Complex tone sandhi types in the Chinese Wu dialect of Huangyan

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TAKE-HOME

- **Tonal sandhi:** individual tones can change when put in context. In Huangyan (a Sinitic Wu language), sandhi patterns are complex but can be explained through how tonal features interact.
- **This poster:** *Slope* of contour ([±smooth])[6] is proposed to capture *contextual behavior* of tones in Huangyan (HY).

BACKGROUND

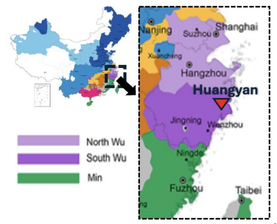
Majority of Sinitic tonal languages display **tone sandhi** – *base tones* on syllables can change based on their position in a tone sandhi domain.[1]

Left-dominant (Northern Wu dialects)
Initial (leftmost) tone is preserved; non-initial tones are lost (1).

(1) Shanghainese: *tone spreading* from leftmost tone
/**ts^{h}ɔ^{34}**-vɛ^{13}/ 'fry-rice' → [**ts^{h}ɔ^{33}**-vɛ^{44}] 'fried rice' [2]
(σ_1 decomposed into simple tones, then extend rightward)

Right-dominant (Min, Southern Wu dialects)
Final (rightmost) tone is preserved; non-final tones are lost (2).

(2) Taiwanese: *tone substitution* with non-final syllables
/te^{24}-**kuan^{51}**/ 'tea-shop' → [te^{33}-**kuan^{51}**] 'teahouse' [3]



(Modified from Huang et al., 2024)[4]

These languages differ on which base tone info is maintained – left or right.

Huangyan (HY): a Southern Wu variety, spoken near the border of the Northern-Wu-speaking area.

Question:
Is HY left- or right-dominant? **ANS**: It's both

TONAL INVENTORY

Huangyan (HY): 8 base/citation tones (for monosyllables)[5]

- **4 Middle Chinese tonal categories**: A (*ping*), B (*shang*), C (*qu*), D (*ru*)
- **2 registers** (& phonation types): (Fig.1)
  Yin/1 (Upper/high & modal): A1^{42}, B1^{51}, C1^{44}, D1^{5}
  Yang/2 (Lower/low & breathy): A2^{21}, B2^{31}, C2^{13}, D2^{2}

Note: D tones always end with a glottal stop

Puzzle: **4 falling tones in HY. How do we handle them?**
→ Incorporate *slope* [±smooth] into the feature geometry of tones (Fig.2)[6]

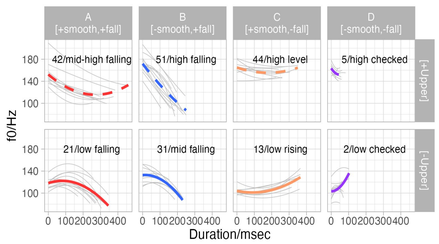


Fig.1 HY Tone inventory based on a native speaker over 60 years of age

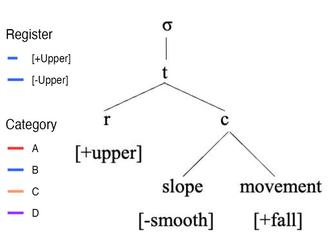


Fig.2 Feature geometry for high falling A1^{51} (r=register; c=contour) [7]

TONE SANDHI: FINDINGS

1. Sandhi in HY is *mostly right-dominant* (Table 1)**, but with exceptions.**

Table 1. Sandhi patterns of possible *disyllabic combinations* in HY (unchanged syllable in bold)

Sandhi pattern	Right-dominant	Left-dominant	Both change	No change	Total
Example	xəʔ mi 'black rice' /5 31/ [3 **31**]	mo̱ʔ pɛ 'plank' /2 51/ [**2** 31]	sɛ sy 'landscape' /42 51/ [33 31]	dẹ̱ʔ səʔ 'trait' /2 5/ [**2 5**]	
Type count	32 (50%)	3 (4.7%)	23 (35.9%)	6 (9.4%)	64

