

A typology of foot-driven tone

1 Towards a factorial typology of tone

Mobile tone patterns, where an underlying tone may surface in a different location, have received much attention in typological OT research (Bickmore 1996; Cassimjee and Kisseberth 1998; Key 2007). However, unlike analogous work on stress (Gordon 2002; Kager 2005), these works fail to investigate the full range of typological predictions that follow from their proposals. This talk presents a foot-based approach to mobile tone, with a focus on investigating the full range of predictions made.

The talk considers bounded, unbounded, and rhythmic tone, exemplified in (1).

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|---------------|---|
| Bounded | <i>Copperbelt Bemba</i> (Bickmore and Kula 2013): |
| | Tone spreads two syllables to the right. |
| (1) Unbounded | <i>Xhosa</i> (Downing 1990): |
| | Tone spreads to the antepenult of a word. |
| Rhythmic | <i>Lamba</i> (Bickmore 1995): |
| | Tone surfaces on every other syllable. |

The intuition explored here is that in all three types, tonal mobility is foot-driven. That is, for bounded patterns, all tone spread and shift takes place within a locally positioned foot. For unbounded patterns, a foot at the prosodic edge defines the target for spread or shift. For rhythmic patterns, tone targets follow from iterative footing over the entire domain.

2 Foot-driven tone in Harmonic Serialism

Example (2) shows the derivation of binary rightward shift, attested in Rimi (Olson 1964). Crucially, after step 2 spreading halts because the edge of the foot has been reached.

- | | | | | | | | |
|-----|------------------------------|---------------|--------------------------|---------------|--|---------------|--------------------------------|
| (2) | $\acute{\sigma}\sigma\sigma$ | \rightarrow | $(\acute{\sigma})\sigma$ | \rightarrow | $(\acute{\sigma}\acute{\sigma})\sigma$ | \rightarrow | $(\sigma\acute{\sigma})\sigma$ |
| | 0. UF | | 1. Footing | | 2. Spreading | | 3. Delinking |

Derivations such as (2) require a serial grammar. Hence, this talk adopts Harmonic Serialism ('HS', Prince and Smolensky 1993/2004; McCarthy 2010). HS deviates from OT in two ways. Firstly, evaluation is serial; an output is fed back into the grammar until no changes occur. Secondly, GEN can only apply one 'operation' to the input, thus restricting the candidate set. Relevant operations here are tone (de)linking and foot construction.

Some mobile tone patterns use a domain of three syllables rather than two (Bickmore 1996). This proposal follows Martínez-Paricio and Kager ('MPK', forthcoming), in adopting a trisyllabic foot. MPK propose that a binary foot and an unparsed syllable can combine to form a higher foot layer covering three syllables. The typological trend of two and three-syllable domains then follows from languages preferring binary or ternary feet.

Finally, this talk proposes a constraint set to relate feet to tone. This proposal expands on De Lacy (2002) by allowing for licensing effects, which adds flexibility for tone spreading. The relevant constraints are instantiated for the different foot layers of MPK, and for both left and right edges of feet. In total, there are 27 constraints for foot-tone interaction.

3 Investigating the full typology

As with OT, a HS typology can be investigated by considering all rerankings. However, the size of the constraint set and the large candidate space of tone and feet representations precludes the use of traditional typology software. Instead, results are presented from a stochastic impression of the full typology: 10,000 random constraint rankings were generated. They were applied to an input set of five forms with eight syllables, all carrying a single H in the UF, at different distances from the edge. This gave rise to several hundred unique output patterns.

A selection of results is shown in (3). Results for shifting are mostly identical to spreading, so the table only lists exceptions. Many of the unlisted patterns closely resemble the listed patterns or are a combination of listed patterns.

Description	UF	SF	Generated	Attested
Bounded				
Binary spreading	.. <u>ó</u> σ..	.. <u>ó</u> ó..	✓	✓
Ternary spreading	.. <u>ó</u> σσ..	.. <u>ó</u> óó	✓	✓
Quaternary spreading	.. <u>ó</u> σσσ..	.. <u>ó</u> óóó..	✗	✗
Quaternary shift	.. <u>ó</u> σσσ..	.. <u>σ</u> σσó..	✓	✗
‘Two-way’ spreading	.. <u>ó</u> óó..	.. <u>ó</u> óó..	✓	✗
(3) Local skipping	.. <u>ó</u> σσ..	.. <u>ó</u> óó..	✓	✗
Unbounded				
Unb. spread to penult	.. <u>ó</u> σ..σσ]	.. <u>ó</u> ó..óσ]	✓	✓
Unb. spread to antepenult	.. <u>ó</u> σ..σσσ]	.. <u>ó</u> ó..óσσ]	✓	✓
Unb. spread to preantepenult	.. <u>ó</u> σ..σσσσ]	.. <u>ó</u> ó..óσσσ]	✗	✗
Unb. shift to preantepenult	.. <u>ó</u> σ..σσσσ]	.. <u>σ</u> σ..óσσσ]	✓	✓
Rhythmic tone				
Sponsor-preserving	..σσ <u>ó</u> σσ..	.. <u>ó</u> σ <u>ó</u> óó..	✓	✓
Sponsor-non-preserving	..σσ <u>ó</u> σσ..	.. <u>ó</u> ó <u>ó</u> óó..	✓	✓

The results confirm that foot structure is a useful tool to account for all three types of tonal mobility. The framework is able to capture binary and ternary patterns as intended. Some overgeneration is also found. The full talk will discuss the role of extragrammatical factors in paring down the predicted typology.

4 Conclusion

This talk has presented a HS framework using layered feet to account for mobile tone patterns. For the first time in tone typology, the framework’s wider range of predictions was investigated, using a random sample of grammars. The predictions include bounded, unbounded and rhythmic patterns. Some potential overgeneration was found in quaternary domains, two-way patterns, and local skipping patterns. In conclusion, this talk advances our understanding of problems in tone typology, and their potential solutions.