A subsegmental correspondence approach to contour tone (dis)harmony patterns

Stephanie S Shih
Stanford University / UC Berkeley
stephsus@stanford.edu

Sharon Inkelas
UC Berkeley
inkelas@berkeley.edu

0 INTRODUCTION

- Long-standing question: are “contour tones” (e.g. LH, 35) single units or sequences?
- Related long-standing question: are “contour segments” (e.g. "d, f") single units or sequences?
- These questions derive from behavioral duality:
  - Contours sometimes behave as units,
  - and at other times their parts act independently.

This talk: ABC+Q

- This paper: Q-theory, a new subdivided, quantized representation that allows contour duality to be referenced.
- Embedding Q-theory into Agreement by Correspondence (ABC+Q) yields a grammatical theory of the behavior of contours.
- ABC+Q marries the representational strength of previous approaches (e.g., Autosegmental Phonology, Aperture Theory, Articulatory Phonology) with the locality and similarity design features of ABC, to capture the unity and internal complexity of segments.
- Focus of this paper: tone (but analysis applicable to segments as well; see Inkelas & Shih 2013a)

1 Q-THEORY: QUANTIZED SEGMENTAL SUBDIVISIONS

(1) Segments are subdivided into temporally-ordered, quantized subsegments:

<table>
<thead>
<tr>
<th>Segment → subsegments</th>
<th>Vowels with triple tone contours:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q → Q(q₁ q² q₃)</td>
<td>Mende mbà’ ‘companion’ (Leben 1987)</td>
</tr>
<tr>
<td></td>
<td>Changzhi ti₅₃₅ ‘bottom’ (Duanmu 1994)</td>
</tr>
<tr>
<td></td>
<td>Iau bé’ ‘tree fern’ (Hyman 2009)</td>
</tr>
<tr>
<td></td>
<td>cf. Segmental contours (Sagey 1986):</td>
</tr>
<tr>
<td></td>
<td>C(n¹ t² ḟ₃) ‘d’ (prenasalized affricate)</td>
</tr>
<tr>
<td></td>
<td>C(t¹ f³ h³) ‘f’ (aspirated affricate)</td>
</tr>
<tr>
<td></td>
<td>V(ș³ a² i) Romanian citază ‘read.IND.IMPERF.2SG’ (Dindelegan 2013)</td>
</tr>
</tbody>
</table>

(2) Quantized subsegments q are coarsely phonetically grounded:

q₁ = Onset, q² = Target, q³ = Release (cf. “landmarks” in Gafos 2002: 271; ‘tonal complexes’ of Akinlabi & Liberman 2001)
(3) Maximum of 3 \( q \) subsegments per \( Q \)

- 2- and 3-tone contours occur on single \( Q \).
- 4-tone contours (e.g., LHLH or HLHL) are typologically rare (e.g., Qiyang: see Hu 2011; or Korean aegyo markers; Moon, in prep) and apparently accompanied by phonological lengthening of the host segment (Zhang 2001, et seq.).
- 2- and 3-\( q \) segments occur, but not 4-\( q \) segments. (Possible exception: Mazatec [\( nt^\text{ʃ}h \]): Pike & Pike 1947; Steriade 1994; but cf. Golston & Kehrein 1998 for an alternative analysis.)

(4) More evidence for tripartite \( q \) structure

- In Dinka, alignment of HL tonal contours are contrastive (Remijsen 2013)
  
  \[
  \text{Fall: } [+\text{late-aligned}] \text{ HL contour on vowel}
  \]
  
  \[
  \text{Low}^{\text{Fall}}: [-\text{late-aligned}] \text{ HL contour on vowel}
  \]

- In terms of Q theory: \( \text{Fall} = Q(H^1 H^2 L^3) \); \( \text{Low}^{\text{Fall}} = Q(H^1 L^2 L^3) \)

(5) Points of contact with Autosegmental Theory (Leben 1973; Goldsmith 1976), Articulatory Phonology (Browman and Goldstein 1989, et seq.; Gafos 2002; a.o.), Aperture Theory (Steriade 1993, 1994), proposals for multiple docking sites on TBU (e.g., Morèn and Zsiga 2006).

