

**PROBLEMS OF ANALYZING CONSONANT-TONE INTERACTION IN  
THAI: A REPLY TO RUANGJAROON\***

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**ABSTRACT**

The interaction between the distribution of tones and syllable types in Thai has been found to be interesting. The absence of the rising contour tone on CVO and CVVO supports the argument that syllables with shorter phonetic duration are bad licensors for the rising contour tone (Zhang 2002). The distributional gaps on CVO and CVVO are also found to be correlated with syllable-final glottalization (Morén & Zsiga 2006). Furthermore, Ruangjaroon (2006) argues that there is the consonant-tone interaction in Thai and analyzes it under the framework of OT. However, I will indicate both theoretical and analytical problems faced by analyses in Ruangjaroon (2006) in this paper.

Key words: Standard Thai, tone, phonological distribution, Optimality Theory.

**1. INTRODUCTION**

The distribution of the tones in a tone language attracts the attention of phonologists because the absence of the tones is relevant to various non-tonal phonetic factors (vowel quality, syllable duration, etc.). In Thai, there are five lexical tones, which are H, M, L, HL, and LH. The distribution of the tones by different syllable types can be summarized as follows:

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(1) The distribution of the tones by different syllable types in Thai

	H	M	L	HL	LH
CVV	Ok	Ok	Ok	Ok	Ok
CVR	Ok	Ok	Ok	Ok	Ok
CVVR	Ok	Ok	Ok	Ok	Ok
CVO	Ok	-	Ok	-	-
CVVO	-	-	Ok	Ok	-

As demonstrated in (1), all five lexical tones can occur on open syllables and on sonorant-ending syllables. However, there are distributional gaps on obstruent-ending syllables (or so-called checked syllables).

Zhang (2002) argues that the distribution of tones is influenced by the duration of different syllable types. According to Zhang's theory, longer tones require longer syllable duration. Generally speaking, contour tones are longer than level tones, and rising contour tones are longer than falling contour tones; open syllables and sonorant-ending syllables are longer than obstruent-ending syllables, and syllables with long vowels are longer than syllables with short vowels. Therefore, for example, the obstruent-ending syllable is the worst tonal licenser for the rising contour tone because rising contour tones are too long and obstruent-ending syllables are too short.

In Thai, the distribution of contour tones can be predicted by Zhang's theory. The rising contour tone LH, which is the longest tone in Thai, can only occur on open syllables or sonorant-ending syllables which are also the longest in syllable duration. LH is banned on shorter obstruent-ending syllables with long vowels CVVO, but HL can still occur on CVVO with its shorter phonetic duration. Finally, shortest obstruent-ending syllables CVO cannot bear any contour tone.

On the other hand, Morén & Zsiga (2006) focus on different distributional gaps of the tones on CVO and CVVO in Thai. As shown in (1), CVO can bear only H and L, and CVVO can bear only HL and L. Morén & Zsiga claim that syllable-final glottalization on obstruent-ending syllables plays an important role in accounting for distributional gaps of the tones for both syllable types. For example, the common distributional gap on both CVO and CVVO is the absence of

the mid level tone M. It is because the tonal association between the mora borne by syllable-final glottalization and L is required.

Ruangjaroon (2006) in turn observes the consonant-tone interaction in Thai. Onsets in Thai can be categorized according to their voicing/aspiration status. Aspirated and fricative obstruents are [spread glottis] (henceforth  $C_1$ ); unaspirated and voiced obstruents are [constricted glottis] (henceforth  $C_2$ ); and sonorants are categorized with  $C_1$  (henceforth  $C_3$ ). The distribution of tones by different onsets and syllable types are as follows (Ruangjaroon 2006:10):

(2) The tonal distribution by different onsets and syllable types in Thai<sup>1</sup>

	H	M	L	HL	LH
$C_{1/3}VV/$ $C_{1/3}V(V)(V)R$	Ok	Ok	Ok	Ok	Ok
$C_2VV/C_2VR$	-	Ok	Ok	Ok	Ok
$C_{1/3}VO$	Ok	-	Ok	-	-
$C_2VO$	-	-	Ok	-	-
$C_{1/3}VVO$	-	-	Ok	Ok	-
$C_2VVO$	-	-	Ok	-	-

As represented in (2), there are distributional gaps between  $C_{1/3}$  syllables and  $C_2$  syllables. For example, open syllables and sonorant-ending syllables with  $C_{1/3}$  onsets can bear all five lexical tones in Thai. By contrast, the same syllable types with  $C_2$  onsets cannot bear H. In other pairs of  $C_{1/3}$  and  $C_2$  syllables, different distributional gaps also occur. Based on the distributional patterns in (2), Ruangjaroon (2006) argues for the consonant-tone interaction in Thai and analyzes the distributional patterns under the framework of Optimality Theory (OT) (Prince and Smolensky 1993/2004).

