

Effects of anticipatory dissimilation on the F0 and alignment of Thai contour tones

or

The role of targets and timing in tonal representation

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Previous co-articulatory research

- ▶ Coarticulatory research in tone is not new
 - ▶ DiCanio (2014) for Triqui
 - ▶ Xu (1997) for Mandarin
 - ▶ Gandour et al. (1992); Potisuk et al. (1997) for Thai
- ▶ Focus is mainly on effects on pitch

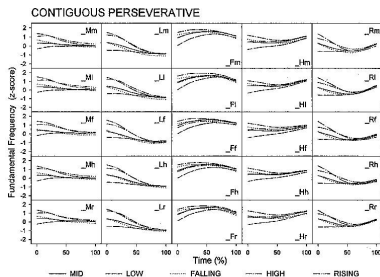
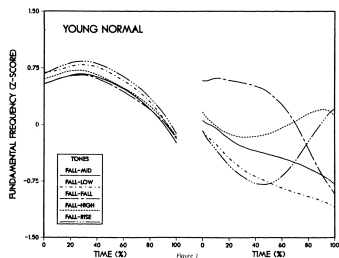


Figure : From Gandour et al. 1992 (left), Potisuk et al. 1997 (right)

Timing and the tone-bearing unit in Thai

- ▶ Recent analysis: the mora is the TBU in Thai (Morén and Zsiga, 2006)
 - ▶ Three level tones: High, Mid, Low
 - ▶ Two contour tones: Falling (HL), Rising (LH)
 - ▶ Contour tones are restricted to words with two sonorant moras

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

Timing and the tone-bearing unit in Thai

- ▶ Tone is realized at the right edge of the mora
 - ▶ T(one)1 is realized at the end of the first mora
 - ▶ T2 realized at the end of the second mora

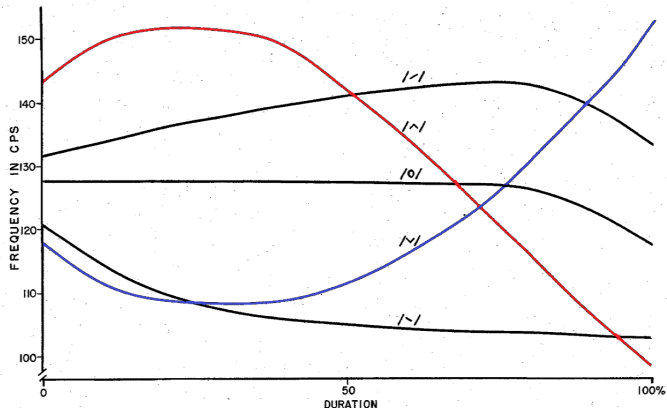


Figure : Thai tones on words with long vowels, from Abramson 1962

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 are represented with a combination of tonal targets and intertonal timing relationships
 1. Tones affect the timing of other tones, but segments do not determine the timing of tones
 2. “Tipping point” between primacy of targets and primacy of 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

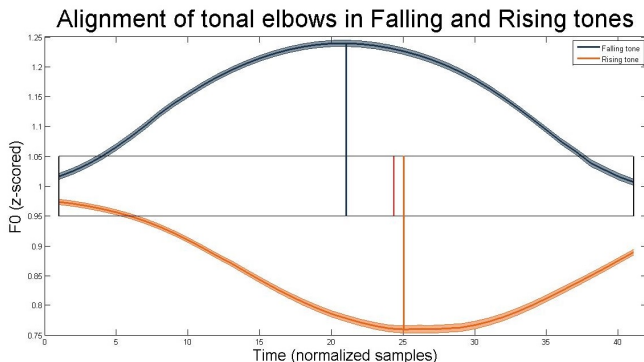
Results

Brief summary of segmental effects on tone timing

- ▶ Do moraic edges control tonal timing?
 - ▶ No. (Please feel free to ask me during questions/after the talk!)
- ▶ In this talk, focusing on:
 - ▶ Effects of the word on the tone contour
 - ▶ Effects of the tone contour on the segments

Context "1": tone identity does **not** affect word 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 ($p = 0.83$)

Context “0”: tone identity affects segmental timing

- ▶ In words produced in isolation, tone identity affects the duration of the word
 - ▶ Rising is longer than Falling
 - ▶ Lengthening **only** affects segments after the start of T2