- Similar to Aperture Theory and Articulatory Phonology in positing phonetically-grounded temporal subdivisions with different featural makeup for (some) segments.
- Similar to Autosegmental Theory and Aperture Theory in allowing independent featural representations for the different portions (subsegments) of a single segment.

(6) Some differences:

- Notion of ‘segment’ explicit in Q theory (vs. Aperture Theory).
- All segments, not just obvious contour segments, have subdivisions (\( q \) subsegments) in Q theory (vs. Aperture, Autosegmental Theory)
- Maximum number of subdivisions is 3 in Q theory (vs. 2 in Aperture Theory).
- \( q \) subsegments are featurally uniform: no multiple associations (vs. Autosegmental Theory).
- Q theory covers vowels as well as consonants—and tone as well as ‘segmental’ features.

2 BEHAVIOR OF CONTOURS: A WORKING TYPOLOGY

(7) Examples of tone contour duality:

<table>
<thead>
<tr>
<th>Harmony</th>
<th>Whole segment: ( Q )</th>
<th>Subsegment: ( q )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Changzhi whole contour tone copying (Duanmu 1994, a.o.):&lt;br&gt;(/ku_\text{213} -ta'<em>{335}/ \rightarrow [ku</em>\text{213} -ta'_{213}] \text{ ‘pan, dim.’}‘</td>
<td>c. Yoruba partial assimilation (Akinlabi and Liberman 2001):&lt;br&gt;(/\text{rârà}/ \rightarrow [\text{rârà}] \text{ ‘elegy’}‘</td>
<td></td>
</tr>
<tr>
<td>b. Pingyao: whole contour dissimilation (Chen 1992, Yip 2002):&lt;br&gt;(/hai_{335} \text{ bing}<em>{335}/ \rightarrow [hai</em>{33} \text{ bing}_{33}] \text{ ‘become ill’}‘</td>
<td>d. Tianjin: subsegments dissimilate across ( \sigma ) boundary (Chen 1985; a.o.):&lt;br&gt;(/\text{fei}<em>{\text{L,ji}}/ \rightarrow [\text{fei}</em>{\text{L,L},\text{ji}}] \text{ ‘airplane’}‘</td>
<td></td>
</tr>
</tbody>
</table>
→ Conclusion: schizoid behavior:

- Contours act as units
- Contours don’t act as units: their constituent subsegmental q’s interact with one another

Analogs to (7) in the segmental domain (see Inkelas and Shih 2013a):

<table>
<thead>
<tr>
<th>Whole segment: Q</th>
<th>Subsegment: q</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Harmony</strong></td>
<td></td>
</tr>
<tr>
<td>[m˘be˘m˘be˘] ‘snail’, [nan˘] ‘today’; *[m˘be˘me˘]</td>
<td>/s˘api˘t˘o˘i˘t/ → [j˘api˘t˘o˘i˘t˘ol˘it] ‘I have a stroke of good luck’</td>
</tr>
<tr>
<td><strong>Disharmony</strong></td>
<td></td>
</tr>
<tr>
<td>/wi鹦i˘ŋka/ → [wi鹦jJECTION] ‘spring-LOC’</td>
<td>/hits˘ + teg˘i/ → [hist˘eg˘i] ‘dictionary’</td>
</tr>
</tbody>
</table>

3 THEORETICAL APPROACHES TO CONTOURS IN HARMONY

Two approaches to harmony and contours:

(9) Autosegmental representations: driven by individual features or feature bundles

- A feature or tone spreads to adjacent timing slots.
- Correctly predicts assimilation to create or be triggered by parts of contours.
- Has trouble with whole contour behavior (e.g., (7); Duanmu 1994; cf. Yip 1989). Contours are not units in standard autosegmental theory.

