

The independence of the timing of tones and tone-bearing units: a study on Thai

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The mora as the tone-bearing unit in Thai

- ▶ In addition to three level tones (low, mid, and high), Thai also contrasts two contour tones, Falling (HL) and Rising (LH)
- ▶ Standard analysis: Thai tone-bearing unit (TBU) is the mora (Morén and Zsiga, 2006)
 - ▶ Only syllables with two (*sonorant) moras can carry contour tones
 - ▶ Specifically, tones associate to the right edge of a mora

Shape	Moras	Low	Mid	High	Fall	Rise
CV	1					
CVO	2*					
CVS	2					
CVV	2					
CVVO	2					
CVVS	2					

Stepping away from the primacy of the segment in timing

- ▶ Right edge alignment breaks down (Karlin, 2014)
 - ▶ Right-edge alignment is consistently inconsistent
 - ▶ Segment-to-tone alignment varies with segmental structure
- ▶ **Alternative hypothesis:** tones generate their own timing independently of segments
 1. Tone sequences affect tone timing, but not segment timing;
 2. Segmental structure of words affect segmental timing, but not tone timing
- ▶ Acoustic study on Thai tonal articulation
 - ▶ Examine effects of surrounding tones on tone timing
 - ▶ Examine effects of segmental structure on tone timing

Current study: Stimuli

- ▶ Four sequences of contour tones:

- ▶ F+F
- ▶ F+R

- ▶ R+F
- ▶ R+R

- ▶ Four types of sonorant bimoraic words:

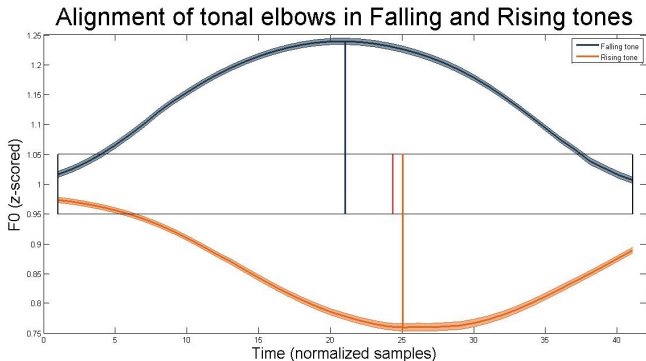
- ▶ CV₁V₂ (/mîa/, /mûa/) (/mïa/, /mÿa/)
- ▶ CV₁V₂N (/mîan/, /mûan/) (/mïan/, /mÿan/)
- ▶ CVN (/mân/, /mûn/) (/măn/, /mÿn/)
- ▶ CVVN (/mâan/, /mûun/) (/măan/, /mÿun/)

Kin <i>Ms.</i>	Targ. word 1 <i>name</i>	Targ. word 2 <i>verbs</i>	Adv <i>well</i>
khun	mâan-F	mûa-F	diidii
naang	mîa-F	mÿun-R	diidii
naang	mïan-R	mûn-F	diidii
khun	măn-R	mÿan-R	diidii

Results

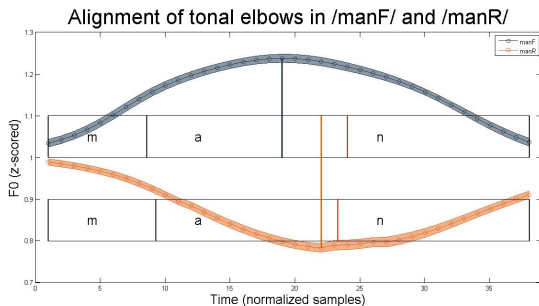
Effect of tone identity: Elbow timing

- ▶ Elbow timing differs significantly between Falling and Rising tones ($p < 0.0001$)
 - ▶ Falling: 54% through the word
 - ▶ Rising: 67% through the word
 - ▶ Duration of the whole word is the same, regardless of tone ($p = 0.83$)



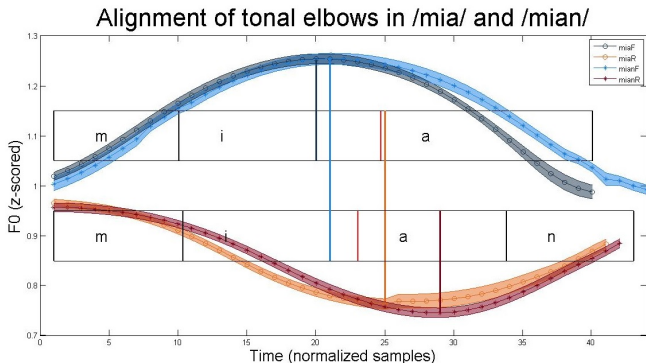
(Non-)Effect of tone identity: Segmental timing

- ▶ However, right edge of the first mora remains constant regardless of tone
 - ▶ Duration of onset + vowel is the same ($p = 0.19$)
 - ▶ Duration of vowel alone is the same for diphthongs ($p = 0.36$)
 - ▶ Duration of vowel alone is different for CVN ($p < 0.0001$), but m also longer