Based on (2), the consonant-tone interaction in Thai is highly possible. However, the OT analyses in Ruangjaroon (2006) face both theoretical and analytical problems. Therefore, I suggest that alternative analyses should be proposed.

<sup>1</sup> Ruangjaroon (2006) marks obstruent codas with T which stands for stops. However, since it is unnecessary to distinguish stops from other obstruents in terms of the distribution of tones on the coda position, I will consistently use O on the coda position in this paper, which stands for all obstruents.

The paper will be organized as follows. In Section 2, the hypothesis in Ruangjaroon (2006) that tones are pre-linked to tone-bearing units (TBU) in UR will be discussed. The hypothesis is found to be undermined because of an ‘overgeneration’ problem. In Section 3, tonal specification of the mid level tone will be discussed. Morén & Zsiga (2006) assume that the mid level tone is structurally the simplest and therefore does not have any tonal specification on TBUs. On the other hand, Ruangjaroon assumes that the mid level tone is lexically specified with M. Nevertheless, the analysis based on the lexically specified M generates an unusual tonal inventory of Thai by following Morén & Zsiga’s (2006) phonetic investigation. Finally, proposing conjoined constraints should be more conservative since conjoined constraints are highly controversial. In addition, the conjoined constraint proposed by Ruangjaroon can be alternatively rendered as a single markedness constraint.

## **2. PROBLEMS OF PRE-LINKING TONES IN UR**

In Ruangjaroon (2006), tones are pre-linked to TBUs in UR, which are assumed to be moras. In terms of OT, any surface change of the association with tones in UR violates **IO-FAITH(TONE)**:

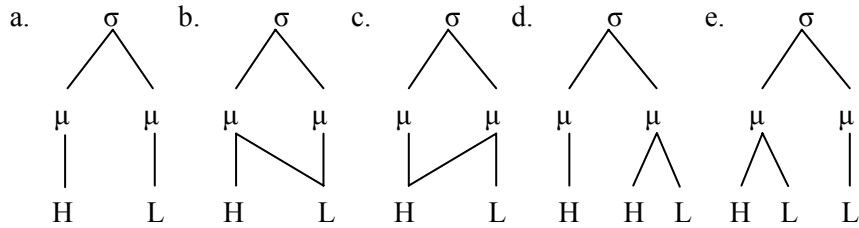
(3) **IO-FAITH(TONE)** (Ruangjaroon 2006:14)

The tonal autosegment that is linked to an input segment must also be linked to that segment in its output correspondent and vice versa.

However, if tones are pre-linked in the UR and the TBU is assumed to be the mora, there is an ‘overgeneration’ problem (Hyman 1988). That is, too many contrasts of tonal representations are generated but empirically unattested.

For example, the falling contour tone HL can be represented in various ways on syllables with long vowels (i.e., bimoraic syllables) as follows:

(4) Overgeneration problem of HL (Odden 1995:450)



In (4), the falling contour tone HL can be represented in the above five representations. If tones can be pre-linked with TBUs in UR, these tonal representations are possible contrasts.

In terms of OT, these possible representations are allowed in UR by the core assumption Richness of the Base (ROTB). Due to this assumption, tonal representations in (4) can be contrastive when relevant faithfulness constraints outrank other markedness constraints. In Ruangjaroon's analyses, such contrasts can be made when **IO-FAITH(TONE)** is higher-ranked than all other markedness constraints violated in (4). Here I take (4d) and (4e) as examples of violations of **OCP** in SR.

(5) **OCP** (Leben 1973)

Adjacent identical tones are prohibited.

