

Directionality and Least Effort Principle in Tianjin

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Phenomenon

Tianjin, a northern Mandarin dialect, has four lexical tones: H, L, HL and LH. Four tone sandhi processes are observed in disyllabic strings (Chen 2000):

Disimilation

- a. L+L → LH.L [fɛj tɛi] "airplane"
- b. LH+LH → H.LH [ɕi ljan] "wash one's face"
- c. HL+HL → L.HL [tɛiŋ tʂɔŋ] "net weight"

Tonal absorption

- d. HL+L → H.L [ʒan tʂan] "earnest"

These four rules govern the realization of tone sandhi in trisyllabic forms. However, tone sandhi rules must apply from left to right to derive the outputs for some tri-tonal patterns and from right to left to account for the others. The rule application directionalities appear to be ungoverned.

[P = Pattern]

Right-to-left

- (P3) HL+HL+HL → HL+L+HL → H+L+HL
- (P4) L+L+L → L+L.H+L
- (P5) LH+L+L → LH+L.H+L → H+LH+L
- (P6) L+HL+HL → L+L+HL → LH+L+HL
- (P7) HL+L+L → HL+LH+L

Left-to-right

- (P1) HL+HL+L → L+HL+L → L+H+L
- (P2) LH+LH+LH → H+LH+LH → H+H+LH

Note that morphosyntactic structures play no role in the application of rules, since a left-branching string and a right-branching string will generate the same surface form.

Our analysis

We propose two constraints to capture the varied manifestations of directionalities in Tianjin:

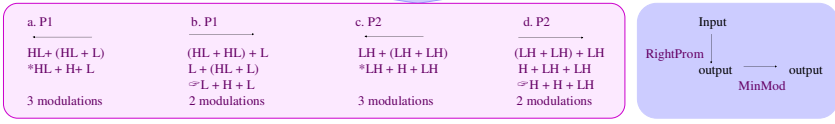
a. RightProm: tone sandhi should apply from right to left, i.e. from the direction of the trigger towards the target ; in a right-dominant language such as Tianjin, the phonological rule should apply from right to left.

b. MinMod (minimize modulation): the number of modulations generated by tone sandhi should be minimal.
[1] For example, HL and LH have one tonal modulation, whereas HLH and LHL have two tonal modulations. Level tones such as H and L have no modulation at all.

Constraint hierarchy

MinMod >> RightProm

In P1 and P2, the right-to-left directionality would generate more tonal modulations than the converse directionality. After evaluation with a *virtual* output, speakers chose to violate RightProm in order to produce sequences with lesser tonal modulations



Notice that articulatory complexity of contour tones does not imply its markedness status in structural sense of the word since there exist, in Chinese, several dialects with only contour tones, such as in Chengtu, Shanghai, Zhenhai, Guiyang, Longquan, Pingyao and Wuxi. MinMod consists in that a great number of modulations is more difficult to produce than a little number of modulations, but it does not imply that tonal modulation is in itself a marked object.