Table 2. Sandhi table: behaviors of base tones in HY (unchanged syllable in bold)

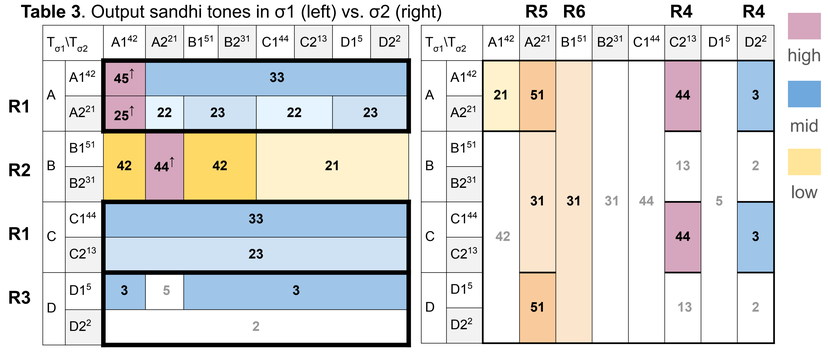
$T_{\sigma1}\backslash T_{\sigma2}$		A1^{42}	A2^{21}	B1^{51}	B2^{31}	C1^{44}	C2^{13}	D1^{5}	D2^{2}
A	A1^{42}	[45$^{\uparrow}$-21]	[33-^{3}51]	[33-31]	[33-**31**]	[33-**44**]	[33-44]	[33-**5**]	[33-3]
	A2^{21}	[25$^{\uparrow}$-21]	[22-^{3}51]	[23-31]	[23-**31**]	[22-**44**]	[22-44]	[23-**5**]	[23-3]
B	B1^{51}	[42-**42**]	[44$^{\uparrow}$-31]	[42-31]	[42-**31**]	[21-**44**]	[21-**13**]	[21-**5**]	[21-**2**]
	B2^{31}	[42-**42**]	[44$^{\uparrow}$-31]	[42-31]	[42-**31**]	[21-**44**]	[21-**13**]	[21-**5**]	[21-**2**]
C	C1^{44}	[33-**42**]	[33-31]	[33-31]	[33-**31**]	[33-**44**]	[33-44]	[33-**5**]	[33-3]
	C2^{13}	[23-**42**]	[23-31]	[23-31]	[23-**31**]	[23-**44**]	[23-44]	[23-**5**]	[23-3]
D	D1^{5}	[3-**42**]	[**5**-51]	[3-31]	[3-**31**]	[3-**44**]	[3-**13**]	[3-**5**]	[3-**2**]
	D2^{2}	[**2**-**42**]	[**2**-^{3}51]	[**2**-31]	[**2**-**31**]	[**2**-**44**]	[**2**-**13**]	[**2**-**5**]	[**2**-**2**]

2. Regular sandhi in HY includes both *positional* & *contextual rules*.

Sandhi type
- *Positional sandhi*: sandhi conditioned by the position of the tone
  Example: C2-C1. /vɛ^{13}-tie^{44}/ 'meal-shop' → [vɛ^{23}-tie^{44}] 'restaurant'
- *Contextual sandhi*: sandhi conditioned by the neighboring tone
  Example: B1-A1. /hu^{51}-tso^{42}/ 'fire-car' - [hu^{42}-tso^{42}] 'train'
  B1-C1. /hu^{51}-tɕie^{44}/ 'fire-arrow' - [hu^{21}-tɕe^{44}] 'rocket'

3. σ1 undergoing sandhi often neutralizes to mid tones;
σ2 undergoing sandhi often lead to idiosyncratic modifications.