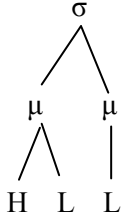
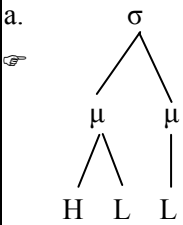
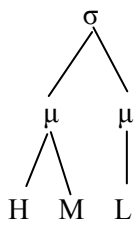
If tones are pre-linked in UR, we may expect a tone language in which **IO-FAITH(TONE)** outranks **OCP**. (4d) and (4e) can therefore surface faithfully:<sup>2</sup>

<sup>2</sup> These examples follow Ruangjaroon's assumption where the mid level tone M is lexically specified in order to exemplify the main argument. The problems of lexical specification of M will be illustrated in the next section.

(6) Surface of (4d)

$  \begin{array}{c}  \sigma \\  \swarrow \quad \searrow \\  \mu \quad \mu \\    \quad \swarrow \searrow \\  H \quad H \quad L  \end{array}  $	<b>IO-FAITH(TONE)</b>	<b>OCP</b>
a. $  \begin{array}{c}  \sigma \\  \swarrow \quad \searrow \\  \mu \quad \mu \\    \quad \swarrow \searrow \\  H \quad H \quad L  \end{array}  $		*
b. $  \begin{array}{c}  \sigma \\  \swarrow \quad \searrow \\  \mu \quad \mu \\    \quad \swarrow \searrow \\  H \quad M \quad L  \end{array}  $	*!	

(7) Surface of (4e)

	<b>IO-FAITH(TONE)</b>	<b>OCP</b>
a. 		*
b. 	*!	

As demonstrated in (6) and (7), the faithful outputs (6a) and (7a) are the optimal output when **IO-FAITH(TONE)** outranks **OCP**. In this case, the surface contrast between (6a) and (7a) is derived. With such a similar constraint ranking, all five representations in (4) can thus be contrastive. However, it is well-known that tone languages never allow for such multiple contrasts for a single tonal melody. Even if only (4a) and (4b) are allowed to occur in SR in a tone language, such a binary contrast for a tonal melody is still unattested.

Similar cases also occur in syllabification. If we assume that a string of segments is syllabified in UR, we can expect a language in which **IO-FAITH(σ)** outranks **NOCODA** or other relevant markedness constraints. However, languages never contrast in syllabification such as CV.CV v.s CVC.V (Clements 1986:318, Coetzee 2006:370). Therefore, it is suggested that syllabification does not occur underlyingly and that

the constraint **IO-FAITH(σ)** is unnecessary. Syllabification is only subject to the evaluation of markedness constraints such as **NOCODA**, which only evaluates the syllable structure of the output candidates. As mentioned above, it can also be argued that syllabification is a phonological process but not a part of the lexicon. The assumption ROTB only allows all possible forms *within* the lexicon.

Following the same logic, I argue that tones are not pre-linked to TBUs in UR. Different tonal representations in (4) are caused by different violations of markedness constraints such as Alignment constraints (McCarthy and Prince 1993a). If **ALIGN(T, L, σ, L)** is higher-ranked, (4b) is preferred; if **ALIGN(T, R, σ, R)** is higher-ranked, (4c) is preferred. Therefore, only tonal melodies are contrastive in tone languages, but tonal representations such as in (4) are not. Indeed, ROTB allows an ‘unconstrained lexicon’, which means that pre-linked and non-linked tones should be permitted. However, I argue that tonal association is not a part of lexicon because tonal association seems non-contrastive in every tone language. In other words, tonal association can be treated as a part of the phonological grammar but not a part of the lexicon. This argument therefore does not contradict the assumption of ROTB.