<table>
<thead>
<tr>
<th>/CVCV/ → [CVCV]</th>
<th>/CVCV/ → [CVCV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>C V C V  → [C V C V]</td>
<td>C V C V  → [C V C V]</td>
</tr>
<tr>
<td>H L H L</td>
<td>H L H L</td>
</tr>
<tr>
<td>simple spreading easily produces partial assimilation of contours (cf. (7c))</td>
<td>simple spreading cannot produce total assimilation of contours (cf. (7a))</td>
</tr>
</tbody>
</table>

(10) Agreement by Correspondence (ABC): original formulation is based on segments as units

- Corresponding local segment pairs of segments, under conditions of similarity and proximity (CORR-XX), are required to be identical (IDENT-XX) in some respect.
  - consonant harmony (Walker 2000; Hansson 2001; Rose and Walker 2004; a.o.)
  - vowel harmony (Sasa 2009; Walker 2009; Rhodes 2010/2012; a.o.)
  - dissimilation (cf. Bennett 2013 (ABC but no similarity scales))
  - tone (esp. consonant tone interactions: Shih 2013)

- Correctly predicts whole segment (dis)harmony, including between contours.
- Has trouble with partial contour behavior. Partial assimilation does not produce overall segment identity, therefore won’t satisfy identity constraints on corresponding segments.
4 QUANTIZED SEGMENTS IN HARMONY

4.1 Q (SEGMENTAL) CORRESPONDENCE

- ABC deals naturally with whole segments/contours participating in harmony.
- Correspondence and agreement targets segments, Q.

(12) $Q_x(q q q) \ldots Q_x(q q q)$ Pair of corresponding segments

$\text{CORR}-Q(q q q) \leftrightarrow Q(q q q)$ $ABC$ constraint, establishes correspondence between whole segments meeting a certain threshold of similarity. *


*Note of clarification: we follow Hansson 2001, Rose & Walker 2004 in assuming that each “Q” instantiates a natural class of segments, e.g. CORR-CC or CORR-VV or CORR-SS (“S” = sibilant); cf. McCarthy 2010, who uses a similar but more restrictive system in which “Q” can only instantiate the entire (consonant) inventory.

(13) Changzhi: tone contours copy as unit (see Yip 1989; Bao 1990; data from Duanmu 1994) (=7a)

a. /kuə213 -tə\\u2192213 \u03c4\u03b4 535/ $\rightarrow [kuə213 -tə圈213]$ ‘pan-DIM’
b. /səŋ24 -tə\\u2192245 535/ $\rightarrow [səŋ24 -tə圈24]$ ‘rope-DIM’
c. /ti535 -tə\\u2192535 535/ $\rightarrow [ti535 -tə圈535]$ ‘bottom-DIM’
d. /kʰu44 -tə\\u219244 44/ $\rightarrow [kʰu44 -tə圈44]$ ‘pants-DIM’
e. /təu53 -tə\\u2192535 535/ $\rightarrow [təu53 -tə圈53]$ ‘bean-DIM’

(14) $\text{CORR-V} \leftrightarrow \text{V}$ Entire vowels correspond

$\text{IDENT-VV}([\text{tone}] [\text{tone}] [\text{tone}])$ Corresponding vowels are tonally identical

$\text{IDENT-IO-V}([\text{tone}] [\text{tone}] [\text{tone}])$ Vowels are tonally identical in input, output
(15) \(/kuə_213\ -tə^{235}/ \rightarrow [kuə_213\ -tə^{235}]\)

<table>
<thead>
<tr>
<th>Correspondence, identity not enforced</th>
<th>Correspondence, identity enforced</th>
<th>No correspondence, identity not enforced</th>
</tr>
</thead>
<tbody>
<tr>
<td>(/V_4(2\ 1\ 3)\ldots V_5(5\ 3\ 5)/)</td>
<td>(/V_4(2\ 1\ 3)\ldots V_5(2\ 1\ 3)/)</td>
<td>(/V_4(2\ 1\ 3)\ldots V_5(5\ 3\ 5)/)</td>
</tr>
<tr>
<td>W1</td>
<td>1</td>
<td>W1</td>
</tr>
</tbody>
</table>

- Duanmu (1994) uses Changzhi to illustrate a distinction between copying versus harmony/spreading. In ABC, note that there is no formal distinction between these processes.

