TD) in Luganda, one of the Bantu Languages spoken in Uganda. Luganda exhibits some similarity to Japanese in terms of its pitch accent system (MacCawley 1979). One of the morphological rules in Luganda deletes a low tone when surrounded by high tones in order

to form a H-plateau. The (postlexical) domain in which Low Tone Deletion applies is called the Tone Domain.

- (48) L Tone Deletion (LTD)
L -- \emptyset / H _ H

Any form within the same clause may join the verb to form a TD; however, when the clause begins with the so-called initial vowel (IV) morpheme, LTD is blocked and the TD is not formed.

- (49) *
L -- \emptyset / _ IV

With few exceptions, all common nouns can take an IV. The sentences in (50) lack the IV. The sentences in (51) illustrate the present-tense with noun objects having an IV.

- | | | |
|------|--------------------|------------------|
| (50) | tu-lab-a bi-kopo | 'we see cups' |
| | H \emptyset H L | |
| | tu-lab-a mu-kazi | 'we see a woman' |
| | H \emptyset H L | |
| | tu-lab-a ma-futa | 'we see oil' |
| | H \emptyset H L | |
| (51) | tu-lab-a e-bi-kopo | 'we see cups' |
| | H L H L | |
| | tu-lab-a o-mu-kazi | 'we see a woman' |
| | H L H L | |
| | tu-lab-a a-ma-futa | 'we see oil' |
| | H L H L | |

Depending on the noun class, the IV is either /e-/, /o-/, or /a-/, as seen. According to Hymn, Katamba, and Walusimbi (above) the semantic difference between (50) and (51) is one of focus: the sentences with IV have relatively even focus, while those without IV focuses on the object. The sentences without IV form a single tone group in which LTD applies. On the other hand, IV blocks LTD from applying, and the two separate melodies are left on the strings. As the conditions of LTD are rather complex (Hyman and Katamba 1989, 1993), the difference between the two types of domains is focused: the domains in which LTD applies and forms a TD, and the domains in which LTD does not apply. Formation of a single TD is illustrated in the following table.

(52) TD Formation

-----	IV	one TD	LTD
H <L> H	--	yes	yes
H L IV H	yes	--	--

In (52), the string without IV, /H <L> H/, and the string with IV /H L IV H/ are contrasted. In /H <L> H/, LTD applies, and a single TD is formed. In /H L IV H/, IV blocks deletion; a single TD cannot be formed. <L> indicates the low tone to be deleted.

4. Summary

The blocking effect on phrasing in Vowel Deletion has been

examined; a single tone domain is formed after deletion applies. The next table displays the application of Vowel Deletion in different types of segment strings, adopting an 'Optimality Theoretic' approach. The following table displays vowels and conditions for Vowel Deletion. Segments or tones which are deleted from the input strings are marked with <>.

(53) Vowel Deletion: Conditions for Application

	sonority	lexical H	dekinking	mmp=TD	Vowel Deletion
e+<i>	--	--	--	--	yes
<e>+o <e>+a	yes	--	--	--	yes
e + ^H a	yes	yes	--	yes	--
< ^H e>+o	yes	yes	yes	--	yes

In (53) the conditions including constraints are listed in the horizontal line. Unlike Optimality Theory, there is no hierarchical order among them. A set of vowel strings at the morpheme boundary in compounds is presented in the vertical line. The first three strings refer to the compounds whose second members are unaccented; among them /<e>+o/ and /<e>+a/ are put together, because they behave exactly in the same way with regard to deletion. The fourth and the fifth strings represent the compounds that have accented auxiliary verbs. For all the vowel strings, the first constituent in a compound can be either accented or unaccented.

Among the conditions in (53), SONORITY and LEXICAL H are input properties. SONORITY indicates the special status of /i/ in the Japanese vowel inventory (cf. Underspecification in 1.3). The least sonorous vowel /i/ is deleted in the second constituent of the compound; no other vowels delete in V2. Under the issue of sonority scale, the more sonorous vowel creates the better nucleus. The distinction between /i/ and the other vowels in terms of sonority indicates the special status of /i/ in deletion (although the relation between the two issues is an open question). LEXICAL H, an underlying blocker for deletion, is marked. The DELINKING delinks the lexical tone in the auxiliary verb in order to form a single domain for deletion; and therefore delinking must be done prior to compounding. The other delinking operations do not influence Vowel Deletion, because they apply after deletion takes place. mmp=TD indicates that the minimal minor phrase is the TD; that is, the compound consists of two separate tone domains. The compound must form a single domain in order for Vowel Deletion to apply. Finally, the strings that Vowel Deletion can apply to are marked.

