Vowel Coalescence in Tigrinya

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(1) What is Tigrinya?

- Tigrinya (Tna) is an ethiosemitic language spoken primarily in Eritrea and the Tigray province of Ethiopia (ca. 4 million speakers).
- Seven vowels /i e ɛ ɨ o u a/, ejectives, pharyngeals. Geminates, spirantization, vowel/glide-alternations, productive reduplication, broken plurals.
- CV-syllable-based orthography (> 300 chars.)

(2) What is vowel coalescence?

- vowels merge under local adjacency, resulting in segmental quality which is a function of the participants (e.g. ɛ + i = e)
- true coalescence iff result and participants are pairwise different

(3) Under which circumstances is coalescence likely to occur?

- language has strict ban on hiatus (strict onset/limited coda) *and*
- possible X/0 alternation of intervocalic blocking material *or*
- morpheme composition creating adjacent vowels

(4) Tigrinya syllable structure

CV(C) [CXV(C) under special circumstances]

(5) The data (see separate sheet)

- from Berhane (1991)'s dissertation [ä = IPA ɛ, y = IPA j]; checked with native speaker from a village 20 km SE of Asmara
- regular paradigm for type-A verbal root √ g.r.f. ´whip´, ´hollow' verb √ m.(w).t. ´die´
- Hollow verbs have a positional or X/0 alternation of medial root element. In Tna these are the high vowels/glides /i,u/.
- There are dialectal differences and optional alternations in coalescence data; focus here on Berhane´s transcription (a native speaker)

(6) Goals of the analysis

- reduce irregularity of hollow verbs to properties of medial element
- formalize coalescence within Declarative Phonology

(7) Framework: Declarative Phonology (DP)

- only surface-true formal descriptions (cf. True Generalization Condition of NGP)
- key assumptions: (i) descriptions =/= objects (ii) monostratal (iii) monotonic (i.e. only inviolable constraints) (iv) lexicalism (hierarchical inheritance-based lexicon conception removes redundancy objection) (v) formal adequacy figures prominently

(8) Background and previous work

- concatenative treatment of non-concatenative prosodic morphology within DP
- major ideas: (i) lexicalized V/0 alternation in stems only (cf. Hudson 1980), affixes are positionally stable (ii) inviolable declarative syllabification and syllable complexity constraints narrow down ´candidate set´ (iii) a single additional left-to-right optimization mechanism prefers the 0 alternant, i.e. non-realization, over X realization at every X/0 occurrence. This "reduce alternation ambiguity as early as possible" strategy can be realized incrementally, hence increases psycholinguistical plausibility.
- Computer-implemented models for Tonkawa fragment and full regular verb paradigm of Modern Hebrew (Walther 1995, Walther & Graf, in prep.).
- In Tna V/0 seems to be restricted to /ɨ/ (schwa), in contrast to Tonkawa and Modern Hebrew.

(9) An earlier analysis of Tna coalescence: Buckley(1994)

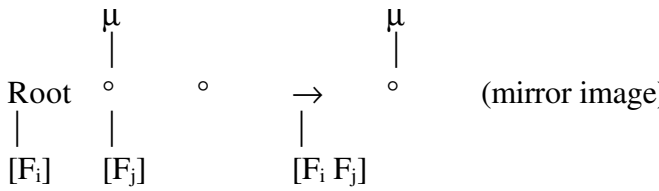
- underspecified vowel representations + FCRs: (Buckley´s /ʌ/ appears as /ɛ/ below)

	i	e	ɨ	ɛ	a	o	u
mid		•		•		•	
low					•		
front	•	•					
round						•	•

FCRs: *[low front], *[low round], *[front round]

- FCR-legal combination gives new vowel, good account of major coalescence results
- rule of merger operating under unification (symmetric)

Vowel Coalescence (Buckley ibid.:13)



(10) Problems with (9)

- excessive features for / ɛ / + /a/. [Buckley favours the non-privative version of the vowel chart in (9), which has [-high] for [mid], but is still redundant for the coalescence result /a/]
- non-monotonic use of underspecification: missing features must be interpreted as absent *iff nothing else is known*. This is incompatible with an unification-based approach: no blocking if ungrammatical vowel qualities in input during comprehension/parsing, no blocking if phonological contexts match,i.e. unify with underspecified representations.
- across-the-board coalescence must be restricted by the Strict Cycle Condition not to apply to suffix - ɛj , *-e
- More problems force Buckley to say:"...the rule of Vowel Coalescence ... is correct as a rule of the phonology, and that the exceptions found in glide-medial verbs are due to special morphologically conditioned rules." (Buckley, ibid.:22)
- rule predicts all coalescence to be symmetric, but Tna can be argued to contain cases of

X + Y =/= Y + X !

(11) Asymmetric coalescence: Tna hollow verbs in the jussive/imperative

- Presuppositions: (i) regular stem vowels in hollow verbs (ii) i/0 is only V/0-alternating type of stem *vowel* in the verbal paradigm
- then difference in e.g. /kimot/ < ki-mɛuit ´die, 1sg jussive´ vs. /mut/ < miuɛt ´die, 2msg jussive´ reduces to different immediate adjacency of ɛu vs. uɛ within the stem: ɛ+u = o, u+ɛ = u! Similarly ɛ+i = e, i+ɛ = i, e.g. in √ k.(j).d. ´go´.

