The Complex Tones of East/Southeast Asian Languages

Current Challenges for Typology and Modelling

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Naxi, Na, Laze
纳西、纳（摩梭）、拉热（“水田话”）
So where’s the challenge?

« Conventional methods of description of tones have not attained the degree of **accuracy** and **generality** that have been accomplished for segmental features of speech of various languages, as evidenced by the most recent version of the International Phonetic Alphabet symbols. »


**First step: typology of tone.**
(William Wang: « possible tone systems »)

1. The diversity of tonal systems

Prototypical tone languages?

Tones defined by $F_0$: Bantu; Naxi; & many others

Not just $F_0$: Vietnamese: bundle of $F_0$ and phonation type characteristics; Tamang: $F_0$; phonation type; consonant realization

Tamang: allophonic variation of initial consonants

\[ \text{\textsuperscript{2}cu-ri \textsuperscript{3}pa-pa} \]

\[ \text{\textsuperscript{2}cu-ri \textsuperscript{1}pa-pa} \]
Duration of stop closure

Oral closure for consonant
Release of oral closure

Symmetrical oscillations: for this token, do not last throughout closure duration

VOT

Portion without full voicing

voiced
unvoiced
Caveat: Not all tones are reducible to $F_0$.

‘polydimensional approach’
(P. Rose)

Graph showing $F_0$ and $O_q$ for Tamang, with annotations for each speaker.

Average across the 5 speakers.
Currently widespread viewpoint: all contours to be analyzed as sequences of levels.

Remarkable successes: positive evidence in many languages

Unwarranted extension to Sinitic (Chinese), Thai...

Common-sense view: contours should be viewed as units unless there is positive evidence to the contrary (Nick Clements, p.c. 2008)

Tamang word-tone.

The analysis of tones into features

“... in spite of the vast amount of work on tone languages over the past thirty years, the number of phenomena that appear to require tone features has become significantly reduced, raising the issue whether the notion of tone features is at all useful. This paper first reviews the basic functions for which segmental features have been proposed, and then examines the evidence that tone features are needed to serve these or other functions in tone languages. The discussion focuses successively on level tones, contour tones, and register, building on examples from Africa and Asia. Our current evaluation of the evidence is that tone features, to the extent that they appear motivated at all, do not serve the same functions as segmental features.”


Hyman, Larry. 2011. “Do tones have features?” Same volume
Diachronic evolution: contour tones

Gradual, continuous evolution of contours.
Not categorical
(no addition/deletion of levels).
Direction of tone change:
some regularities.

Figure 2: Thai tonal space in 4 stages

Bangkok Thai


Santitham Prom-On & Yi Xu. This conference. Pitch target representation of Thai tones.
Diachronic evolution: level tones

**Categorical evolution** of levels.  
Phonetic pool of variation; diachronic **change**: by transphonologization.

| Table 1. A comparison showing the origin of the extra-high tone of Moba. Data and analysis from [15:317]. |
|---|---|---|
| meaning | Gulmancema | Moba |
| he stepped over | ³⁰ kándì | ²u kánt |
| he steps over | ³⁰ kándí | ²u kánt |

→ further investigation: **diachronic models of tone change** for various tone systems.

2. From tonal typology to intonation

- Studies of intonation: borrow from analyses of lexical tones.

- Broadening tonal typology opens perspectives for intonation models.
Lexical tones and intonation: a thin line

Vietnamese tones

Two « difficult » tones:

- **B₂**: with final constriction → **like assertion** . → à
- **C₁**: low, long, with final rise → **like interrogation** ? → à

[conservative realization]

Relationship: phonetic? mnemonic? metaphorical?

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Potential for tonal reinterpretation of intonation: an example

Interjection 啊, /a/:  
啊！我考过了！ Wow! I passed the exam!  
啊？你在那儿干什么？ Huh? What are you doing here?  
啊，这样可以。 All right, that’s fine.

Described by some dictionaries as different tones:

Tone 1 á : « speaker gets to know something pleasant »  
Tone 2 á : « call for repetition »  
Tone 3 ā : « surprise or disbelief »  
Tone 4 à : « sudden realization of sthg »

Approximating intonation by means of tone.  
Attraction of the tonal system. (Transfer to L2)
Tonal and non-tonal intonation

Intonation:  
(i) marking of boundaries/junctures – strongly linked to syntax;
(ii) marking of information structure – pragmatics;
(iii) expression of attitudes and emotions.

Major difference across languages:  
to what extent (if at all) these are structured in tonal terms.

