

Tone Sandhi Directionality and Relative Markedness Constraints

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In some Chinese dialects, disyllabic tone sandhi rules must apply from left to right to derive the outputs for some tri-tonal strings and from right to left to account for the others. One common point among them is that morphosyntactic structures play no role, a left-branching string and a right-branching string generating the same surface form.

We examined the trisyllabic sequences of four Chinese dialects: Boshan (Chen 2000), Tianjin (Chen 2000), Sixian-Hakka (Hsu 1996, Hsiao 2000), and Chengtu (Lin 2004). We argue that rule application directionality is primarily determined, in Boshan, Sixian-Hakka and Tianjin, by the (lowest) number of tonal modulations generated in the output; if the number of modulations generated by both left-to-right and right-to-left rule application is the same (which happens to occur in Tianjin), (right-to-left) directionality follows from final stress (RIGHTPROM). Thus, in Tianjin, where two tone patterns show left-to-right application of sandhi rules, and five others right-to-left application, the correct surface form never has more tonal modulations than the one generated by the opposite direction. For example, the left-to-right application $\underline{HL}+\underline{HL}+L \rightarrow L+\underline{HL}+L \rightarrow \widehat{L}+\widehat{H}+L$ implies two modulations, while the opposite direction would generate three modulations, i.e. $HL+\underline{HL}+\underline{HL} \rightarrow \underline{HL}+\underline{L}+HL \rightarrow *H+\widehat{L}+\widehat{HL}$. This fact, in line with the principle of least effort (Zipf 1949, Martinet 1955, Lindblom 1986, 1990), will be formulated as a constraint labeled MINMOD (minimize modulation) dominating RIGHTPROM.

The analytical task becomes more challenging in Chengtu, which has initial stress and a mid register. In three cases, the candidates generated by right-to-left application could be said to win simply because they satisfy MINMOD. However, in these cases, as well as, crucially, in four other cases in which the outputs generated by both directionalities have the same number of modulations, we observe that the illicit forms have farther-apart pitch targets compared with the attested surface forms. Thus, the sequence MH+LM+MH, where both directionalities involve three modulations, gives $\widehat{MH.L.M}$ (left-to-right), not $*\widehat{MH.L.H}$ (right-to-left); the same holds for the sequence LM+LM+MH, which gives $\widehat{LM.L.M}$ (left-to-right), not $*\widehat{LM.L.H}$ (right-to-left). Sundberg (1973, 1979) has remarked that a complicated tonal contour involving more pitch targets involves more complicated muscle state changes. In other words, if the principle of least effort is the major criterion in governing tone sandhi directionality, the output with farther-apart pitch targets must be eliminated. We posit a dominating constraint MINAMP (minimize amplitude of contour tones) to capture this fact; thereby, both MINMOD and LEFTPROM can be shown to be trivially satisfied in Chengtu.

The present analysis has an interesting result compared with a classic OT analysis. Contrary to candidate selection, in which markedness is built into grammars by means of constraint violation before candidates are submitted to EVAL, in the present analysis, MINMOD and MINAMP cannot be said to be violated (nor satisfied) before EVAL takes place. The markedness constraints proposed here are intrinsically *relative*: an output having three tonal modulations does not, *per se*, violate MINMOD, but only in comparison to the output generated by the opposite directionality. This conception is reminiscent of structural linguistics (Hjelmslev 1935, Trubetzkoy 1939, Jakobson 1941), where markedness was defined in terms of contrastive specification, not in terms of constraint violation.