Furthermore, in Ruangjaroon’s analyses, **IO-FAITH(TONE)** never plays a crucial role in ruling out candidates. All the optimal outputs are the same even if the violation(s) of **IO-FAITH(TONE)** is ignored in every single OT-tableau.<sup>3</sup>

Ruangjaroon (2006:32) also discusses intensified reduplication in Thai, the shape of which is C<sub>2</sub>V-CVC and the reduplicant is always high-toned. When the base is C<sub>2</sub>VO, the reduplicated form is C<sub>2</sub>VO-C<sub>2</sub>VO despite the fact that the C<sub>2</sub>VO is forbidden to be high-toned as shown in (4). Ruangjaroon thus suggests that ‘the H tone must be underlyingly present in the reduplicant as it is invariably high-tone(d) on the surface.’ The higher-ranked faithfulness constraint **MAX-OR-H** is proposed to prevent the deletion of H on the reduplicant. Nevertheless, since it is problematic to pre-link tones to TBU in UR, a possible alternative markedness constraint **INTRED→H** can be suggested, which requires the intensified reduplicant to be high-toned. This constraint must

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<sup>3</sup> In Ruangjaroon (2006:26), **IO-FAITH(TONE)** is fatally violated by (36a). However, (36a) will still be ruled out by ignoring the violation of **IO-FAITH(TONE)** because (36a) also violates **\*H**, which is not violated by the optimal output (36c).



outrank **MAX-BR** (McCarthy and Prince 1993b) to derive a reduplicated form such as C<sub>2</sub>ʔO- C<sub>2</sub>VO.

If tones are not pre-linked in UR, Ruangjaroon's analyses are undermined. In Ruangjaroon's analyses, output candidates with toneless TBUs are ignored. It can be assumed that the faithfulness constraint **MAXLINKMORA[T]** is higher-ranked:

- (8) **MAXLINKMORA[T]** (Morén & Zsiga 2006:138)  
Do not lose an association between a mora and a tone.

By ranking this constraint higher than \*[-SG]<sub>∞</sub>[ʔ], output candidates that lose underlying tonal association(s) will be ruled out:

- (9) \*[-SG]<sub>∞</sub>[ʔ] (Ruangjaroon 2006:12)  
When an onset is [-SG], no high tones are allowed on a following TBU. The two features do not have to be immediately adjacent but do need to be in the same syllable in order for there to be a violation.

With the constraint ranking {**MAX-H**, **MAXLINKMORA[T]**} >> \*[-SG]<sub>∞</sub>[ʔ], the absence of H on C<sub>2</sub>VV/C<sub>2</sub>VR can be predicted (Ruangjaroon 2006:19):

(10) Underlying H to surface contour tones on C<sub>2</sub>VV/C<sub>2</sub>VR

	<b>MAX-H</b>	<b>MAXLINKMORA[T]</b>	<b>*[-SG]<sub>∞</sub>[V]</b>
a.			<b>**!</b>
b.			<b>*</b>
c.		<b>*!</b>	
d.	<b>*!</b>		

In (10), (10a) is ruled out because it fatally violates  $*[-SG]_{\infty}[\acute{V}]$  twice with two high-toned TBUs preceded by a  $[-SG]$  segment. (10c) is ruled out because it loses an underlying tonal association. (10d) deletes the underlying H and fatally violates **MAX-H**.<sup>4</sup> In this analysis, the absence of H on  $C_2VV/C_2VR$  can be predicted.

However, if tones are not pre-linked in UR, **MAXLINKMORA[T]** is not effective. A different optimal output will be derived with an additional violation of **\*L** or **DEP-L**:

(11) Wrong output with non-pre-linked H on  $C_2VV/C_2VR$

$\begin{array}{c} C_2 \quad V \\   \quad / \backslash \\ [-sg] \mu \quad \mu \\ H \end{array}$	$*[-SG]_{\infty}[\acute{V}]$	<b>*L</b>
a. $\begin{array}{c} C_2 \quad V \\   \quad / \backslash \\ [-sg] \mu \quad \mu \\ \bullet \quad   \\ H \end{array}$	*	
b. $\begin{array}{c} C_2 \quad V \\   \quad / \backslash \\ [-sg] \mu \quad \mu \\ \ominus \quad   \quad   \\ L \quad H \end{array}$	*	<b>*!</b>

In (11), the lower-ranked **\*L** is implied by Ruangjaroon's analyses. (11a) is the wrong optimal output since the underlying H can only

<sup>4</sup> Ruangjaroon (2006:19) provides another optional optimal output with HL but the case is not critical and is therefore omitted.

associate to one of the two moras in the syllable and only violate  $*[-SG]_{\infty}[\acute{v}]$  once. In (10), the same surface representation (i.e., 10c) can be ruled out with the violation of **MAXLINKMORA[T]**. However, since tones are not pre-linked in UR in (11), **MAXLINKMORA[T]** is not effective. The optimal output in (10) is ruled out as in (11b) because the insertion of L additionally violates  $*L$ . In fact, in Morén and Zsiga's analysis, **MAXLINKMORA[T]** is lower-ranked. Therefore, even in (10), **MAXLINKMORA[T]** might not be effective to derive the correct optimal output.