As we have seen in both Luganda and Japanese, the blockers, whether IV or lexical H, play a role inhibiting forming a single tone domain. Through phonological changes, whether Low Tone Deletion or Vowel Deletion, only one single tone domain is derived.

5. Conclusion

Vowel Deletion exhibits an interesting property regarding the interplay between the segmental, prosodic, and tonal domains: for instance, in Vowel Deletion, phrasing exhibits the discrepancy between the morphological and tonal analyses. Two types of phrasing are possible for the compound verbs: one is to form a single tone domain (=a minor phrase), and the other is to form two tone domains (=two minimal minor phrases). This is due to the existence of the underlying lexical tone on the second member of the compound. The OCP accounts for the cases of /aru/ or /oru/; the OCP prevents the derivation of two high tones in a single domain--if there are two high tones in a string, the string must be split into two tone domains, or delinking of one of the high tones must apply. The derived phrase for Vowel Deletion is one type, involving a single tone domain in which only one tonal peak is assigned. In other words, Vowel Deletion is applicable domain internally, but never applies at the phrasal boundary. The Vowel Deletion facts in Tokyo Japanese are not merely a language specific phenomenon when we consider the interaction with assignment of tone melodies and its domain for application. Rather, it is seen in languages such as Greek, Luganda, or Yoruba (Pulleyblank 1988), especially in colloquial speech forms.

NOTES

1. The minor phrase is a smallest domain for intonational assignment. The minimal minor phrase is equivalent to the prosodic word. The minimal minor phrase (usually) consists of one content word plus a function word (see Poser 1984, and section 3.2 in this chapter).

2. See Soga, Koyama, and Ohso (1987) for Vowel Deletion in compound verbs.

3. /oru/ is not often used in the Tokyo dialect compared with the other auxiliary verbs. /oru/ will be analyzed later in this chapter.

4. Honorific auxiliary verbs, such as /kudasaru/ 'give', /idadaku/ 'receive', or /sasiageru/, 'give', are not included in the discussion. There are some differences between honorific auxiliary verbs and regular auxiliary verbs in terms of pragmatic and semantic restrictions.

5. The gerund /te/ becomes the voiced /de/ as in /yoNde-miru/ when preceded by /N/. This voicing assimilation is discussed in Ito and Mester (1986), Ito, Mester, and Padgett (1993), and others.

6. No other combination of vowels is found. See the list of auxiliary verbs in (3).

7. The difference between /o/ and /a/ will be discussed later.

8. In the vowel inventory in Japanese /ɯ/ is unrounded. /ɯ/ does not appear in the initial position in the auxiliary verbs in question.

9. /a/ is also considered as an unspecified vowel in Japanese (Grignon 1984).

10. Kubozono (1986) characterizes the lexical high tone as 'sudden drop in FO contour' (see Chapter I). The lexical high tone is immediately followed by a low tone (cf. Pierrehumbert and Beckman 1988).

11. The tonal representation here skips the process of linking of the lexical tone. I use only the gerund and the citation forms.

12. /aru/ originally means 'exist'; however, when it is used as an auxiliary verb, the original meaning is lost. For example, /tabete-aru/ means 'have been eaten already'. When /aru/ is attached to typical action verbs, such as /tabe/ 'eat' or /yom/ 'read', it functions with the meaning of 'have been done in advance'. When /aru/ is attached to /ake/ 'open' or /shime/ 'close' (transitive verbs), it indicates 'continuous state' (cf. Soga and Matsumoto 1990).

The LHH melody is derived as follows. /ageru/ is an unaccented word, and therefore it is pronounced without HL fall (technically, it is done by assigning a high tone to the final TBU; the high tone spreads to the left). Initial Lowering lowers the initial syllable, deriving the LHH melody. See Haraguchi 1977, 1991, Selkirk and Tateishi 1988, 1991, Pierrehumbert and Beckman 1988 for Initial Lowering.