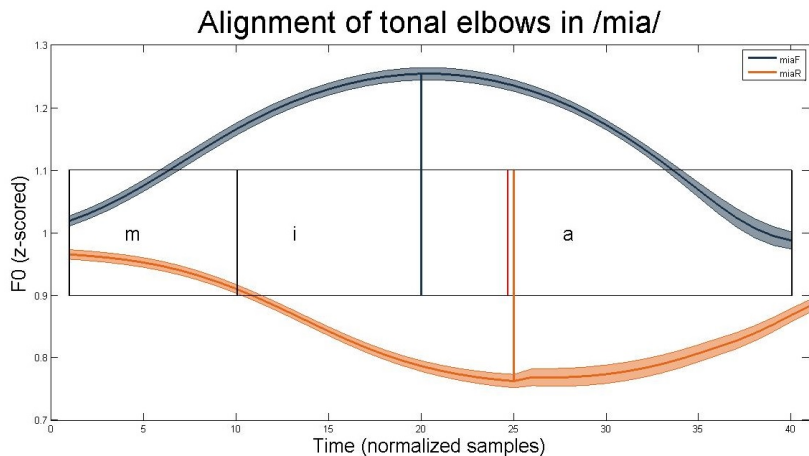


(Non-)Effects of non-moraic codas: Tone and segmental effects

- ▶ Both V_1 and V_2 are shorter in CV_1V_2N than in CV_1V_2
- ▶ Elbows do not move accordingly
 - ▶ Do not move at all (Falling)
 - ▶ Move in the wrong direction (Rising)

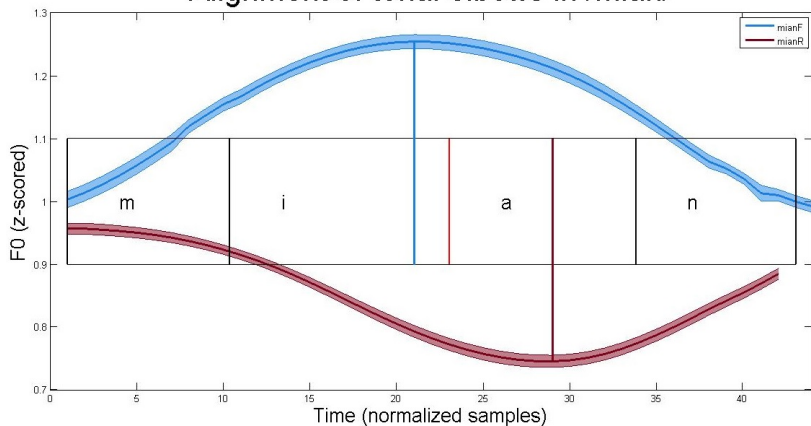


Elbow timing: /mia/



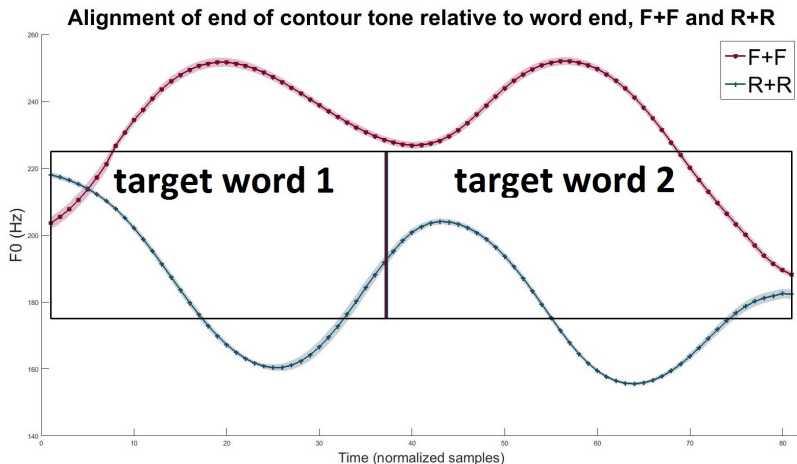
Elbow timing: /mian/

Alignment of tonal elbows in /mian/



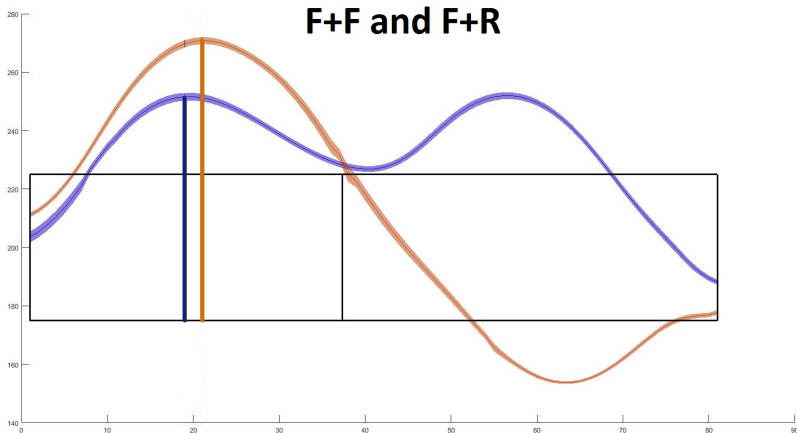
(Non-)Effect of Mora 2 (and the syllable): Middle elbow timing