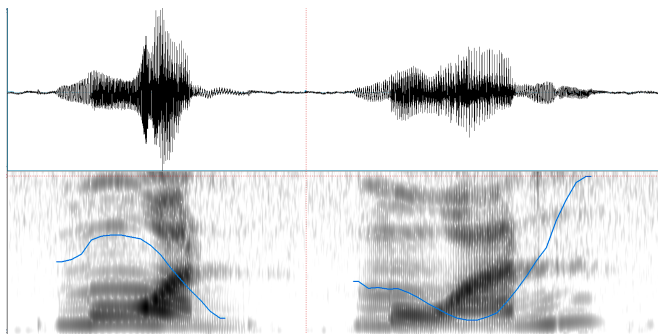
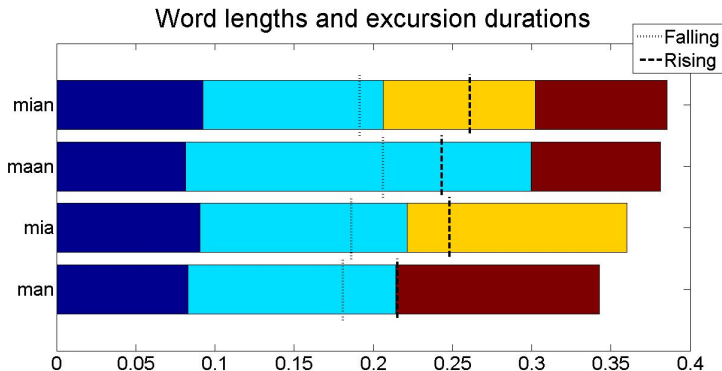


Figure : /mûan/ (left) and /mǔan/ (right), in citation form

Context "1": Effects of word shape on excursion duration

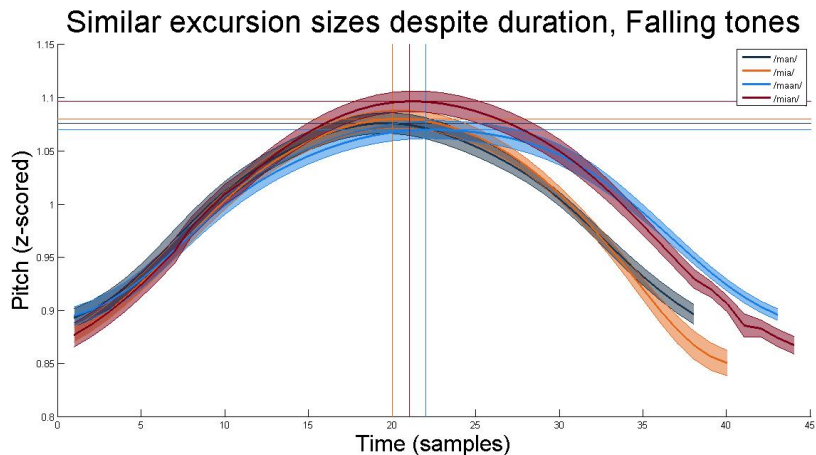
- ▶ Word shapes do not have the same duration ($p < 0.0001$)
 - ▶ /man/ is the shortest
 - ▶ /mian/ and /maan/ are the longest
- ▶ Excursion length (ms) depends on word ($p < 0.0001$)
- ▶ Excursion length (ratio) is more consistent ($p = 0.001$)



Context “1”: Effects of word shape on excursion size

- ▶ Excursion size (Hz) does not differ across words ($p = 0.31$ altogether)
 - ▶ Falling: /mian/ has a large excursion ($p = 0.0003$)
 - ▶ Rising: /mia/ and /mian/ are almost larger ($p = 0.02$)

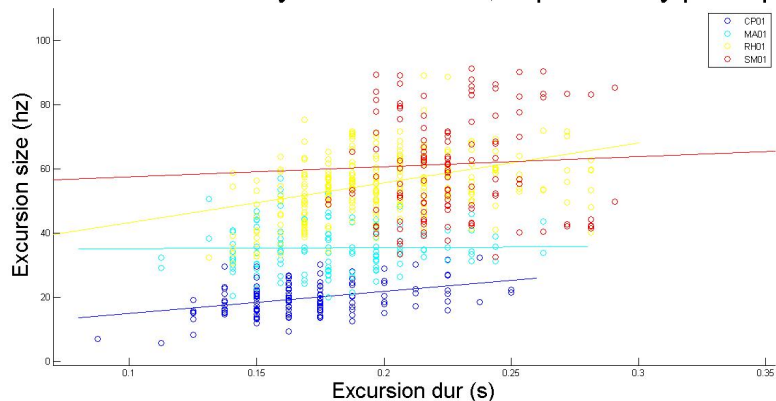
Context "1": Effects of word shape on excursion size



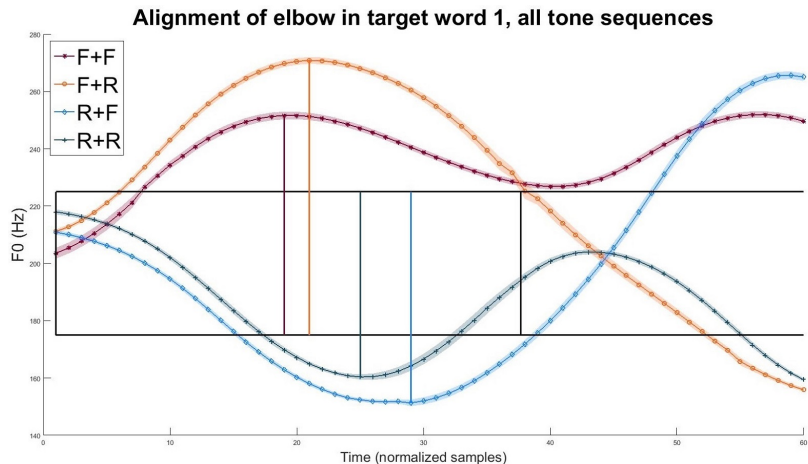
Context "1": Summary of word shape effects