In this section, I have discussed how it is problematic to pre-link tones in UR. Moreover, if tones are not pre-linked in UR, Ruangjaroon's analyses are undermined and should be reconsidered.

### 3. MID LEVEL TONES AS TONALLY UNSPECIFIED SYLLABLES

In Morén & Zsiga (2006), the mid level tone M in Thai is assumed to be a tonally unspecified syllable. This assumption follows Yip's (2002) argument that the mid level tone is structurally the simplest (i.e., mid level tones are represented by toneless syllables). On the other hand, Ruangjaroon assumes that the mid level tone M is lexically/tonally specified and the assumption causes few problems in her analyses.

First, as pointed out in the previous section, **IO-FAITH(TONE)** never plays an important role in any of the analyses; that is, it is too lower-ranked to be effective. Thus, **IO-FAITH(TONE)** and the tonally pre-linked UR were suggested to be unnecessary. This is the same problem faced by the lexically/tonally specified M in Ruangjaroon's analyses. If M is lexically/tonally specified, a markedness constraint  $*M$  needs to be proposed to ban it in the surface form. This is true for both the high level tone H and the low level tone L and there is a general markedness constraint ranking hierarchy  $*H \gg *L$  (Yip 2002:84). However, since  $*M$  is always lower-ranked in Ruangjaroon's analyses, we should ask why it is necessary to assume a lexically/tonally specified M in Thai. In particular, to propose a lexically/tonally specified M contradicts the assumption that the mid level tone is structurally the simplest, as just mentioned. In other words, we still cannot explain the fact that the mid level tone is the most unmarked tone from the perspective of the structure of tones.

Instead of banning a lexically/tonally specified M with the markedness constraint **\*M**, it is more plausible to explain the absence of the mid level tone by banning toneless syllables. If we assume that the mid level tone M is represented by the toneless syllables, Association Convention (Goldsmith 1976) is violated because every TBU (either the syllable or the mora) must be associated with a tone (i.e., tonally specified). Yip (2002:83) then formalizes Association Convention into a markedness constraint **SPECIFYT**, which is in turn followed by Morén & Zsiga (2006):

(8) **SPECIFYT**

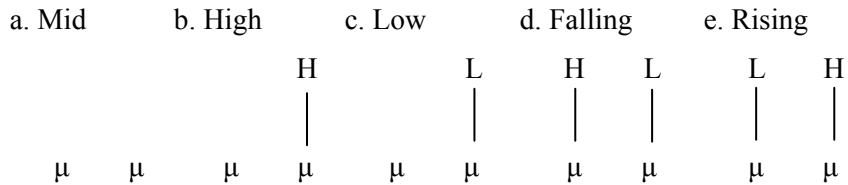
A TBU must be associated with a tone.

If **SPECIFYT** is higher-ranked in a given tone language than **\*H**, **\*L** and **DEP-T**, the tone language does not allow the mid level tone because every TBU must be associated with a tone in this particular tone language. By contrast, if **SPECIFYT** is lower-ranked, then the TBU is allowed to be toneless. This explanation is more plausible because it follows the assumption that the mid level tone is structurally the simplest. Moreover, we do not have to propose an additional constraint **\*M** to ban a lexically/tonally specified M, which may not exist.

The second problem faced by the assumption of the lexically/tonally specified M is that the tonal inventory of Thai is entirely different from the widely accepted definition. Recall that there are five lexical tonal melodies in Thai: H, M, L, HL, and LH. As suggested in the previous section, these tonal melodies are contrastive, but their surface representations are not. For example, H is a level tone and LH is a contour tone, despite the possible case that their tonal representations are phonetically realized as contour tones. Morén & Zsiga (2006) claim that this is true based on the phonetic investigation.

