A Segmental Account of Tones: Evidence from Zulu

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Abstract

I. Summary This study presents segmental evidence and representations of Zulu tones based on the observations of incremental patterns. Zulu tonal structure proposed in this study suggests tones are licensed as segment-sensitive empty structure that has significance beyond syllables. Tones are regarded as the extension of segmental structure and often function as a configuration of segmental layout at the word domain level.

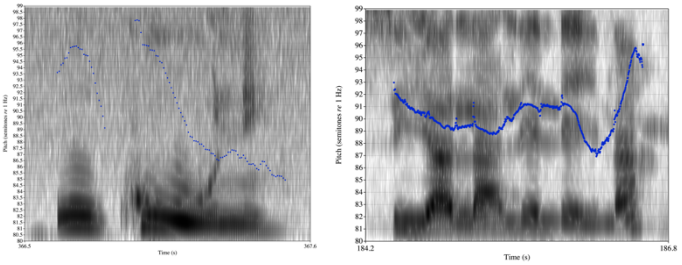
II. Increments It is observed that all Zulu word domain tonal contour patterns can be simplified into one (V-shaped), two (W-shaped) and three falling tones (W-V shaped). Each tonal curve may accommodate varying number of syllables. A key observation based on measurement is that Zulu tonal increments (in **semitone**, st) predominantly occur in two harmonic surface forms (approximately): -4st (a major third) and -7st (a perfect fifth) (and a less common form: -12st, i.e., an octave).

III. Data Khumalo (1981), Traill et al. (1987) discussed the effect of depressor consonants and penultimate syllable, surrounding three surface tonal increments, this study suggests apart from depressor (often license -7st pitch) and penult ([+ATR] nuclei often surface -7st, while [-ATR] -4st), there are more tonally salient segments, here are some examples:

a) Nuclear preceding a depressor often carry a higher pitch than preceding a non-depressor, and depressor pitch lowering is based on the pitch of preceding syllable.

b) Sonorant onset following a pitch lowering delays the tonal realisation (apply to -4st, -7st and -12st), e.g., illustrated in *ukhuni* (1a) and *siyalalelela* 'we are listening for' (1b) (pitch lowering of *siya-* see *c)* in this list).

(1) a. *ukhuni* 'a firelog' b. *siyalalelela* 'we are listening for'



c) Word initial segment C_0+/i/+C_0+/a/ sequence often surface as a -4st, e.g., word initial sequence *siya- ngiya-, sila, siba* can surface as -4st, but *siwu-*, *uya-*, *baya-*, *kula* cannot.

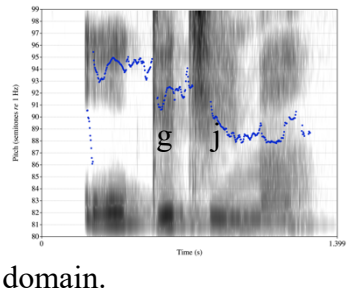
IV. Further Observation and Ordering

Across approximately 1000 Zulu recordings surveyed, Zulu word domains express several principle tonal patterns:

d) A word domain must employ at least one tonal increment (apart from extreme cases where two level tone conditions are met).

e) Penultimate syllable and final syllable exhibit contrastive stress pattern: stressed syllable carries a prominent pitch shift (usually the penult), while the unstressed syllable carries a smaller pitch increment.

(2) *ukugiima* 'to run'



f) -4st, -7st can both be the only prominent increment in a WD, increments showing evidence that they are transferrable and compatible in a domain: when there is no other increment present, a depressor may surface as a -4st; when two depressed syllables are adjacent, the first depressor may surface as a -4st, and the second completes the -7st lowering, e.g., *ukugijjima* 'to run' (as shown in (2)); This study suggests Zulu word domain tonal structure is characterised by:

i. Tonal structure showing hierarchical relations within a word domain.
ii. Having a head structure (a prominent pitch drop) projecting up to the word domain.
iii. The head can either be a nuclear structure or an onset structure.
iv. The head allows complement tonal structures no larger than itself to surface.