13. /ageru/ is subject to another type of deletion. Some colloquial forms have the contraction as follows. They are derived through phonological deletion.

kiite-ageru	---	kiitaru	'(I will) ask (for you)'
∅ ∅∅			
shite-ageru	---	shitaru	'(I will) do (it for you)'
∅ ∅∅			

14. The role of lexical tones will be discussed later. The lexical tone itself blocks deletion; consequently, the lexical tone blocks forming a single tone domain.

15. Only /a/ and /o/ are accented in this context. The case of /oru/ will be discussed later.

16. Initial Lowering (IL) does not apply to CVV and CVN syllables (Haraguchi 1977).

17. As far as I observe, there is no case that places accent on the non-initial positions in the vowel-initial auxiliary verb in the Tokyo dialect in regard to Vowel Deletion. Other dialects, such as the Kansai dialects, place accent on the second syllable: e.g. in Tokyo /aru/ is initial-accented, whereas in the Kansai region, /aru/ is pronounced with the second syllable accented.

In addition to the four types of melodies in (29), there are two other optional tone melodies as listed below. The extra melodies are enclosed.

	compounds	deletion	
H+∅	$\overline{\text{tabe-te-i}}\overline{\text{ru}}$ -- $\overline{\text{tabe-te}}\overline{\text{ru}}$		'be eating'

	<u>y</u> oN-de-i <u>k</u> u	--	<u>y</u> oN-de-f <u>k</u> u	'go and read'
	<u>k</u> ai-te-ager <u>u</u>	--	<u>k</u> ai-t-ager <u>u</u>	'write (it for you)'
	<u>t</u> ot-te- <u>o</u> ku	--	<u>t</u> ot-t- <u>o</u> ku	'keep (it in advance)'
H+H	<u>t</u> abe-te-aru	--	* <u>t</u> abe-t-aru	'have eaten'
	<u>y</u> oN-de-aru	--	* <u>y</u> oN-d-aru	'have read'
	<u>k</u> ai-te-aru	--	* <u>k</u> ai-t-aru	'have written'
	<u>t</u> ot-te-aru	--	* <u>t</u> ot-t-aru	'have kept'

As for the above tone melodies, there is no difference in meaning compared with the basic tone melodies in (29). The above tone melodies are derived in the following manner. First, in the pattern H+ \emptyset , tone melodies are assigned to the first and the second constituents prior to compounding. The tone melodies of both constituents are not affected by compounding.

e.g.	input	tone melody assign.	compound.	Vowel Del.
	H	H L L H	H L H	H L H
	[tabete][iru]	[tabete][iru]	[tabeteiru]	[tabeteru]

It seems that this operation is a recent trend as Ishihara (1991, p. 147) mentions.

As mentioned in Poser (1984), the younger generation has a compound accent pattern different from the one cited in this thesis. For them, every compound is accented regardless of the accentedness of its constituents.

In the above configuration, Vowel Deletion occurs in the output strings as a late postlexical operation. For $\emptyset+\emptyset$ strings, there is no optional melody, since the two constituents without any lexical tones are put together by compounding and a single tone melody is mapped onto them.

e.g. input compounding

[masite][iru] --- [masitéiru]

Second, for the pattern H+H with /aru/, delinking optionally applies to the output strings. This delinking applies in fast speech; in deliberate speech, the initial /a/ tends to be high-toned.

Delinking (fast speech): $H \text{ -- } \emptyset / \left[H + \left[\underline{\quad} \right] \right]_{\alpha}$

compounding delinking single TD

[tabete][aru]--[tabete][aru]--[tabete][aru]--[tabetearu]

Note that delinking applies only for H+H strings. The OCP would be violated if there were two Hs in a single domain. In o+H strings, for example in /masitearu/, delinking does not apply; delinking would result in an ill-formed melody as shown below:

[masite] [aru] --- [masitéaru]

This fast speech rule and its application are illustrated as follows. Vowel Deletion cannot apply for the strings with /aru/; delinking is ordered after Vowel Deletion.

input	delinking	compounding	V.Del.	delinking
 tabete aru	N.A.	 [tabete][aru]	N.A.	 [tabetearu]
 masite aru	N.A.	 [masitearu]	N.A.	N.A.

For this thesis, only the four types in (29) are considered for analysis, because the existence of lexical tones is projected straightforwardly in them. The extra melodies are derived by

additional operations, such as fast speech rules, etc. They are superficial variations and do not affect Vowel Deletion.