According to the experimental results in Morén & Zsiga (2006), level tones in Thai begin with the pitch of the mid level tone. The high level tone and the low level tone reach their pitch target later in the syllable. Therefore, Morén & Zsiga conclude that the TBU is the mora in Thai and that the tones are aligned with the right edge of the syllable. The surface representations of the five lexical tonal melodies on bimoraic syllables proposed by Morén & Zsiga (2006:134) are as follows:

(12) Surface representations of tones in Thai



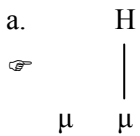
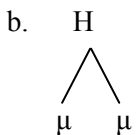
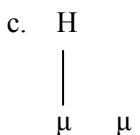
(12a), (12b), and (12c), respectively represent toneless M and the right alignment of H and L. Contour tones have a one-to-one mapping between tones and TBUs (moras) in (12d) and (12e).<sup>5</sup> In particular, (12b) and (12c) are derived by the constraint ranking **ALIGN-R** >> **\*[μμ]T** >> **SPECIFYT**:

(13) **\*[μμ]T** (Morén & Zsiga 2006:140)

Two moras within a same tonal domain are prohibited.

Here I take the derivation of the high level tone as an example as follows:

(14) Surface representation of H in Thai

/μμ, H/	<b>ALIGN-R</b>	<b>*[μμ]T</b>	<b>SPECIFYT</b>
a. 			*
b. 		*!	
c. 	*!		*

<sup>5</sup> Contour tones do not show the right alignment because of higher-ranked **\*[TT]μ**. See Morén & Zsiga (2006) for complete analyses.

In (14), (14a) is the optimal output because the full specification of tones on every TBU is banned by the higher-ranked \*[ $\mu\mu$ ]T as in (14b). (14c) is ruled out because H is aligned with the left edge of the bimoraic syllable.

With such surface tonal representation, we can conclude that *phonetically* H and L in Thai are contour tones. However, if M is lexically/tonally specified in UR as assumed by Ruangjaroon, the tonal inventory includes M, MH, ML, HL, and LH. In other words, *phonologically* there is only one level tone M and four contour tones which are MH, ML, HL, and LH. The explanation can be that a *phonetic* pitch contour is not necessarily a *phonological* contour tone.<sup>6</sup> Yip (2002:22) clearly points out that it is natural for a tone to have a slight falling pitch contour. Therefore, for example, 21 in Taiwanese Southern Min can be *phonologically* treated as a low level tone (L), despite a slight falling pitch contour.<sup>7</sup> If it is the same case in Standard Thai, then MH and ML can be argued as *phonological* level tones H and L. However, based on Morén & Zsiga's phonetic investigation, it is not the case. As shown in Table I in Morén & Zsiga (2006:130), the pitch change of H and L is twice as much as the pitch change of M. I claim that the slight pitch falling of M in Standard Thai can be phonologically ignored as which of 21 in Standard Chinese. By contrast, the pitch contour is much more significant for H and L in Standard Thai and it cannot be ignored phonologically. Moreover, as mentioned previously, the initial pitch and the mid pitch of H and L is highly similar to those of M, according to Morén & Zsiga (2006). Thus, if M should be phonologically specified as argued in Ruangjaroon (2006), why should H and L not be treated as MH and ML phonologically?

When the tonal inventory of Standard Thai is defined as M, ML, MH, LH, and HL, a fundamental analytical problem arises. In terms of OT, if the two level tones H and L are ruled out, \*H and \*L must be higher-ranked than certain faithfulness constraints. However, H and L still occur in ML, MH, LH, and HL, which creates a ranking paradox. Since more similar serious problems might emerge, there is no reason to abandon the traditional definition of the tonal inventory of Thai (i.e., H, L, M, HL, and LH) and the plausible analysis in Morén & Zsiga (2006).

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<sup>6</sup> The author thanks an anonymous reviewer for bringing this point into the discussion.

<sup>7</sup> The five-tone system follows Chao (1930), where 5 stands a highest tone and 1 stands for a lowest tone.

In this section, the assumption that the mid level tone M is lexically/tonally specified has proved to have above problems. The analysis of the consonant-tone interaction is therefore recommended to follow Morén & Zsiga (2006) unless their analysis also contains some fundamental problems.