V. Structural Proposal Tonal structure showing hierarchical head-subordinate relation can be interpreted structurally with projection structures. Larger tonal increments project higher, allowing smaller non-persistent increment to surface. The tonal increments can be represented as in (3):

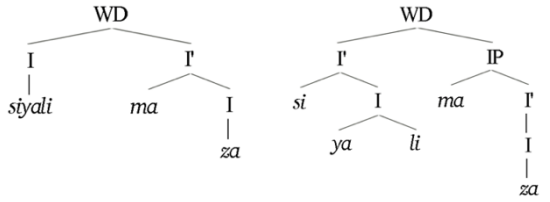
(3) Tonal projections
IP → Prominent surface increment
| (approx. -7st)
I' → Surfaced increment
| (approx. -4st)
I → Unsurfaced increment (Level tone)

The structural indication is that each pitch lowering find in a V, W or W-V shaped domain tonal contour corresponds with an I projection (to I' or IP), e.g., incremental representations of possible tonal forms of *siyalimaza* 'we are hurting' can be represented with structures in (4): final depressed syllable *za* is the most salient tonal structure in the word domain, in (4a), only depressed final syllable surfaces as a -4st increment (I'); while in (4b), depressed final syllable surface as a prominent -7st lowering (IP), allowing word initial C_0+/i/+C_0+/a/ sequence *siya-* surface as a -4st, and the sonorant onset causes segment *li* delay the tonal realisation of *siya-*, becoming the most deeply embedded structure on the left. Since segment *ma* precedes a depressed syllable, it sits in the specifier position of prominent tonal projection, indicating increment relation with the tonal head of the domain (*za*).

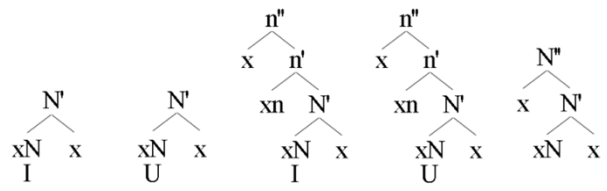
Consider the structure of C_0+/i/+C_0+/a/ -4st increment. It is clear that C_0+/i/+C_0+/a/ -4st increment is solely triggered by vowel sequence /i/-/a/ in word initial CVCV structure, since changing onsets do not affect the surfacing (applicable to *siya/siba/sila*), while this increment is not observed (or lexically impossible) once alter the vowel sequence to sequences other than /i/-/a/ (*siwu/uya/baya/kula*). Hence, this study suggests that the segmental structural contrast can be transferred into tonal structure, segments are not simply embedded in the increment structure suggested above, but often express tones with available internal structure. This study approaches the segmental tonal structure with the theory of Government Phonology 2.0 (Pöchtrager, 2006, 2018). Suggested GP2.0 representations of Zulu vowels are shown in (5):

(4) Possible structures of *siyalimaza*

a. V-shaped realisations b. W-shaped



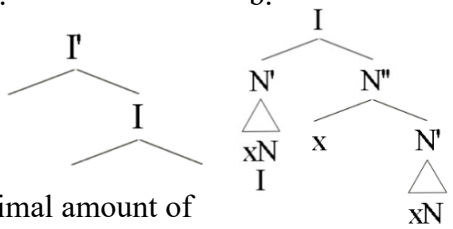
(5) GP2.0 representations of Zulu vowels



The implication of C_0+/i/+C_0+/a/ is that /i/-/a/ sequence create a structure like (6a) without I→I' projection, as illustrated in (6b). It is noteworthy that turning internal structure tonal does not take away the structural space of the nuclei, on the contrary, the essence of nuclear tonal structure is a structural licensing process to the lowest nuclei. Due to the abundance of structural space, /a/ is more reactive (in a tonal context), even with minimal amount of extra structure. Following this proposal, prominent penultimate nuclear falling can also be reinterpreted as variable structural licensing based on the internal segmental space of the nuclei, but the tonal surface forms vary due to the [±ATR] attribute of the nuclei when stressed ([+stress] means rejection of Specifier xn, which marks [-ATR]).

(6) /i/-/a/ bears similar structure as a -4st

a. b.



Reference:

A. Traill , J.S.M. Khumalo & P. Fridjhon. (1987) Depressing facts about Zulu, African Studies, 46:2, 255-274.
J.S.M. Khumalo (1981) Zulu Tonology, African Studies, 40;2, 53-130.
Pöchtrager, Markus A. (2006) The Structure of Length. Ph.D. thesis, University of Vienna, Vienna.
Pöchtrager, Markus A. (2018) Sawing off the branch you are sitting on. Acta Linguistica Academica, 65, 1, 47–68.