Table 3. Output sandhi tones in σ1 (left) vs. σ2 (right)



R1. Neutralization of smooth tones (A/C).
A1^{42}/C1^{44} neutralize to 33 before all Ts;
A2^{21}/C2^{13} neutralize to 23 before B/D.
R2. Neutralization of steep falling tones (B).
B1^{51}/B2^{31} to 42 before A/B, to 21 before C/D.
R3. Lowering of high checked tone (D1).
D1^{5} to 3 before all Ts except A2^{21}; D2^{2} preserved before all Ts.

R4. Raising of non-falling low tones (C2, D2).
C2^{13} to 44 after A/C; D2^{2} to 3 after A/C.
R5. Raising of smooth falling low tone (A2).
A2^{21} to 51 after A/D, to 31 after B/C.
R6. Lowering of steep falling high tone (B1).
B1^{51} to 31 after all Ts.

TONE SANDHI: EXPLANATION

4. Contour slope [±smooth] predicts tonal behavior: smoothness is targeted by sandhi rules and also conditions sandhi rules.

- *Sandhi targeting high smooth tones*
  A1^{42}/C1^{44} neutralize to 33.
  [+upper, **+smooth**, α fall]$^{42/44}$→[+upper, +smooth, ø]^{33} / __ σ #
- *Sandhi targeting low smooth tones and conditioned by non-smooth tones*
  A2^{21}/C2^{13} neutralize to 23.
  [-upper, **+smooth**, α fall]$^{21/13}$ → [-upper, +smooth, ø]^{23} / __ [**-smooth**] #

5. Contextual constraints target Contour and Register independently.

- *Contour constraints*: Contour dissimilation (a), avoid contour clashes (b)
- *Register constraints*: Register dissimilation (c)

a. OCP-Contour. Avoid successive tones with same contour.
Example: A1+A1: /t^{h}ie^{42}-sɥ^{42}/ 'sky-book' → [t^{h}ie$^{45\uparrow}$-sɥ^{21}] 'gibberish'
Exception: 0 for input tones, 2 for output tones (B1/B2^{42}-A1^{42})

b. *fall-rise. Avoid fall-rise contours.
Example: A1+C2: /sɛ^{42}-di^{13}/ 'mountain-ground' → [sɛ^{33}-di^{44}] 'hill'
Exception: 0 for input tones, 0 for output tones

c. *[+Upper][+Upper]. Avoid successive tones in high register (OCP-Register).
Example: B1+C1: /ɕəu^{51}-t^{h}ɒ^{44}/ 'hand-cover' → [ɕəu^{21}-t^{h}ɒ^{44}] 'glove'
Exception: 0 for input tones, 3 for output tones (B1/B2^{42}-A1^{42};D1^{5}-A2^{51})

- Strong support for Obligatory Contour Principle (OCP):
  All 16 combinations (4x4) of falling tones undergo sandhi
  Note: output 42-31 does not violate OCP: 42 is [+smooth], 31 is [-smooth]

6. Irregular sandhi resolves contour clashes through multiple repairs.

- HY uses H-upstep (45$^{\uparrow}$/25$^{\uparrow}$,44$^{\uparrow}$) as a repair: /hl-hl/ → [h$^{\uparrow}$-hl] (h=high, l=low)
  A1^{42}/A2^{21}-A1^{42}. First T$^{42/21}$ to 45$^{\uparrow}$/25$^{\uparrow}$, second T^{42} to 21.
  Example: A1-A1. /t^{h}ie^{42}-sy^{42}/ 'sky-book' → [t^{h}ie$^{45\uparrow}$-sy^{21}] 'gibberish'
- H-upstep also attested in Mankon (Cameroon)[8] : /l-hl-h/ → [l-h-$^{\uparrow}$h]

FUTURE DIRECTIONS

- **Tonal categories & representation**
  How do learners represent the abstract tonal categories? How is slope information used in tonal recognition?
- **Psychological reality of sandhi**
  What sandhi rules are productive? How do they affect processing?
- **Language contact**
  What features might transfer from left-dominant languages to a right-dominant one? Examine larger sandhi domains in future work

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