(12) Immediate consequences

- site-specific encoding of stem vowels needed
- simplest approach: lexicalize coalescence potential in situ
- yet another argument for morphemes-as-constraints, the DP standard position ever since

(13) Formal treatment of coalescence in "optimizing DP"

- no underspecification -> blocking problems vanish, but fully-specified vowels don't coalesce due to unification clash
- two states of vowels to be distinguished: 1 bit (named 1-value "c"/ named 0-value "nc"). Coalescing state (c) annotates vowel set which subsumes noncoalescing (nc) singleton set: Example semi-formal descriptions using logical implication and conjunction:

ε1 := is(c -> nonhigh & nc -> ε).
i1/2 := is(c -> front & nc -> i).
u1 := is(c -> round & nc -> u).
ε2 := is(c -> vowel & nc -> ε).

- coalescence is not universally quantity-preserving (contra de Haas (1988): Tna has no long vowels. Hence a second type of positional alternation apart from X/0 is needed: a *realignment* (left/right) by one position. Since shifting material around directly (left) or indirectly (right) supports L-R-optimization, it is unmarked resp. preferred by optimization over *in situ* realization. Note that X/0 is also a type of realignment, as the following formal (CUF) definitions show:

```
realign(X, Y, MoreMaterialStartsHere) :=
        ( X & MoreMaterialStartsHere & unmarked
        ; obligatory(Y, MoreMaterialStartsHere & marked)
        ).
realign(x0, X, More) := realign(_,X, More).
realign(left, X, More) := realign(left:X, X, More).
realign(right,X,More) := realign(right:X, X, More).
```

String relations induced by x0*:* ....AXB.... -> .....AB..... .

-" "- left: ....AXB.... -> .....AB.....
X
-" "- right: .....AXB.... -> ....ABX...

(14) Stem vowels in $C_{1,root}\ V_1\ X_{2,root}\ V_2\ C_{3,root}$

V_1	infinitive; jussive/imperative & not 1s:		(/i/)
	elsewhere	:	/ɛ/
V_2	perfective	:	/ɛ/
	gerund	:	/i/
	imperfective;jussive 1s	:	(/i/)
	jussive;imperative & not 1s	:	/ɛ/
	infinitive	:	/a/

(15) No coalescence in stems without medial glide

- *stable* root-medial consonants assign "nc" to both adjacent V positions
- otherwise unempirical free variation due to underspecification of coalescence state bit

(16) Perfective Coalescence

- from 3 to 1 positions by left shift oft medial glide and left shift of V_2

$m\varepsilon_1 u\varepsilon_2 t$ -> $m\varepsilon_1\varepsilon_2 t$ -> $m\varepsilon_1 t$ [mot]

u ε_2 (stacking indicates coalescence!)

u

(17) Imperfective & Jussive 1s Coalescence

- from 3 to 1 positions by non-realization of final (i) and left shift of medial glide

$m\varepsilon_1 u(i)t$ -> $m\varepsilon_1 ut$ -> $m\varepsilon_1 t$ [mot]

u

(18) Jussive/Imperative & not 1s

- from 3 to 1 positions by non-realization of initial (i) and left shift of second stem vowel

$m(i)u\varepsilon_2 t$ -> $mu\varepsilon_2 t$ -> mut [mut]

ε_2

This is the case showing that ε_2 must have different coalescence properties (see def. above)!

(19) Gerund

- V-initial suffixes: from 3 to 2 positions by left shift of medial glide

$m\varepsilon_1 ui_2 t$-V.. -> $m\varepsilon_1 i_2 t$-V.. [mɔjt]

u

- C-initial suffixes: from 3 to 2 positions by right shift / metathesis of first stem vowel!

$m\varepsilon_1 ui_2 t$-C.. -> $mui_2 t$-C.. ɛ/

ε_1

- remarks: (i) high V $<_{sonority}$ nonhigh V to get correct syllabifications -> add [high] = {i,u} feature! (ii) if u is a segment rather than secondary labialization, invoke phonetic interpretation to produce extrashort realization; this is plausible due to general ban on complex onsets in Tna; weaken anti-complexity constraint to *Complex-Onset-if-not-high
- side issue: is i_2 left-shiftable?

Alternative a. no. Then no further constraints necessary, but asymmetry with other vowels in this position (except /a/, however...)

Alternative b. yes. Then constraints necessary for *mwet-V... Interestingly a prosodic condition like "minimally bimoraic stem" is not surface-true, due to (admittedly also irregular) forms of √(b).(h).l. ´say´: ʔil-V.. ´say, gerund´.

Surface-true local alternative: $V_{2,gerund}$ onset -> V_2 = i ." if right neighbour of stem vowel 2 in gerund is onset, then stem vowel 2 itself is constrained to be /i/")

(20) Infinitive coalescence

from 3 to 2 positions by non-realization of first stem vowel (i): mi-m(i)uat-....-> mi-muat-.....