DEF.  
tonal intonation=addition of tones of intonational origin;
‘Intonational tones’: intonational origin; structurally similar to lexical tones.
Tonal intonation

- Marginally present in Naxi:

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... hā.pà́ gā́ lā̄ dù.hū ko.
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Chinese GEN. too some celebrate

‘[The Naxi not only celebrate their own feasts, they] also celebrate some Chinese feasts.’ from: /hā.pà/ ‘Han, Chinese’

- “rampant in African tone systems” (L. Hyman, p.c.)

E.g. Luganda:

/òmùlimì/ ‘farmer’; with boundary H: /òmúlími/

\[\text{L L L L} \quad \text{L H H H}\]

**Interpretation (hypothesis):**

Extension, by analogy, of a tonal, categorical treatment...

... to intonation, which is originally nontonal, noncategorical
Telling apart tonal and non-tonal phenomena: An experiment comparing Vietnamese, Naxi, and English

Comparing « careful » and « emphatic » renderings of the same words in carrier sentences (This is ___):
- 1st context: teaching a student how to pronounce a word
- 2nd context: answering s.o. for the umpteenth time.

Aim:
- Illustrating intonational malleability of tone (Vietnamese, Naxi).
- Comparing phonetic correlates of tone and of intonation.
  (in particular: F₀, I)
Vietnamese:

Tone D2
(=nonglottalized), careful (nonemphatic) reading.
Mid-range open quotient.

Emphatic reading.
Open quotient:
same range.
F₀: higher.

42 items in each graph.
Overall acoustic intensity (RMS amplitude): difference across reading conditions

(experimental settings unchanged)

Vietnamese data: difference > 5 dB on average
$\uparrow$ Naxi: differences in $F_o$ (register + contour).

English: various strategies. →

Blue: careful reading,
red: emphatic reading
Differences in intensity and in $F_o$

Expected ratios of intensity / $F_o$,
Naxi language

Expected ratios of intensity / $F_o$,\textsuperscript{1}
English language

in Vietnamese:

emphatic

careful
Emphasis: relies proportionally more on intensity in languages with tone.
Lexical tone: proportionally less bearing on intensity.
Modelling non-tonal intonation: 
the case of Mandarin Chinese [4 lexical tones]

Speech synthesis for Mandarin: 
Shih Chilin et al.

1 template 
+strength coefficient 
(based on: informational prominence).

Less strong = more coarticulated.
Conclusion: debate over tonal approaches to intonation

‘Superpositional’ approaches to prosody, tone-sequence (‘autosegmental’) approaches: different field of typological application.
Languages differ in whether – and to what extent – they have intonational tones*.
Intonational tones* strictly speaking: relatively rare.

*tones of intonational origin; structurally similar to lexical tones.

Thank you for your attention!
• Lexical tones and intonation: a thin line. Contemporary linguistics: crossing the line?

« In the most restrictive versions of current intonational phonology, it is explicitly assumed that independently chosen global shapes—e.g. a declination component—are not needed anywhere in the phonological description.

In effect, the restrictive linear view says that all languages have tonal strings; the main difference between languages with and without lexical tone is simply a matter of where the tonal specifications* come from. » (Ladd 1992)

*Tone: understood as levels, « like H(igh) and L(ow) » (Gussenhoven 2004:xvii)

Final upward tilt of Vietnamese tone C1: « due to final H »?

Final rise in interrogative intonation (English, French): « due to final H »?


Contemporary linguistics: crossing the line?

Some terms

- Pitch: the linguistic side of fundamental frequency ($F_0$)
- Tone: the analysis of pitch into discrete units (both in temporal and frequency dimensions)

J. Goldsmith

PPT presentation on «English and tone languages», Introduction to Linguistics 2: Winter 2004
humanities.uchicago.edu/faculty/goldsmith/Intro2/

Unified account of lexical tones and intonation

1. Background

Contemporary linguistics: crossing the line?

<table>
<thead>
<tr>
<th>Term</th>
<th>« Tonal »</th>
<th>« Non-tonal »</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition of Hyman et al. 2008: in phonetic terms</strong></td>
<td>Realized by $F_0$</td>
<td>Realized by parameters other than $F_0$, e.g. phonation types</td>
</tr>
<tr>
<td><strong>Meaning under a functional approach: in structural terms</strong></td>
<td>Contrastive tones, whatever their correlates</td>
<td>All other phenomena, whatever their correlates</td>
</tr>
</tbody>
</table>

**Can $F_0$ be isolated from other phonetic correlates?**

→ Pike: « tonemes »