### 4.2 q (SUBSEGMENTAL) CORRESPONDENCE

(16) \(q_q\ldots q\ldots\text{Pair of corresponding subsegments}\)

Corr-\(q\rightarrow q\ldots\text{ABC constraint, establishes correspondence between local pairs of q’s meeting a certain similarity threshold}\)

Ident-qq-[F]\ldots\text{ABC constraint, enforces identity (in [F]) among corresponding segments}\)

(17) Yoruba: partial assimilation creates contour tone (Akinlabi and Liberman 2001) (= (6c)). (For a similar tone pattern, see Chiquihuitlán Mazatec (Jamieson 1977; Yip 2002))

- a. H L → H HL \(/rárâ/\) → \([rárâ]\) ‘elegy’

- b. L H → L LH /àlà/ \(\rightarrow [àlî]\) ‘dream’

(18) Corr-q[V] \(\sigma: q[V]\ldots\text{Vocalic q’s across a syllable boundary must correspond}\)

Ident-qq-[tone]\ldots\text{Corresponding q’s should be tonally identical}\)

(19) \(/ránâ/ \rightarrow [ránâ]\)

<table>
<thead>
<tr>
<th></th>
<th>IDENT-q[V] [tone]</th>
<th>CORR-q[V] [σ: q[V]]</th>
<th>IDENT-IO-q[tone]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. V(H H H) \ldots V(L L L) (W_1)</td>
<td>L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. V(H H H) \ldots V(L L L) (W_1)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. V(H H L) \ldots V(L L L) (W_1)</td>
<td>L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. V(H H H) \ldots V(L L L) (W_3)</td>
<td>W3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correspondence, no identity |
Correspondence, identity |
No correspondence |
Unnecessary correspondence |
Hakha-Lai partial contour tone agreement (Hyman and VanBik 2002). Adjacent halves of contours must agree across syllable boundaries (as realized after the proclitic ka- ‘my’).

a. LH-HL /thłaän-zuû/ → [thłaän zuû] ‘grave beer’
   HL-LH /tlaâŋ-tsaân/ → [tlaâŋ tsaân] ‘mountain time’
   L-LH /koom-tsaân/ → [koom tsaân] ‘corn time’
   HL-L /tlaâŋ-saa/ → [tlaâŋ saa] ‘mountain animal’
   L-L /koom-saa/ → [koom saa] ‘corn animal’

b. HL-HL → HL-L /tlaâŋ-zuû/ → [tlaâŋ zuu] ‘mountain beer’
   L-HL → L-L /koom-zuû/ → [koom zuu] ‘corn beer’

LH-LH → LH-HL /thłaän-tsaân/ → [thłaän tsaân] ‘grave time’
LH-L → L-L /thłaän-saa/ → [thłaän saa] ‘grave animal’

5 Disharmony

- ABC+Q analysis can extend to disharmony.
  - Bennett (2013): dissimilation occurs when correspondence is too costly.
  - e.g., violates a high-ranking constraint such as CC-Edge: corresponding segments may not be separated by a syllable boundary. (Or IDENT-XX)
- Tonal dissimilation occurs between Q’s and between q’s.

Tianjin whole contour Q dissimilation and partial contour q dissimilation (Chen 1985; Yip 1989: 163; 2002: 51, 179)

Adjacent whole tones (Q) **dissimilate** via contour simplification (a) or contour creation (b).
Adjacent subsegments (q) across a syllable boundary also **dissimilate**, by the same methods (b,c):

a. LH.LH → H.LH *HL.LH /xiLH/ → [xiH.lianLH] ‘wash one’s face’
   HL.HL → L.HL *LH.HL /jingHL/ → [jingL.zhongHL] ‘net weight’

b. L.L → LH.L *HL.L /feiL/ → [feiL.lijiL] ‘airplane’

c. HL.L → H.L
(23) \[ / \text{fei₄, ji₄} / \rightarrow [\text{fei₄, ji₄}] / \]