#### 4. CONSERVATISM IN PROPOSING CONSTRAINTS

In previous sections, the constraints such as **IO-FAITH(TONE)** and **\*M** proposed by Ruangjaroon were rejected because they are redundant and unnecessary. In this section, the conspiracy of the constraints in Ruangjaroon's analyses will be illustrated and the constraints need to be simplified. Despite the freedom of proposing constraints under the OT framework, we should refrain from complicating the analysis, or even the grammar.

Ruangjaroon tries to incorporate the fact that syllable-final glottalization affects the distribution of tones in Thai, a finding which is concluded in Morén & Zsiga (2006). Therefore, two OT constraints are proposed to deal with the distributional patterns in Thai:

- (15) **\*[v̥]-[-SG]** (Ruangjaroon 2006:12)

If the coda is an obstruent, a high tone autosegment incurs one violation if it immediately precedes this obstruent.

- \*[v̥]-[-SG]** (Ruangjaroon 2006:13)

If the coda is an obstruent, mid tones are not allowed on an immediately preceding segment.

Both of the constraints are apparently motivated by the summary of the distributional patterns in (2), which is recalled as follows:



(2) The tonal distribution by different onsets and syllable types in Thai

	H	M	L	HL	LH
$C_{1/3}VV/$ $C_{1/3}V(V)(V)R$	Ok	Ok	Ok	Ok	Ok
$C_2VV/C_2VR$	-	Ok	Ok	Ok	Ok
$C_{1/3}VO$	Ok	-	Ok	-	-
$C_2VO$	-	-	Ok	-	-
$C_{1/3}VVO$	-	-	Ok	Ok	-
$C_2VVO$	-	-	Ok	-	-

As shown in (2), except on  $C_{1/3}VO$ , H and M are prohibited on obstruent-ending syllables. Therefore, the two constraints in (15) are responsible for the absence of H and M, respectively. Nevertheless, the two constraints in (15) conspire with the statement that ‘syllables which end in [-SG] must be associated with L’. In Morén & Zsiga (2006), this conspiracy has already been formalized into a single markedness constraint **C.G.CODA→L**:

(16) **C.G.CODA→L** (Morén & Zsiga 2006:143)

Constricted glottis coda segments must be associated with low tone.

In Ruangjaroon’s analyses, there is no independent evidence which supports the separation of **C.G.CODA→L**.<sup>8</sup> Moreover, Morén & Zsiga provide a plausible analysis with this single constraint.

**C.G.CODA→L** is separated into two constraints in Ruangjaroon’s analyses possibly in order to propose a conjoined constraint (Smolensky 1995) to account for the tonal gaps caused by the consonant-tone interaction in Thai and a binary conjoined constraint is only violated when the two constraints are violated simultaneously.

In (2), it is shown that only the low level tone L can occur on syllables  $C_2VO$  and  $C_2VVO$ . For this pattern, Ruangjaroon proposes a conjoined version of  $*[-SG] \infty [\acute{v}]$  and  $*[\acute{v}] - [-SG]$ . The conjoined version of  $*[-SG] \infty [\acute{v}]$  and  $*[\acute{v}] - [-SG]$ , in terms of Ruangjaroon’s terminology, is

<sup>8</sup> In Ruangjaroon (2006:16),  $*[\acute{v}] - [-SG]$  outranks  $*[-SG] \infty [\acute{v}]$ . However, the optimal output will not change even if we treat the two constraints as a single constraint. Moreover, Ruangjaroon does not further indicate the constraint ranking of the two constraints in the following analyses.

‘high tones are prohibited when they fall between two [-SG] segments within a syllable’.

However, the existence of conjoined constraints is still very controversial. Kager (1999:400) summarizes three negative sides arise from Local Conjunction constraints (i.e., conjoined constraints). First, the *worst-of-the-worst* should be sufficient to be banned by minimal violation, instead of by the adding of an extra mechanism. Second, a core conception in OT, *strict domination*, which assumes violations of lower constraints cannot compensate for violations of higher constraints, is undermined by Local Conjunction constraints. Third, it is unclear whether every constraint can be conjoined together or not. Or, the freedom of conjoining constraints together will highly increase the number of constraints. Therefore, despite the plausibility of proposing a conjoined version of \*[-SG]<sub>∞</sub>[v] and \*[v]-[-SG], I suggest that conjoined constraints should be avoided as much as possible.