- ▶ Excursion duration differs across word shape
- ▶ Excursion size does **not** differ across word shape

Excursion duration by excursion size, separated by participant

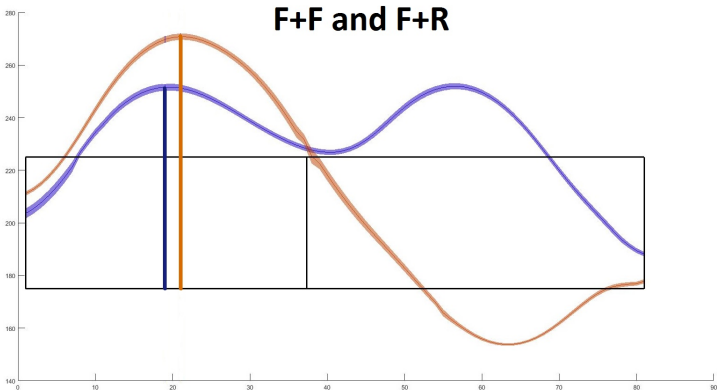


Context "2": Effects of context on contour timing



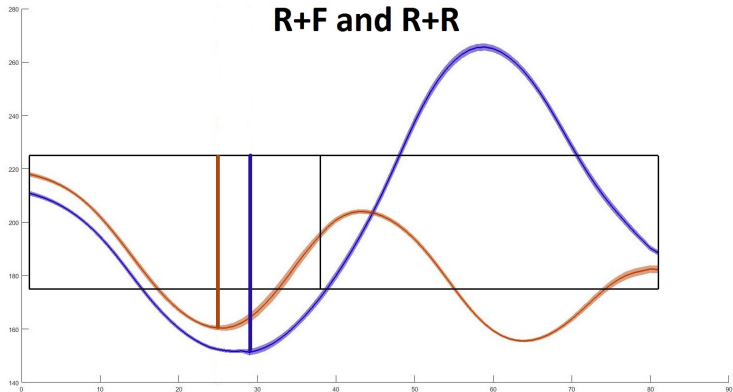
Context "2": Effects of context on contour timing (Falling)

- ▶ In F+R sequences, the elbow of Target 1...
 - ▶ Is **later** ($p < 0.0001$)
 - ▶ and is **higher**, with a greater excursion ($p < 0.0001$)
- ... than in F+F sequences



Context "2": Effects of context on contour timing (Rising)

- ▶ In R+F sequences, the elbow of Target 1...
 - ▶ Is **later** in terms of *ms values only* ($p = 0.003$),
 - ▶ and is **lower** ($p < 0.0001$),
 - ▶ but with an equal excursion ($p = 0.25$)
- ... than in R+R sequences



Context “2”: Effects of tone timing on segments

- ▶ But, the whole first word is longer in R+F than R+R (true for /mia/, /mian/, /maan/)
 - ▶ Lengthening is **not** uniform through the whole word
 - ▶ Lengthening **only** affects the last segment
- ▶ Some déjà vu...

Context “0”: tone identity affects segmental timing

- ▶ In words produced in isolation, tone identity affects the duration of the word
 - ▶ Rising is longer than Falling
 - ▶ Lengthening **only** affects segments after the start of T2

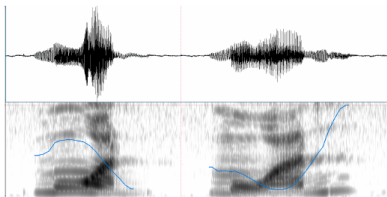


Figure : /mūan/ (left) and /mǔan/ (right), in citation form

Discussion

Summary of results

- ▶ A longer excursion does **not** necessarily mean that the elbow is more extreme
- ▶ If the elbow is more extreme, the excursion is **longer**
- ▶ Tones are not bounded by segments... and if they need more time, they will create it

Tonal representation

- ▶ Tone representation includes a **tone target**
 - ▶ Likely a pitch range
 - ▶ Determined by distance from some median
- ▶ Tone representation includes timing relationships between tone specifications (H and L)
 - ▶ A tone starting near the target range doesn't immediately activate the second tone
 - ▶ Second tone references the first?
 - ▶ First tone specification references gestural complex at the beginning

Conclusions and future directions

- ▶ Mora works well for phonological distribution (though with some additional restrictions)
- ▶ Evidence that tonal representation includes target and timing relationships
 - ▶ Articulatory study (in progress)
 - ▶ Beyond just contour tones
 - ▶ Altered feedback for pitch

Thank you!

References

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