18. There are a variety of terms used to describe phrasal domains, for example, tone groups, prosodic domains, morphological domains, tone domains, accentual phrase, clitic phrases, association domains, and so forth. The definitions for some of them are cited in the literature as follows:

Tone Group: the part of a sentence over which a particular intonation pattern extends (Ladefoged, 1982).

Prosodic Domain: the phonological word and the phonological phrase are proposed as the domains of postlexical rule application (Inkelas 1989; cf. Selkirk 1986). Prosodic Domains are expressed in the prosodic hierarchy.

Tonological Domains: postlexical domains, made up of words concatenated by the rules of syntax (Selkirk and Shen 1990).

Morphological Domain: the domain consists of stems, clitics, affixes, and roots. It indicates morpheme combination, compounds, and bound morpheme types, and so forth (see Inkelas above).

Tone Domain: the postlexical domains in which phonological rules, such as Low Tone Deletion in Luganda, apply (cf. Hyman, Katamba, and Walusimbi 1987; see 3.4. of this chapter).

Accentual Phrase: used in Pierrehumbert and Beckman (1988) to indicate the minor phrase (or approximately equivalent to the minor phrase).

Clitic Group: used in Nespor and Vogel (1986). The term indicates syntactic constituency.

Association Domain: a domain in which tones may shift and spread, if the domain has more than one syllable. The domain is sensitive to syntactic relations; the domain is determined by a positional parameter (Duanmu 1992).

19. In Classical Japanese, /ori/ is considered pronounced with the onset /w/.

20. Compare with the Prosodic Hierarchy below:

Prosodic Hierarchy (McCarthy and Prince 1993, Ito and Mester 1992, and others)

PrWd
|
Ft
|
@
|
m

21. Sequential Voicing changes the initial /k/ of /kesiki/ to the voiced counter part /g/. See Ito and Mester (1986), Ito, Mester and Padgget (1993), and others.

22. In the illustration (41) and (42), the two minimal minor phrases /akai/ 'red' and /see₁taa-wa/ 'sweater-TOPIC' form a single minor phrase. /see₁taa/ 'sweater' is an initial accented noun, but no low boundary tone is linked to the initial syllable. The experimental study conducted by Pierrehumbert and Beckman (1988) suggests that the initial lowering effect is shown on the initial accented syllable (phrase-internally); however, this phonetic phenomenon is not considered for phonological analysis, as they ignore it in (42).

23. This table does not include fast speech effects and their rules.

Concluding Remarks

Nasal Spreading and Vowel Deletion are analyzed in terms of three domains: segmental, prosodic, and tonal domains. In order to specify the environments for their formations, segmental analysis must be discussed first. As for segmental analysis, in Nasal Spreading, Rhotic Underspecification, Feature Class Theory, and Feature Licensing specify the status of /r/ and /n/ sounds in Japanese. In Vowel Deletion, sonority prominence and the Theory of Underspecification support the claim that /i/ has special status in the Japanese vowel inventory. Prosodic analysis deals with the output syllable templates in Nasal Spreading: Nasal Spreading is analyzed as a mora augmentation and contrasted with /a/-epenthesis, which is another type of mora augmentation in /nai/-suffixation. In Vowel Deletion, prosodic domains are discussed, focusing on the mismatch between morphological domains and prosodic domains. Tonal processes are involved in both formations. In Nasal Spreading, the agreement in tone melodies between the standard and the colloquial forms are expressed as the disyllabic requirement on the derived base: the constraints on Accent Shift or Initial Lowering require such a structure. In Vowel Deletion, the lexical high tone is treated as an underlying blocker for deletion. These complex environments are sorted out by adopting the Optimality Theoretic approach. A minimal number of constraints are selected and ranked, and each candidate set is evaluated. For example, RecM and Rec@ makes a distinction between Nasal Spreading and /a/-epenthesis.

The forms in this thesis are drawn from modern Tokyo Japanese. Few analyses deal with such forms, especially, in a current theoretical framework. One of the reasons is that there are quite a few variations in surface representations, due to ongoing language change. The judgements of the data by native speakers vary inevitably. I included these surface variations in the analysis. I also classified the words for both literary and colloquial forms and specified the type of words in which the colloquial formation applies most consistently. This contrasts forms that undergo the changes and with the words that are not subject to change. In most cases, the expressions are based on the Tokyo accent spoken among young people, so that the present trend or 'the evolution' of the language can be seen.

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