In fact, the conjoined version of \*[-SG]<sub>∞</sub>[v] and \*[v]-[-SG] is also conspired. As re-interpreted above, the constraint bans high tones between [-SG] segments within a syllable. Therefore, an alternative markedness constraint \*[-SG]...H...[-SG]]σ can replace the conjoined constraint in Ruangjaroon’s analyses. There are some advantages by replacing Ruangjaroon’s Local Conjunction constraints. First, we can apparently avoid the controversies arising from Local Conjunction constraints and simplify the phonological grammar and analysis. Second, except for replacing Local Conjunction constraints, the correct optimal output in Ruangjaroon’s analyses can be derived without any change of the constraint ranking or the proposal of the constraints.

In this section, the conspiracies among the constraints proposed by Ruangjaroon have been explained, which over-complicate the analyses and face theoretical controversies. It can be concluded that proposing constraints in OT should be more conservative and that the analyses in Ruangjaroon (2006) should be reconsidered.

## 5. CONCLUSION

In this paper, the problems faced by Ruangjaroon’s (2006) analyses to the consonant-tone interaction in Thai have been briefly reviewed. It is convincing that such an interaction does exist because Ruangjaroon provides an interesting collection of data. However, Ruangjaroon’s

analyses are endangered from various aspects. First, tones should not be pre-linked in UR. Second, the mid level tone should be treated as a toneless syllable. Third, OT constraints should be proposed conservatively. In sum, the conclusion is that an alternative analysis to the consonant-tone interaction should be proposed. Moreover, the alternative analysis should be based on Morén & Zsiga (2006), in which an empirical study of the distribution of tones in Thai has been completed. An entirely new analysis with a similar approach but different bases is not suggested.

#### REFERENCES

- Clements, George N. 1986. Syllabification and epenthesis in the Barra dialect of Gaelic. *The phonological representation of suprasegmentals*, ed. by Koen Bogers, Harry van der Hilst and Martin Mous, 317-336. Dordrecht: Foris.
- Coetzee, Andries. 2006. Variation as accessing 'non-optimal' candidates. *Phonology* 23.3:337-386.
- Goldsmith, John. 1976. *Autosegmental Phonology*. PhD Dissertation, MIT.
- Hyman, Larry. 1988. Syllable structure constraints on tonal contours. *Linguistique Africaine* 1:49-60.
- Kager, René. 1999. *Optimality Theory*. United Kingdom: Cambridge University Press.
- Leben, William. 1973. *Suprasegmental Phonology*. PhD Dissertation, MIT.
- McCarthy, John and Alan Prince. 1993a. Generalized Alignment. *Yearbook of Morphology 1993*, ed. by G. E. Booij and J. van Marle, 79-153. Dordrecht: Kluwer.
- McCarthy, John and Alan Prince. 1993b. Prosodic Morphology I: constraint interaction and satisfaction. Ms., University of Massachusetts, Amherst and Rutgers University.
- Morén, Bruce and Elizabeth Zsiga. 2006. The lexical and post-lexical phonology of Thai tones. *Natural Language and Linguistic Theory* 24:113-178.
- Odden, David. 1995. Tone: African Languages. *The Handbook of Phonological Theory*, ed. by J. Goldsmith, 444-475. United Kingdom: Blackwell.
- Prince, Alan and Paul Smolensky. 1993. Optimality Theory: constraint interaction in generative grammar. Ms., Rutgers University, New Brunswick and University of Colorado, Boulder. [Reprinted in 2004 by Blackwell]
- Ruangjaroon, Sugunya. 2006. Consonant-tone Interaction in Thai: An OT Analysis. *Taiwan Journal of Linguistics* 4.2:1-66.
- Smolensky, Paul. 1995. On the internal structure of the constraint component *Con* of UG. Handout to talk presented at Rutgers Optimality Workshop 1, 23 October 1993, New Brunswick, New Jersey. [ROA-86, <http://roa.rutgers.edu>]
- Yip, Moira. 2002. *Tone*. United Kingdom: Cambridge University Press.

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Zhang, Jie. 2002. *The effects of duration and sonority on contour tone distribution: Typological survey and formal analysis*. New York: Routledge.

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