<table>
<thead>
<tr>
<th>/ V(L L L) ... V(L L L) /</th>
<th>CORR-Q-[Q] [tone]</th>
<th>QQ-Edge-[σ]</th>
<th>IDENT-QQ-[Q] [tone]</th>
<th>CORR-q-[q] [tone]</th>
<th>qq-Edge-[σ]</th>
<th>IDENT-qq-[Q] [tone]</th>
<th>IDENT-Q</th>
<th>IDENT-I0</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ V_d(L L L) \ldots V_d(L_\alpha L L) ]</td>
<td>W1</td>
<td>W1</td>
<td>L</td>
<td>Q and q correspondence, faithful</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [ V_d(L L L) \ldots V_d(L_\alpha L L) ]</td>
<td>W1</td>
<td>W1</td>
<td>L</td>
<td>Q correspondence only, faithful</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [ V_d(L L L) \ldots V_d(L_\alpha L L) ]</td>
<td>W1</td>
<td>W1</td>
<td>L</td>
<td>q correspondence only, faithful</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [ V_d(L L L) \ldots V_d(L_\gamma L L) ]</td>
<td>W1</td>
<td>W1</td>
<td>L</td>
<td>No correspondence, faithful</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. [ V_d(L L H) \ldots V_d(L_\alpha L L) ]</td>
<td>W1</td>
<td>W1</td>
<td>W1</td>
<td>1</td>
<td>Q and q correspondence, dissimilation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. [ V_d(L L H) \ldots V_d(L_\gamma L L) ]</td>
<td>W1</td>
<td>W1</td>
<td>1</td>
<td>Q correspondence only, dissimilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. [ V_d(L L H) \ldots V_d(L_\alpha L L) ]</td>
<td>W1</td>
<td>W1</td>
<td>1</td>
<td>q correspondence only, dissimilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. [ V_d(L L L) \ldots V_d(L_\alpha L H) ]</td>
<td>W1</td>
<td>1</td>
<td>q correspondence only, dissimilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. [ V_d(L L L) \ldots V_d(L_\gamma L H) ]</td>
<td>W1</td>
<td>1</td>
<td>No correspondence, dissimilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. [ V_d(L L H) \ldots V_d(L_\gamma L L) ]</td>
<td>1</td>
<td>No correspondence, dissimilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.1 **Q/q INDEPENDENCE IN DISHARMONY**

- \( Q \)'s and \( q \)'s can behave independently in dissimilation and agreement.

(24) Pingyao whole contour \( Q \) dissimilation and partial contour \( q \) agreement (Chen 1992; data from Yip 2002: 196). (cf. Tianjin (21))

Adjacent whole tones **dissimilate**.
Adjoin \( q \)'s agree across syllable boundaries (see also Hakha Lai for a similar pattern).

- a. \( \text{hai}_{35} \text{ bing}_{35} \) → \([\text{hai}_{35} \text{ bing}_{35}])\ ‘become ill’
- b. \( \text{er}_{35} \text{ ruan}_{35} \) → \([\text{er}_{35} \text{ ruan}_{35}])\ ‘ear soft, i.e. gullible’

6 **ADVANTAGES OF AN ABC+Q APPROACH**

- Major advantages of a ABC+Q approach to harmony (and disharmony) (contra a feature-spreading approach):
  1. Similarity basis for explicitly stating participant segments.
  2. Ability to capture both long distance and local (CV) phenomena.

6.1 **THE SIMILARITY BASIS AND NON-LOCALITY**

(25) Proximity and similarity as conditions on correspondence:

1. Proximity: adjacent \( Q \)'s or adjacent \( q \)'s correspond.
   (e.g., Yoruba (17), Hakha Lai tone (20))
2. Featural Similarity: \( q \)'s with similar feature specifications correspond.
   (e.g. Tianjin (21), H tone plateauing in Luganda)
(26) Luganda: H tone plateauing between two lexically H morphemes in same word (a), vs. (b,c): (Hyman & Katamba 1993).