- ▶ For both F+F and R+R sequences, the tone trajectory continues beyond the edge of the word



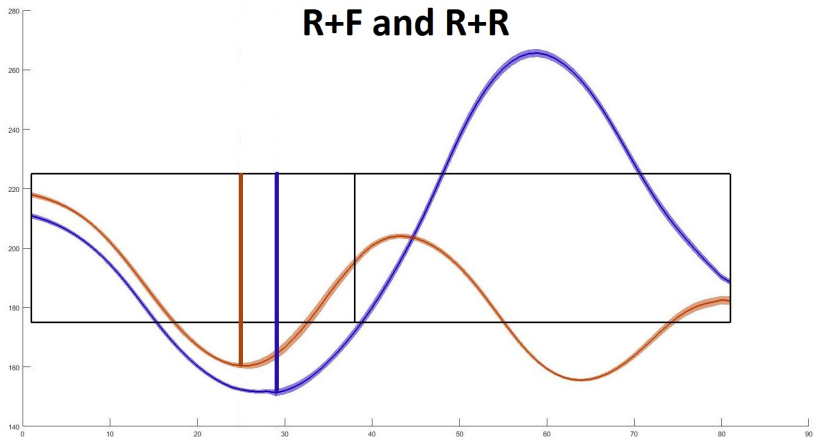
Effects of tone sequence: Elbow timing (Falling tones)

- ▶ In F+F sequences, the elbow of Target 1 is earlier than in F+R sequences ($p < 0.0001$)
- ▶ Right edge of mora 1 does not move with the tone ($p = 0.97$)



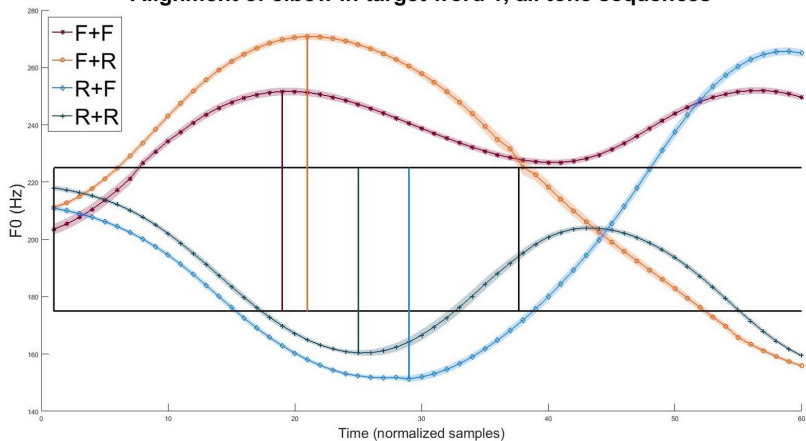
Effects of tone sequence: Elbow timing (Rising tones)

- ▶ $R+R \approx R+F$: $p = 0.16$ (normalized)
- ▶ Right edge of mora 1 does not move with the tone ($p = 0.84$)
- ▶ But, the whole first word is longer in $R+F$ than $R+R$



Elbow timing: R+F and R+R

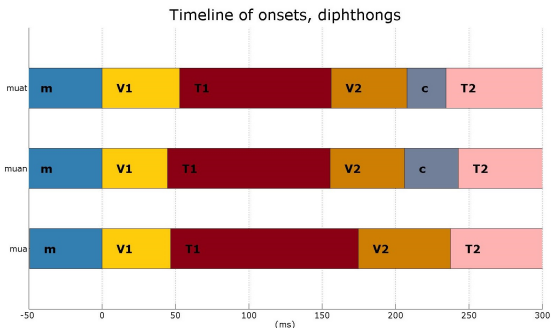
Alignment of elbow in target word 1, all tone sequences



Discussion

Relation with previous work

- ▶ Unlike previous coarticulation studies, this study focuses on timing
 - ▶ Effects of tone identity on elbow location
 - ▶ Effects of following tone on elbow location
 - ▶ Effects of segments on tone (or tone on segments)
- ▶ Corroborates finding from articulatory study on falling tone: tone timing remains constant, while segments change timing



Conclusions

- ▶ Mora works well for phonological distribution (though with some additional restrictions)
- ▶ In terms of concrete timing, the right edge of a mora does not bound tonal contours
 - ▶ Planning: delayed presentation of second word in sequence (tone vs. segments)
 - ▶ Some gestural coordination at the beginning of a word
 - ▶ Planning within larger, phrasal domain

Thank you!

References

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Speech error: continuation of tone contour