a. bá-mu-láb-a  →  bá-mú-láb-à ‘they see him’
b. bá-tu-sib-a  →  bá-tū-sib-à ‘they tie us’
c. a-tu-láb-a  →  à-tū-láb-à ‘he sees us’

(27) C ORR-VH ↔ VH H toned vowels correspond
CORR-V::V Adjacent vowels correspond
IDENT-VV [tone] Corresponding vowels are tonally identical
IDENT-IO Input and output tone is identical

<table>
<thead>
<tr>
<th>/V(H H H)V(L L L)V(H H H)/</th>
<th>CORR-VH ↔ VH</th>
<th>IDENT-VV [tone]</th>
<th>CORR-V::V</th>
<th>IDENT-IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. V₃(H H H)V(L L L)V₄(H H H)</td>
<td>W₂L</td>
<td></td>
<td>W₁W₂L</td>
<td>1</td>
</tr>
<tr>
<td>b. V₃(H H H)V₅(L L L)V₄(H H H)</td>
<td>W₁W₂L</td>
<td></td>
<td>W₁W₂L</td>
<td>1</td>
</tr>
</tbody>
</table>

6.2 THE SIMILARITY BASIS: LOCAL CV AND TONE INTERACTIONS

- Similarity basis for harmony patterns afforded by ABC allows direct reference to participating segments in harmony: especially useful for CV and tone interactions (Shih 2013).

(28) Nupe partial spread after L tones to create rising contour is licensed when the intervening onset is [+voice] or sonorant (George 1970; Yip 2002: 143–144).

a. ètú ‘parasite’
b. èdù ‘taxes’
/cè-lé/  →  [èlè] ‘past’
c. è-mì/  →  [èmì] ‘I’ or ‘me’ (in the Kpada dialect; in other dialects = [mì])

(29) Nupe pattern can be modeled as (a) correspondence between sufficiently sonorous q subsegments across a segment boundary (“S”), using stringent sonority constraints from Shih (2013); and (b) agreement in tone specification:

| CORR-q{V,R,N,D}-S-q{V,R,N,D}, IDENT-qq(tone) » FAITH-IO q(tone) » CORR-q{V,R,N,K}-S-q{V,R,N,K} |
|-----------------------------------------------|-----------------------------------------------|
| (eₑ eₑ eₑ) (dₑ dₑ dₑ) (uₑ uₑ uₑ) [L][L][L] [L][L][L] [L][H][H] |

7 CONCLUSION

- Contour tones exhibit schizoid, “dualist” behavior:
  - Behave as whole contours,
  - Parts of contours can behave independently.
**ABC+Q:**
- Endows ABC with subsegmental architecture that can be targeted for correspondence relationships.
- Allows for duality of contour behavior to be modeled, in tone and segmental domains.
- Unites segments and tone under one treatment for harmony and disharmony.

**Advantages of ABC (versus (say) autosegmental spreading)**
- Similarity amongst participating segments is a design feature, not a stipulation.
- ABC can capture not only similarity but also proximity effects that determine participating segments in harmony/disharmony.

**Main insight behind all ABC analyses (see e.g., Inkelas and Shih 2013b): UNSTABLE SURFACE CORRESPONDENCE is repaired.**
- Unstable surface correspondence = state of similarity and proximity which passes the threshold of interactivity but does not achieve stable identity or stable dispersion.
- e.g., Yoruba: proximal segments are not similar enough and assimilate in tone to achieve stability.
- e.g., Luganda plateaus: similar tones are not proximal enough and cause assimilation in tone to achieve stability.
- Instability can target local and non-local phenomena (i.e., not limited in distance), and instability can target many levels: string, syllable, mora, segment $Q$, subsegment $q$.

- Offers potential new insights to the extent and limitations of contour tone make-up and behavior: e.g., restrictions against contour tones with mid tones can be modeled as unstable tonal dispersion: $*$ML, $*$MH, $*$HM, $*$ML vs. $\triangleright$LH, $\triangleright$HL (see e.g. Yoruba: Akinlabi and Liberman 2004).

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8 **References**


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